The Pedagogical Architecture of Modern Learning Environments in Four New Zealand Secondary Schools

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Abstract

The New Zealand Ministry of Education has committed significant resources to develop state-owned school buildings that are purposefully built with quality materials, embrace internet capable technology and contain large, flexible learning spaces. Schools and classrooms built in this manner have been referred to as modern learning environments (MLEs). The development of MLEs was to improve the quality of school property infrastructure and increase student achievement with learning environments that support 21st-century teaching and learning. Initially, there was quite specific guidance on building and design standards for MLEs, but there was limited guidance on how to change teaching and learning practices to match with the physical changes of learning environments.

This thesis reports on qualitative multi-site research that explored teaching and learning in four New Zealand secondary schools that followed the requirement to adopt MLEs. Data was collected at each school via document review, a semi-structured interview with the principal, semi-structured interviews with teachers who taught in the MLEs and a focus group discussion with students who were timetabled to the MLEs. Across data sources, the main foci were (1) to investigate how the concepts of learners, educators, content and resources were interpreted and organised in the MLEs and (2) to explore what those in MLEs considered 21st-century skills and competencies to be and how these were being developed in learners.

The employed methodology offered primacy to the participants' understandings and experiences to help make visible the operation of MLEs from the varying perspectives of those involved in daily teaching and learning in these environments. Viewing the MLES in the four schools this way identified an observable gap between the potential that literature presumes MLEs may contain to develop 21st-century skills and competencies in learners and the realities of the daily operations of these learning environments. This gap is visible when considering how underpinning concepts related to the operation of MLEs are employed and when exploring individual reflections on how aspects of the physical space of MLEs may

enable or constrain teaching and learning practices. Viewing MLEs this way also demonstrated how influential participants' individual perspectives were when limited guidance on how to change teaching and learning practices was offered, and therefore how essential purposeful time to reflect with colleagues is when collaboration is a valued or required aspect of a learning environment. Additionally, viewing MLEs this way suggests teaching and learning in an MLE deprivatises both teacher and student practice by making teacher and student actions visible to colleagues and peers in a way they were not visible in pre-MLE learning environments.

The approach taken in this thesis to explore the phenomena of MLEs in the New Zealand secondary school context contributes to the emerging discourse around the development and understanding of MLEs from the perspectives of those involved in the reality of teaching and learning in such spaces. By making visible the reality of the use of MLEs, this research can be used to develop support for those who carry out teaching and learning in these environments.

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Table of Contents

List of Tables

Chapter One: Introduction

The Catalyst for this Research

In 2016 I completed a Graduate Diploma in Teaching (secondary). As part of this degree's requirements, I carried out two six-week practicums at different secondary schools. Practicums are important to help student teachers gain teaching experiences in operational classrooms with qualified teachers. The two schools in which I was placed offered very different experiences. One school had traditional cellular classrooms that were each about 10m x 7m in area. There were around 30 students and one teacher per class. The class had a single curriculum subject focus such as English or Science, and all the students were from the same year level. The students' desks were in tidy rows facing the whiteboard, and the teacher stood at the front of the class portraying a position of "knowledge expert". The learning day was divided into five periods of learning. Each period students would move to a different classroom where they would have a different teacher and a different curriculum focus. I learned in this type of environment when I attended secondary school in the 1990s the only difference was that our desks faced a blackboard.

The other school in which I was placed had a single modern learning environment, the rest of the school was unmodified and held the original structure from when it was built in the 1960s. Throughout this thesis, the spaces which are the focus of this study will be referred to as modern learning environments or MLE. MLE are learning environments in New Zealand state-owned schools that were established in line with the goals and vision of *The New Zealand School Property Strategy 2011–2021* (Ministry of Education [MoE], 2011)[1]. The first time I entered that MLE, it appeared chaotic, a hive of activity in one large, open learning environment six times the size of the classrooms at the other practicum school. The MLE was colourful and loud; it contained about 100 students and five teachers. There was a variety of furniture in the space that students and teachers would arrange as

[1] This concept will be further defined throughout this chapter.

necessary. The teachers taught as a team and the students, who were from multiple year levels, were working on projects that integrated four curriculum subjects: English, Science, Mathematics and Social Studies. The day was divided into three periods of learning. Students stayed in the MLE with the same team of teachers for the four subjects mentioned earlier, and those subjects were often taught in a cross-curricular way, for example using Science content to teach English skills, or understanding statistics through a Social Studies context.

After graduating, I taught full-time in an MLE where the teachers were required to work as a collaborative team. For us, that meant we planned lesson content together, team-taught together and took collective responsibility for students' pastoral care and academic achievement. Apart from my practicum experience, as a team, we had had no other experience with MLE. In their previous teaching careers and their initial teacher education (ITE), my colleagues' experiences were more akin to the organisation of the other practicum school in single-cell classrooms. When teaching full-time in the MLE I began to truly understand how much time and effort both teachers and students were expending to try and operate effectively within the modified space of the learning environment. They were navigating the increased physical space, learning to work as a team, integrating curriculum and educating multiple year levels simultaneously in the single learning environment.

The MLE was a recent addition to the school. One of my colleagues who had been working in the space since it was first established suggested there was a lack of guidance from the Ministry of Education on how to operate teaching and learning in MLEs. They said it was like we had been given a brand-new multimillion-dollar cruise ship: the teachers were the staff; the students were our passengers. We were given the curriculum as a type of map, expected to function together as a crew, and tasked with facilitating student achievement. The perceived lack of guidance made it feel like no one explained how to sail the ship.

When the idea to undertake this PhD began to solidify, I asked my colleagues what they would be interested to know about MLEs. The leader of the MLE I was assigned asked me to find out why the physical learning environment had needed to change from the traditional cellular classroom. Together we wondered how other teachers and students

organised teaching and learning in their MLEs and adapted to the change in physical space, or if others who operated in an MLE knew why they did so.

General Context

One subject I learned in those cellular classrooms in the 1990s was History. Our teacher made sure to instil in us the idea that having some historical context of a topic can aid in understanding a topic in the present. What follows is a short history of New Zealand education to provide some context for the origin of MLE.

When Europeans came to New Zealand in the 19th century, they brought with them the organisation of the school structure from their home countries. When the Education Act 1877 was passed the Department of Education was established (Swarbrick, 2012) and schooling was made compulsory for children in New Zealand between the ages of seven and 13 where they would attend lessons to "learn English, have Christian values instilled and be taught 'moral' habits" (Tearney, 2016, p. 16). This curriculum was promoted to "ensure the future success of the colony" (p. 16). As time passed the school leaving age increased, secondary schools were established, and the curriculum became broader in scope. Any areas included in the curriculum were always promoted with a focus on developing productive citizens and the success of the nation. One such example was in 1904 when the new curriculum for primary schools was developed. This curriculum still included good moral habits but was expanded to include "civics (patriotism, loyalty and duty to others) and health, alongside regular primary school subjects such as reading, writing and mathematics" (Tearney, 2016, p. 20). This curriculum was promoted to help prepare children "for their future citizenship in a democratic society" (p. 20).

Throughout the history of secondary school education in New Zealand, in general, a major focus in the classroom had been on what students learn and examining that knowledge, compared to how they learn and developing those skills (Bojesen, 2017; Bolstad & Gilbert, 2012; Swarbick, 2012; Tearney, 2016). A focus was also preparing students for further education or employment outside of school, which has previously valued knowledge

retention and the ability to work as you were told, when you were told, within a bureaucratic hierarchy (Bolstad & Gilbert, 2012)[2].

In New Zealand, school facilities were initially the concern of churches and secular organisations but with the inception of the Department of Education, 12 school boards were created to govern schools throughout New Zealand (Swarbrick, 2012). At this point schools became autonomous self-managing entities; the management and maintenance of school property was the responsibility of individual schools with some government funding provided depending on the school roll and location (MoE, 2011, 2020; Swarbrick, 2012). The post-war baby boom of the 1950s saw a population increase and many school facilities were built to meet this need (MoE, 2011, 2020). In the 1970s, following international trends, some schools were built with large open-plan learning environments with the rationale that the open physical space would aid in contemporary teaching practice (Bennett & Hayland, 1979; Fletcher et al., 2020). This type of learning environment was largely abandoned by the 1980s, and spaces were segmented into cellular learning environments once more. Critics suggested that at the time "openness" was confused with "flexibility" (Dovey & Fisher, 2014). In the 1980s, prefabricated buildings were moved onto school campuses to meet further needs of population growth.

In 1989 the Education Act 1989 was passed, the Department of Education was dissolved, the Ministry of Education was established, the school leaving age was raised to 16, and the public was introduced to the concept of a school Board of Trustees (BOT) (Swarbrick, 2012; Tearney, 2016). In New Zealand, all schools now have a BOT. At secondary school, the BOT consists of the school principal and representatives of staff, students and parents (MoE, 2021a). The BOT is tasked with governing the school and is responsible for the "curriculum (what is taught), property, personnel, finance and health and safety" (MoE, 2021a, para 3) of the school with the primary goal of student achievement. The specific role of the BOT in relation to property shall be commented upon further shortly.

[2] Similar comments have been made regarding secondary schools in other countries that are also part of the OECD (Bergasal et al., 2007; Fisher, 2005; Nair & Fielding, 2005).

The diversity of New Zealand schools, the varying capability of those in management positions, individual school contexts and challenges, mean school facilities have been managed in a range of ways (Hipkins, 2018; MoE, 2011, 2020). More recently, a large number of the buildings schools had previously acquired reached the end of their lifespans and needed to be renovated or removed from school campuses. Once again, there was a need to provide more school facilities for population growth and increased levels of student retention predicted for secondary school. Teaching practices, student needs, and technology had changed, there was a perceived "need to provide more flexible learning environments to reflect that change" (MoE, 2010, Instructions, point 7), and health and safety standards had also been modified (Hipkins, 2018; MoE, 2010, 2011, 2020).

The Ministry of Education responded to these issues by developing *The New Zealand School Property Strategy 2011–2021* (MoE, 2011), which was applicable to all primary, intermediate, secondary, kura kaupapa Māori (Māori immersion schools) and special education state-owned schools in New Zealand. This document is fundamental to this thesis as it was in this document that the MLE concept was introduced, and it was stated that all state-owned schools would develop such environments "as they become due for their next round of property funding" (p. 13) or as they were newly built. It is essential to alert the reader that during the execution of this thesis a new property strategy was published in June 2020: *Te Rautaki Rawa Kura The School Property Strategy 2030* (MoE, 2020). *The New Zealand School Property Strategy 2011–2021* has become a historic document but was extremely influential during its time which was when the MLE of the four schools that participated in this research were created. All references to the 2011 – 2021 strategy have been removed from Ministry of Education websites but it can be accessed through the reference list of this thesis.

During the time *The New Zealand School Property Strategy 2011–2021* was operative, as classrooms needed to be renovated, or built, or as entire new schools were built, they were required to align with the visions and goals of this document. As stated in this property strategy, "the Ministry of Education is focused on having a world-leading education

system that equips all New Zealanders with the knowledge, skills and values to be successful citizens in the 21st century" (p. 2); and "the Ministry of Education, as the owner of state schools, requires a portfolio of well-maintained schools supporting a modern education system that produces skilled people who can contribute toward a productive economy" (p. 3). Accordingly, the reasons for introducing New Zealand schools to MLE were twofold: to improve the quality of school property infrastructure and to increase student achievement with learning environments presumed to support 21st-century teaching and learning. However, at the time little guidance was offered on how to alter classroom practice in line with the physical space to increase student achievement and develop the desired citizens (Benade, 2017a; Starkey & Wood, 2021).

Improving Property Infrastructure

To offer the reader a clearer understanding of how the physical space of classrooms had the potential to change with the introduction of MLE, it is important to address the more specific details of the directive to adopt these spaces. When the directive was issued it was accompanied by the Innovative Learning Environment Assessment Tool (ILE Tool) (MoE, 2010). At existing state-owned schools, assessment of school property with this tool was required by Boards of Trustees every five years to support the development of the 10 Year Property Plan[3] at their schools. The ILE Tool has also become historic since research for this thesis began, and has been replaced by the School Evaluation of Physical Environment (SEPE) survey (MoE, n.d-a, 2021b), but was an influential document during the time the participating schools adopted MLE(s).

Specifically, the ILE Tool directed Boards of Trustees toward school space design which "reflects learning space designs that are found in new schools in New Zealand or overseas and are considered desired outcomes for the longer-term" (MoE, 2010, Instructions, Line 5). School spaces that should "comprise of flexible teaching zones that can

[3] A school's 10 Year Property Plan sets out how the physical environment will be maintained to support teaching and learning over a 10-year timeframe (MoE, 2020c).

easily be reconfigured and used in a variety of ways. They have better environmental qualities (heating, lighting, ventilation and acoustics), and are wired for ICT"[4] (MoE, 2011, p. 13) in comparison to existing buildings. Examples of questions taken directly from the ILE Tool that reveal these designs for some learning areas are set out in Table 1.

Table 1
Examples of Questions from the ILE Tool

Learning area	Question number	Question
General learning Spaces (Classrooms)	1.4	Does the classroom design allow teachers to work co-operatively with teachers from other classrooms or specialist disciplines e.g. are there movable walls between spaces or access to a shared space?
	1.5	Is there visual transparency, e.g. glass windows/walls, between learning spaces and other areas, such as corridors, breakout spaces, staff workrooms?
Student support spaces	9.4	Do students have access to a home base near their general classroom learning spaces or an area where they can socialise or work with peers?
Teacher support spaces	10.5	Are workspaces transparent to students who can see teachers working or have access to them?

A main difference between SEPE and the ILE Tool is that the SEPE survey asks how well the current physical space of a school supports the school's desired teaching approaches while the ILE Tool directed the space to be designed in a specific way. As noted, there was an initial lack of pedagogical guidance from the Ministry of Education when the physical space was directed to be changed (Benade, 2017a; Starkey & Wood, 2021). However, by implementing the ILE Tool, and requiring the physical environment to be designed in a specific way, "the Ministry of Education *is* dictating that teaching and learning cease to take place in single-cell classrooms" (Benade, 2017a, p. 100) (italics in original). The difference, for example, concerning the affordance of "visual transparency" between classrooms and staff workrooms, and a "home base" for students as noted in Table 1, or to be wired for ICT, meant that teaching and learning had the potential to be, and may have needed to be, carried out differently to how they had been in pre-MLE spaces.

[4] ICT is only referred to in the abbreviated form in this document but unabbreviated in Ministry of Education literature stands for Information and Communication Technologies (MoE, 2006, p. 1)

Supporting 21st-Century Teaching and Learning

The idea of equipping all New Zealanders with the knowledge, skills and values to be successful citizens in the 21st century was influenced by national needs and international ideas around education, just as historically, the organisational structure of schools in New Zealand was previously influenced by European ideas around education. Specifically, regarding the turn towards MLE, the Ministry of Education was influenced by the Organisation of Economic Co-Development (OECD) and its ongoing research into how to design education for learners to prepare them for the 21st century (Benade, 2017a; Bolstad & Gilbert, 2012; Carvalho, 2019; Education Review Office [ERO], 2018). The OECD (2015) says of schools today that they

> need to prepare students for more rapid economic and social change than ever before, for jobs that have not yet been created, to use technologies that have not yet been invented, and to solve problems that we do not yet know will arise. (p. 3)

Research indicates a successful citizen in the 21st century is a creative person who can find and apply knowledge in novel situations. They have good communication skills and can collaborate with others in both work and home life, are literate, think through issues and find solutions autonomously (Anaiadou & Claro, 2009; Bolstad & Gilbert, 2012; Dumont et al., 2010; MoE, 2007, 2016, n.d; OECD, 2012, 2015).

More explicitly, the OECD suggests that "the rapidly changing and mobile nature of contemporary society places a particular premium on such competency areas as; *teamwork and collaboration, creativity, capacity for problem-solving, knowledge transfer to new problems, and digital media literacy*" (OECD, 2012, p. 4) (italics in original). The New Zealand Curriculum (NZC) places value on the key competencies: thinking; using language, symbols and text; managing self; relating to others; and participating and contributing (MoE, 2007, p. 7).

When envisioning preparing students to contribute towards a productive economy, it is interesting to consider the idea of social investment. Social investment is about employing resources today so that less of the government's social interventions would be needed in the

future (Boston & Gill, 2017; Hawke, 2017). "Education Policy as a whole is not part of [the] social investment initiative" (Hawke, 2017, p. 360), but education has long been understood as a process of human capital formation that generates both public and private benefits. This process of human capital formation can be seen earlier in this chapter in relation to the historical context of New Zealand education, which promoted a curriculum perceived to "ensure the future success of the colony" (Tearney, 2016, p. 16), or prepare children "for their future citizenship in a democratic economy" (p. 20).

There is clear overlap between the key competencies of the NZC and the OECD's ideas of 21st-century competency areas, all of which could be understood through a lens of social investment. These skills and competencies could also be seen as a "turn towards the development of learners' dispositions, capacities and competencies to deal with new situations and environments including those with high degrees of complexity, fluidity and uncertainty" (Bolstad & Gilbert, 2012, p. 2). Both the key competencies and the OECD's competency areas also demonstrate movement away from a focus on the aforementioned valued knowledge retention and the ability to work as you were told when you were told within a bureaucratic hierarchy (Bolstad & Gilbert, 2012; Starkey & Wood, 2021).

MLE and ILE

Originally, the New Zealand Ministry of Education used the term MLE for these learning environments (Benade & Jackson, 2017; Bissett, 2014; Bradbeer, 2016; Couch, 2018; ERO, 2017; MoE, n.d., 2011) but from around 2015 they began to use the term innovative learning environment (ILE) as it has greater international recognition (Te Kete Ipurangi,[5] n.d.-a). The OECD (2012) uses the term ILE to distinguish between traditional or conventional pedagogy and a new way of learning that may include, but need not be guided by, a change in the physical space where learning takes place.

[5] Te Kete Ipurangi "the online knowledge basket" (Te Kete Ipurangi, n.d.-b, para 1) is a Ministry of Education initiative that provides information and curriculum materials to progress teachers' professional development and raise learner achievement.

The OECD definition of an ILE is "an organic, holistic concept - an ecosystem that includes the activity and the outcomes of the learning" (OECD, 2013, p. 11). Innovation is added to the learning environment concept because according to OECD-related research, innovation is a key element of success in the current climate, encouraging learners to be innovative and being innovative in the way that students are encouraged to learn (Dumont et al., 2010). In this way, ILE is about an educational paradigm shift in the way learning takes place, the knowledge and skills valued in contemporary society, and the knowledge and skills assumed to be valued in the future. The OECD paradigm shift is guided by research and school-specific strategies to help prepare learners with 21st-century skills and competencies (OECD, 2012).

The focus of the Ministry of Education on the physical learning environment in policy was guided by the need to develop equitable school facilities and successful citizens for the 21st century (Benade, 2017a; MoE, 2011, 2020; Starkey & Wood, 2021). When the directive was issued there was no nationally or internationally agreed list of what skills, competencies, or pedagogies may constitute 21st-century teaching and learning (Anaiadou & Claro, 2009), or best prepare students to be successful 21st-century citizens in New Zealand (Benade, 2017a; Starkey & Wood, 2021). Now that MLE are in action in New Zealand, OECD research is promoted as a guide on how to successfully implement these learning environments (Carvalho, 2020; Couch, 2018; ERO, 2018).

In some countries, this shift in education to prepare learners for the 21st century is being led by a purposeful change in teaching and learning practices. OECD countries have been approaching this idea in different ways; for example, in the Australian state of Victoria, there was funding available for schools to develop learning programmes that were innovative. The goal of those programmes was to "improve student learning outcomes, change teacher practices, develop connections between pedagogy and space, encourage flexibility of teachers' working relations, professional learning and innovation, and facilitate cooperation and collaboration between schools" (Blackmore et al., 2011, p. 8). In Israel, the Ministry of Education's Experiments and Entrepreneurship Division identifies schools and

educators with strong visions for innovative learning and offers a five-year support programme with funding, and research and development tools. If, at the end of the five years, the schools demonstrate special success, they then become a dissemination centre for others to come and learn how to develop similar strategies within their own environments (OECD, 2015). In Mexico, the National Council for Education Development has developed a system in which itinerant pedagogical advisors travel to rural and disadvantaged communities. These advisers work collaboratively with the community and parents to strengthen the operation of teaching and learning in schools. Also, in the former Yugoslav Republic of Macedonia, there is a United Nations International Children's Emergency Fund (UNICEF) programme designed to develop in-service teacher education to address low achievement of numeracy and literacy. This is a programme designed to change the paradigm of education from the bottom up and is fuelled by professional development to train teachers and also their advisers (OECD, 2015).

As education becomes a policy priority for countries, refurbishment and development of learning environments have become a focus for local and national governments, for example in Iceland (Sigurðardóttir & Hjartarson, 2011), Scotland (The Scottish Government, 2009) and Portugal (Veloso et al., 2014) (as well as New Zealand). Part of this focus is to update and create equitable learning facilities, and part is related to the assumption that learning environments have the potential to impact on the teaching and learning practices that occur within (Dovey & Fisher, 2014; Nair & Fielding, 2005).

As stated, throughout this thesis the spaces in New Zealand which are the focus of this study will be referred to by their original name: modern learning environment, or MLE. One reason for this is the name of the building standards which heralded their conception. These environments were required to be adopted regardless of whether the school communities were prepared or saw a need to change the teaching and learning practices. The organisation of property funding meant that school buildings that were most in need were the ones that were renovated or replaced and that this would happen in stages throughout the life of the school. This organisation meant that a part of the school may be an MLE while

the rest of the school continued to hold the original structure, as was the case in my practicum school.

Another reason why I have chosen to continue to call the learning environments in this study MLE, as opposed to ILE in line with the Ministry of Education, is that my experience in MLEs illustrated to me that although it is necessary to alter some conventional pedagogical practice to operate effectively within this different sort of learning environment, the changes are not necessarily innovative as the OECD advocates and the name suggests. The final reason to continue to use the term MLE is that with the introduction of the new property strategy (MoE, 2020) and the SEPE survey (MoE, n.d-a, 2021b) there is potential for schools to have more agency to align the physical space with the educational vision of the school when renovating and building learning environments. Therefore, MLE are learning environments (including whole schools) which were built and renovated in line with the vision and goals of *The School Property Strategy 2011 – 2021* (MoE, 2011).

Pedagogical Architecture

By now the reader may be beginning to understand there are two equally important strands of information that need to be woven together to create a clear picture of MLE in the New Zealand school context: (1) the physical space of the learning environment, its design, quality and how it may or may not impact on teaching and learning (architecture), and (2) teaching and learning practices that may help develop 21st-century skills and competencies in learners (pedagogy). With this in mind, in the title of this thesis and in the coming chapters, the term *pedagogical architecture* is used.

Kedian and West-Burnham (2017) offered imagery of the family home throughout different countries in the world and explained that although the purpose and function of the home in different locations has a similar origin they can be expressed quite differently. The available materials or physical space may affect the expression of a home just as the valued design or specific use in different environmental and cultural contexts may affect that expression. As I began to read literature on modified learning environments based on case

studies carried out in different countries throughout the world, I began to appreciate the similar origin, purpose and function of such spaces but recognised the spaces could be expressed quite differently depending on the specific context, valued architecture, pedagogical design or specific students and educators that operate in different learning environments. Therefore, the concept of architecture has been added to the concept of pedagogy to invoke the idea of meta-design, including "structural design, planning, style, construction, materials and many other elements" (Kedian & West-Burnham, 2017, p. 5). By including architecture in this definition I also make reference to the context within which the school exists, not only the physical space of the learning environment.

The Ministry of Education is in agreement with the OECD understanding of ILE as ecosystems. However, considering the focus on developing New Zealand state-owned school infrastructure, pedagogical architecture is a multidimensional concept that pays attention to the context of the school, the physical learning environment and teaching and learning practices applied within. This definition of pedagogical architecture will be revisited in the conclusion.

OECD Concepts Used in this Thesis

OECD research influenced the Ministry of Education's focus on developing 21st-century skills and competencies in learners and their consideration of learning environments as holistic ecosystems. OECD research is also advocated for by the Ministry of Education as guidance when implementing MLE in New Zealand classrooms (Carvalho, 2020; Couch, 2018; ERO, 2018). Two further concepts from OECD learning environment literature helped shape the research questions of this thesis; the pedagogical core and organisational structure (OECD, 2013) of a learning environment and the 7 Principles of Learning (Istance & Dumont, 2010). These two concepts are fundamental to this thesis and used to help make sense of how the schools that participated in this research may have been using their MLE(s) to support 21st-century teaching and learning.

As defined in *Innovative Learning Environments* (OECD, 2013), the pedagogical core comprises of the four elements found in every learning environment; learners, educators, resources and content. Organisational structure concerns how those elements are organised in each learning environment. The OECD's Centre for Educational Research and Innovation used these elements to explore the organisation of 40 case studies across 15 OECD countries to create understandings of how those individual cases (schools) were operating teaching and learning in innovative ways in the specific context of their learning environments. Using these elements to organise their data provided unique but general profiles of each of those schools. These elements are used in this research to explore the organisation of the four participating schools in their unique contexts through general profiles and discover any common aspects of operating within an MLE.

The 7 Principles of Learning comes from a 2010 OECD document titled *The nature of learning: Using research to inspire practice* (Dumont et al., 2010). This document was a collection of chapters by educational researchers, the aim of which was "to inform educational policy and practice via evidence-based reflection on how learning environments should be designed" (Ischinger, 2010, p. 4). The editors hoped to show how to reshape learning environments to develop and support knowledge gain and "21st century competencies" in "new millennium learners" (quotation marks in original) (Ischinger, 2010, pp. 3–4). The key transversal conclusions from this collection are the 7 Principles of Learning which the research strongly indicated "should be present in a learning environment for it to be judged truly effective" (Istance & Dumont, 2010, p. 326). The 7 Principles of Learning were listed on page 317 of this document (see also; OECD, 2013, p. 153 and OECD, 2015, p. 24) and are set out in Table 2 on the following page.

Once I began reading for this thesis I often came across the 7 Principles of Learning, prior to this, during my ITE, whilst on practicum, and employed to teach in the MLE these principles were not brought to my attention and I was unaware of them. The authors suggested these learning principles should help develop and support 21st century

competencies and be present in the learning environment for it to be judged effective. In line with this idea, one reason given by the Ministry of Education to develop MLE was to support 21st-century teaching and learning. Therefore, I was curious if others who taught in MLE were aware of these principles, and their perceptions of these learning principles in relation to their MLE. These principles were purported to help support and develop 21st-century competencies, accordingly, were they being used as a tool to do so in the MLE of the participating schools, the physical space of which was also designed with this purpose?

Table 2
The OECD's 7 Principles of Learning

Principle number	Description of principle
One	Make learning central, encourage engagement, and be where learners come to understand themselves as learners.
Two	Ensure that learning is social and often collaborative.
Three	Be highly attuned to learners' motivations and the importance of emotions.
Four	Be acutely sensitive to individual differences including prior knowledge.
Five	Be demanding for each learner but without excessive overload.
Six	Uses assessments consistent with these aims, with strong emphasis on formative feedback.
Seven	Promote horizontal connectedness across learning activities and subjects, in and out of school.

Research Questions

Given the Ministry of Education requirement, justification and dual purpose of creating building facilities built to contemporary quality standards that would help support 21st-century teaching and learning, the OECD influence, and my own interests from my experience of teaching in an MLE, the overarching and sub-research questions for this thesis are:

- How are MLE in the participating New Zealand secondary schools being used to develop 21st-century skills and competencies in learners?

a) What do the MLEs in the participating schools look like at their *pedagogical core* and what is the *organisational structure* of these learning environments?
b) What do educators and learners in MLEs in the participating schools consider 21st-century skills and competencies to be?
c) In the MLEs at the participating schools, what are the educators' perspectives of the OECD's *7 Principles of Learning*?

A Point of Difference

Existing research regarding MLE and ILE investigated single or related aspects of learning environments, for example, the benefits and challenges of curriculum integration in New Zealand secondary schools (McPhail, 2017), the impact learning environments may have on student achievement (Byers et al, 2018), or the impact of learning environments on teacher mind frame (Bradbeer et al., 2019). Other research approached MLE from different participant perspectives, such as effective leadership in leading the transition from pre-MLE spaces to co-teaching in MLEs (Fletcher et al., 2017), implications for teacher professional development in MLE from the perspective of school principals (Charteris & Smardon, 2018), or experiences of teachers in the 21st century and policy and how the space of an MLE can affect teacher practice while at the same time being shaped by teacher practice (Benade, 2017b). Additional research defined types of learning environments present in different schools (Dovey & Fisher, 2012; Imms et al., 2017) or contained single or multiple case studies which again explored single or related aspects of learning environments, often in regard to their self-identified alignment with innovative learning practices (Blackmore et al., 2011; ERO, 2018; OECD, 2013, 2015).

This thesis explores teaching and learning at four New Zealand secondary schools that followed the requirement to adopt MLE(s). The aim of the current research was to explore the operation of the MLEs in the participating schools from the perspectives of those who were involved with the operation of those spaces with reference to the development of

21st-century skills and competencies in learners. This was achieved by recording principal, teacher, and student participants' perspectives and understandings with reference to the research questions. A general focus on the daily operation of MLE offered insight into the operation of the spaces and how to support teachers and students in these learning environments in general. General can be understood in comparison to any curriculum specific or single perspective specific (such as solely leadership) research. A point of difference in the approach taken in this thesis is that it makes visible underrepresented voices of teachers and students regarding the daily operation of learning environments in New Zealand secondary schools.

Exploring the operation of MLE with research based on the participants' daily experiences and understandings, and doing so in four separate locations, will allow an exploration of context-specific findings and findings applicable across all participating schools (Audet & d'Amboise, 2001; Herriott & Firestone, 1983; Jenkins et al., 2018; Lewin & Stuart, 2002, 2003). As well as hoping to offer insight into the operation of learning environments at secondary school to support teachers and learners, this approach may make visible connections between experiences, aspects of the physical space, teaching and learning practices and the operation of learning environments that may have previously been unnoticed.

Chapter Summaries

Chapter Two: Literature Review. This chapter begins by exploring how the physical space of a learning environment and teaching and learning practices have been conceptualised with reference to 21st-century teaching and learning. This information begins to form a foundation of understandings that helps explore the New Zealand movement toward MLE. Following this literature commissioned by and related to the Ministry of Education is addressed and the final section reports literature related to pedagogical practices researched in the classroom.

Chapter Three: Methodology and Methods. This chapter positions this study theoretically and contains a summary of the elements of the conceptual framework, methodology, and methods including ethical considerations used in this project.

Chapter Four Findings I: The Pedagogical Architecture and Organisational Structure of the Participating schools. This chapter begins to respond to research sub-question A and contains information on the contexts of each of the four participating schools. This information includes each school's demographic context, design of the physical space of the MLE(s), the organisational structure of the students, teachers and learning time and information on the schools' ongoing journey to MLE(s).

Chapter Five Findings II: Awareness and Comprehension of 21st Century Skills and Competencies and the 7 Principles of Learning. This chapter responds to research sub-questions B and C by addressing participant awareness and comprehension of the concepts of 21st-century skills and competencies and the 7 Principles of learning.

Chapter Six Findings III: Increased Interactions, Teacher Teams and Enablers and Constraints. The contents of this chapter was developed by reflexive thematic analysis applied to all participant transcripts across all four sites. It explores the themes of *Increased Interactions*, *Teacher Teams* and *Enablers and Constraints* to provide information on the daily operation of MLE from the perspective of those who were involved in that daily operation.

Chapter Seven: Discussion. In this chapter the findings from the previous three chapters are discussed under the headings *Perspectivism and Intersubjective Realities*, *Increased Visibility of Practice* and *Spatial Code*. These sections are discussed in relation to relevant literature and aspects of the conceptual framework explored in Chapter Three.

Chapter Eight: Conclusion. This final chapter provides a research summary and responds to the research questions, presents key findings, recommendations and limitations of this thesis and summarises the potential this research has to contribute to the discourse of MLE.

Chapter Two: Literature Review

Introduction

This chapter has been written into three sections. The first section explores how physical learning environments and teaching and learning have been conceptualised. These points are reviewed with reference to ideas surrounding 21st century teaching and learning. This section includes OECD learning environment literature and provides a foundation of understandings from both national and international literature to better comprehend the movement toward MLE in the New Zealand context. The second section reports on literature related to and commissioned by the New Zealand Ministry of Education; this section includes information on policy and access to guidance that has shaped the national context the MLE from the participating schools were operated within. The final section reports on research which focuses on the pedagogical practices of MLE in operation.

The two main reasons for the turn to MLEs in the New Zealand context were improving property infrastructure and increasing student achievement with learning environments presumed to support 21st-century teaching and learning (MoE, 2011). Correspondingly, when the concept of pedagogical architecture was introduced in Chapter One, two aspects of modern learning environments were considered equally important: the physical space, and teaching and learning practices. Therefore, the literature reviewed in this chapter addresses the physical space of learning environments and teaching and learning practices, as well as any explored impact they may be perceived to have on each other with reference to the New Zealand context. The contents of this chapter present an overview of literature relevant to the research subject of this thesis: the operation of MLE in New Zealand secondary schools with reference to 21st-century teaching and learning.

It is essential to comment on the nomenclature used within this chapter. The authors of the articles reviewed here variously refer to the learning environments as innovative/modern learning environments (I/MLE) (Bojesen, 2017), flexible learning space (FLS) (Benade, 2017b; ERO, 2018; Fletcher et al., 2017; MoE, 2017; Wall 2016a, 2016b;

Whyte, 2017), modern learning environments (MLE) (Benade & Jackson, 2017; Bissett, 2014; Bradbeer, 2016; ERO, 2017; MoE, n.d-b, 2011), innovative learning environments (ILE) (Bradbeer et al., 2019; Byers et al., 2018; Charteris et al., 2017; ERO, 2018; Imms et al., 2017; Kedian & West-Burnham, 2017; MoE, 2020; OECD, 2013, 2015), next/new generation learning environments (NGLE) (Bradbeer, 2016; Charteris & Smardon, 2018), or quality learning environments (QLE) (MoE, 2020). This list provides examples but is not exhaustive of the total articles included in this chapter. These labels may or may not have different meanings, or definitions, in different contexts, depending on the perspective(s) of the author(s) of the article. When discussing other researchers' work, I have retained their preferred terminology, believing that, like me, they will have their reasons for what they name the studied environment or aspect of the environment.

Conceptualising Physical Space and Teaching and Learning

The modification, development, conceptualisation, and building of learning environments with specific infrastructure to achieve educational aims (such as the aim of developing MLE to support 21st-century teaching and learning) has been happening throughout history in New Zealand and overseas (Alterator & Deed, 2013; Bennett & Hayland, 1979; Blei, 2020; Bradbeer, 2020; Dovey & Fisher, 2014; Fletcher et al., 2020; Monahan, 2002; Pezzetti, 2020; Saltmarsh et al., 2015; Strong-Wilson & Ellis, 2007). An example is the open-air schools of the early 20th century, which were developed in response to influenza and tuberculosis epidemics (Blei, 2020). During this time, many schools worldwide operated teaching and learning outside, where there was greater ventilation than in the classroom (Blei, 2020). Greater ventilation meant less chance of contracting illness and that the aim of continuing students' education could be achieved.

Loris Malaguzzi and their local community in Italy post World War II took a different tactic to conceptualising physical space and teaching and learning and developed the Reggio Emilia approach to early childhood education (Strong-Wilson & Ellis, 2007). In this approach to education, the environment where learning occurs is considered the Third

Teacher instead of only considering the environment (or classroom) as a space where learning could occur. The other two teachers are the teacher and the other students. The environment as the Third Teacher is only a part of this philosophy; however, it is the focus in this review, primarily because of its relevance to the research topic. In this approach to learning, the environment affects students' learning by how students' perceive space and use it to create meaning (Pezzetti, 2020; Strong-Wilson & Ellis, 2007). Consider working in the garden outside; students may observe lifecycles in nature, they may become curious about how a person's voice carries differently outside to inside, or a further curiosity not preidentified by a teacher may lead students to initiate some other type of inquiry. This example and the following two paragraphs may seem selective but are crucial to be aware of when the New Zealand movement to MLE began with a change in the physical space where learning happened with the assumption that the affordances of the modified space would support 21st-century teaching and learning (Benade, 2017; Starkey & Wood, 2021).

The idea of non-traditional learning environments such as MLEs are not new. The concept of large, open-plan, flexible learning environments that were perceived to be multi-functional and have the potential to aid in contemporary teaching and learning practices first began to emerge in America and Europe in the 1960 and 70 (Alterator & Deed, 2013; Bennett & Hayland, 1979; Fletcher et al., 2020; Saltmarsh et al., 2015). As mentioned in the New Zealand context in Chapter One, this type of learning environment was largely abandoned by the 1980s, and spaces were segmented into cellular learning environments once more. Critics expressed that at the time "openness" was confused with "flexibility" (Dovey & Fisher, 2014).

The open learning environments from the previous paragraphs reflect the built pedagogy (Monahan, 2002) of their time. Monahan explained this concept as the "architectural embodiments of educational philosophies" (p. 5). The tiered lecture theatre is a further example; because of the physical design, acoustics and lighting, the educator must take their traditional place in the front of the room, the learners lining the rows of desks and chairs which are fixed in place. This environment shows the educational philosophy valued

at the time of construction: the traditional transfer of knowledge with the educator as the expert and the learner as the receiver of knowledge. Monahan advised that "built pedagogies operate along a continuum between discipline and autonomy" (2002, p. 5). The tiered lecture theatre or cellular pre-MLE space are examples on the discipline end of the continuum as they only allow for particular movement and uses of the space. A large open MLE with moveable furniture that allows for flexibility in the use of the learning environment would feature at the autonomy end of the continuum. Simply put, built pedagogy is how the physical space affects teaching and learning by allowing for and preventing different types of pedagogy.

Architects and Educational Advisers

Ideas regarding the affordances of the physical space and the impact they may have on teaching and learning have come to the forefront with reference to preparing students for the 21st century (Bergsagel et al., 2007; Fisher, 2005; Nair & Fielding, 2005). Some educational advisors (Bergsagel et al., 2007; Bergsagel & Sauer, 2007; Dovey & Fisher, 2014; Fisher, 2005) and architects (Nair & Fielding, 2005; Pezzetti, 2020) have suggested that the physical space of a learning environment could be architecturally designed and purposefully employed as a pedagogical tool. These ideas stem from research that argues the current schooling system does not adequately prepare learners for the 21st century (Bergsagel et al., 2007; Bergsagel & Sauer, 2007; Bolstad & Gilbert, 2012; Dumont & Benavides, 2010; Fisher, 2005; Nair & Fielding, 2005; OECD, 2013, 2015). In a working paper commissioned by the OECD, it is stated that

> Developments in society and economy require that educational systems equip young people with new skills and competencies, which allow them to benefit from the emerging new forms of socialisation and to contribute actively to economic development under a system where the main asset is knowledge. (Ananiadou & Claro, 2009, p. 5)

The authors contended that skills and competencies that achieve such goals are often referred to as 21st-century skills and competencies. When discussing the context for contemporary educational change, several researchers make note that pre-MLE and non-MLE spaces are perceived as inhibitive or restrictive to 21st-century teaching and learning (Alterator & Deed, 2013; Bradbeer, 2020; Campbell et al., 2013; Dover & Fisher, 2014; Starkey & Wood, 2021).

In 2012 Bolstad and Gilbert prepared a report on 21st-century learning for the New Zealand Ministry of Education. Their report integrated national and international research, and they found there did not seem to be "a fixed prescription" (p. 1) of what 21st-century learning was. Instead, the authors conveyed that 21st-century learning was "an emerging cluster of new ideas, beliefs, knowledge, theories and practices" (p. 1). Bolstad and Gilbert explained that education in New Zealand needed to be re-shaped for 21st-century learning because the world had changed dramatically since the development of what could be considered traditional education, and there was "no longer a good fit between the education we are currently *providing* and the education we *need*" (p. 11) (italics in original). To explain this, they introduce the reader to the concept of *wicked-problems*, issues in today's world that education needs to develop the capacity within its learners to engage with productively. This concept was used to characterise 21st-century challenges that span multiple disciplines, were highly complex, uncertain, and value-laden, such as climate change, waste disposal, or persistent poverty.

The paradigm shift being called for in education requires changing how knowledge is conceptualised (Bergsagel et al., 2007; Bergsagel & Sauer, 2007; Bolstad & Gilbert, 2012; Dumont & Benavides, 2010; Fisher, 2005; Nair & Fielding, 2005; OECD, 2013, 2015). In the secondary schooling system, knowledge has traditionally been understood as transmitted and absorbed, then stored for later use. To help prepare learners for the 21st century, learners must begin to be active in knowledge creation and learn how to generate knowledge themselves (Ananiadou & Claro, 2009; Bolstad & Gilbert, 2012; Dumont et al., 2010; OECD, 2013, 2015). Pedagogical practices advised to aid in 21st-century teaching involve more

student agency, personalised learning, and digital literacy. Some educational advisors (Bergsagel et al., 2007; Fisher, 2005) and architects (Nair & Fielding, 2005; Pezzetti, 2020) have submitted that if learning environments were designed with specific qualities to support innovative teaching as well as the emotional, social, and cognitive development of students, the spaces might be more effective in aiding 21st-century teaching and learning than traditional cellular classrooms. This belief is in line with Fisher an educational advisor, who proposed that "pedagogical activities require specific spatial qualities to be effective" (2005, p.8).

A "learning suite" is a specific example of an architecturally designed learning environment purposefully built with qualities to support 21st-century teaching and learning. This learning environment was proposed by architects Nair and Fielding (2005) who based their architectural design on spatial, psychological, physiological and behavioural dimensions of human experience to create learning environments that were both healthy and functional. A learning suite is generally large enough to allow the simultaneous possibilities of single desks, groups of desks, and an area where students could present their work. The architects advocated that this type of learning environment had spatial qualities, including flexible space and access to technology, to allow for more varied pedagogical practice than it was presumed a pre-MLE classroom did. These qualities were promoted to have the potential to afford independent study for students while at the same time allowing peer tutoring or collaborative teamwork, all types of learning considered more relevant to the 21st century than traditional teacher-led lecturing (Bolstad & Gilbert, 2012; Fisher, 2005; Nair & Fielding, 2005).

The influence of architecture on school buildings concerns how it was imagined that a different sort of pedagogical focus had the potential to better prepare learners for the 21st century than the more traditional "cells and bells" (Nair & Fielding, 2005, p. 18) pre-MLE style classroom and associated pedagogical practices. This potential lay in the idea that learning environments that are flexible and dynamic may help students learn knowledge-

building skills instead of cellular classrooms where traditionally knowledge retention had been valued.

Dovey and Fisher (2014) note that a focus on architecture in learning environment research suggested the assumption that different designs of spaces may help develop different types of learners. They raised the idea that just as traditional classrooms could be seen to inhibit innovative practices, "the irreversibility of the open plan can be construed as the use of architecture to coerce teachers into new pedagogies" (Dovey & Fisher, 2014, p. 16). This point can be understood concerning MLE where renovations of existing state-owned New Zealand schools were required to be developed according to the ILE Tool (MoE, 2010) (see Table 1 for examples). These renovations were required when property funding became available regardless of whether the school community perceived any need for pedagogical change. Although the requirement to adopt MLE foregrounded changes in property infrastructure, building designs were different to the already existing single-cell classrooms and new pedagogical practices were required to operate effectively within the spaces. Therefore, it could be argued that the Ministry of Education was using architecture to coerce teachers to use different pedagogies. Some of the principal respondents in a New Zealand study by Charteris et al. (2017) perceived the Ministry of Education policy shift to require adopting ILEs as resulting in a form of social control over educators. This perception was based on how principals perceived different demands on teachers who worked in MLEs. These demands were related to how the teacher may have needed to operate differently because of the design of the physical space and the focus on student-centred, individualised learning, and any collaboration teacher team members may have been required to do.

It is important to note that the documents (Bergsagel et al., 2007; Fisher, 2005; Nair & Fielding, 2005) identified by the Ministry of Education to influence the ILE Tool, which provided guidance on the design of renovated and refurbished MLE, all come from non-New Zealand contexts but have heavily shaped MLE in New Zealand. Additionally, Fisher (2005) and Nair and Fielding's (2005) work did not refer to any research undertaken in the classroom that explored the reality of using these designs, instead commenting on the

perceived potential of the affordances of these new physical spaces to impact positively on 21st-century teaching and learning.

Research undertaken in modern learning environments in the New Zealand context from the perspective of those who operate within the classroom (not only leadership) is necessary to help fill this gap in information. The overarching research question of this thesis addresses this question: How are MLE in the participating New Zealand schools being used to develop 21st-century skills and competencies in learners?

Educational Philosophers and Researchers

As MLE and ILE became established in schools, educational philosophers and researchers began exploring the potential of these buildings and the experiences of those who use the space. This research can be seen in contrast to research in the previous section which reported the potential of the space from the perspective of architects and educational advisers. These ideas consider power/surveillance (Bojesen, 2017; Charteris et al., 2017; Thompson, 2018), learning environment research that appears at a conjunction between the physical space and pedagogical practice (Benade, 2017b; Couch, 2018; McPhail, 2017), and notions of assemblage (Carvalho et al., 2020; Charteris et al., 2017; Dovey & Fisher, 2014).

As noted, access to technology, personalised learning, and increased student agency are promoted to help students develop the ability to create knowledge, not just retain knowledge. These ideas emphasise the individualisation of knowledge-building skills (how a learner learns) as opposed to content (what is learned) (Bojesen, 2017; Thompson, 2018). In the view of Dumont and Instance (2010), for individualised learning to be truly effective, the learner must know themselves, and the educator must be aware of the learners' motivations, interests, and prior knowledge (Dumont & Istance, 2010).

Neither Bojesen (2017) nor Thompson (2018) had experience teaching in a modified learning environment but shared their ideas on the pedagogical potential of such spaces. Bojesen (2017) proposed that in a pre-MLE space, learners would often sit in rows and study the same topic at the same time in the same way as their peers. He advised that the emphasis

on the individualisation of learning in an I/MLE could mean that students hold more power in comparison to the assumed mass-schooling of conventional classroom spaces, which it was proposed did not necessarily embrace the individual learner. Bojesen (2017) counselled, therefore, without explicitly teaching it, the individualisation of learning carried out within an I/MLE may teach students to know themselves, their emotions and motivations better than if they were in a mass-schooling situation.

Thompson (2018) advocated that having more agency and control over their learning and learning interests also has the potential to make the learner more visible in the large open space of MLE; both authors reference ideas of power and surveillance. Thompson (2018) advocated that the freedom of individualised learning could encourage students to focus primarily on their own personal interests and needs, meaning that learning experiences in such spaces have the potential to become only about the pursuit of personal interests and motivations and teachers' experiences became primarily about facilitating this focus. Therefore, Thompson (2018) proposed that at the extreme end of the scale, freedom to explore personal interests and motivations could become a means of control and surveillance of the students and the teachers.

Couch (2018) made the point that ILEs were presented in Ministry of Education guidance as student-centred, while at the same time, schools are tasked with creating lifelong learners who will be successful in the future economy, an idea which does not necessarily align with the idea of a learning environment being student-centred. Thompson (2018) maintained that the primary goal of such learning environments was to create an environment that would cultivate an individual moral self in line with the state's bureaucratic needs. He put forward that this goal was developed in line with education policy and the bureaucratic state, which puts value on specific skills and competencies, such as the key competencies of the New Zealand Curriculum (NZC) (MoE, 2007) imagined to have the potential to develop productive 21st-century citizens.

Some learning environment literature appears at the conjuncture between MLE as the space conceived by policy makers and designers and the space as used by educators and

learners (Alterator & Deed, 2013; Benade, 2017b, 2019, 2021; Benade & Jackson, 2017; Benade et al., 2017; Couch 2018). Much of this work borrows from Henri Lefebvre (1991), a French philosopher (1901–1991) who spoke of "social space". His book *The Production of Space* was written in French in 1978 and translated to English in 1991 and was a search for a unifying theory of space (assembling its physical, mental and social dimensions). The work of Couch (2018) mentioned in the previous paragraph is one such piece of research. Couch explored ile.education.govt.nz[6] which was originally the Ministry of Education's primary source of information regarding ILE; what the ministry considered them to be, and the intent of the spaces. The conjuncture, which Couch addressed, was defined as mental space, "the intersection of the State and citizen imagery of a particular construct (in this instance, MLE)" (p. 122) (brackets in original). Here the ideal, theoretical, philosophical space of an ILE is acknowledged as a complex concept presented as both student-centred and also creating productive future citizens. This complexity could be considered confusing for architects, designers, school leaders, teachers, and parents who wanted to understand how to effectively use the space to benefit students.

Benade (2017b), a New Zealand academic interested in learning environments and educational policies, focused on teachers' lived experience of 21st-century teaching and learning. His research appeared at the conjuncture between the physical space of the learning environment and the reality of how it was used. He quoted Lefebvre (1991) to explain MLE as an example of "conceptualised space, the space of scientists, planners, urbanists, technocratic sub-dividers and social engineers … all of whom identify what is lived and what is perceived with what is conceived" (Lefebvre, 1991, p. 38). Benade contended that those teaching and learning in MLE were influenced by the space while at the same time influencing the space with their understandings and actions, just as a person's understanding of the policies that create a space affects how they understand the use of that space as explored by Couch (2018). Benade (2017b) mentioned that most teacher

[6] This site is now defunct, removed by the MoE.

participants' comments were about the design limitations of the physical space rather than the pedagogical implications of the space. He concluded this work by advising from the perspective of those who participated in the research; MLE as physical structures needed to be appropriate for the educational vision and teaching and learning practices applied within. This idea could be seen in comparison to MLE beginning as architecturally designed spaces that met specific technical standards without thorough research into the reality of how pedagogical practices function within the spaces to make them effective. This issue may begin to be remedied with the use of SEPE (MoE, n.d-a, 2021b) instead of the ILE Tool, this point shall be expanded on under the heading *Ministry of Education*.

McPhail (2017) was also interested in research that appears at a conjunction. His interests explored MLE and curriculum integration which could be seen as the conjunction between school life and real life. Curriculum integration is one teaching and learning practice promoted for use in MLE, or, as the OECD (2013) referred to it with Learning Principle Seven: promoting horizontal connections across subjects. McPhail focused on secondary schools and raised reasons for, and problems with, curriculum integration, warning that it was not as simple as it may have seemed. Reasons for integrating curriculum were to create deeper, authentic learning to help prepare learners for "real life" and increase student motivation. McPhail countered these arguments by reminding the reader that schools were not actually real life but places where learners accessed knowledge that was not available at home and signified that authenticity and motivation were pedagogical issues, not related to the curriculum. In a later article, McPhail (2018) reported on a case study investigating how teachers transitioning into an MLE understood and approached curriculum integration. McPhail argued to keep disciplinary boundaries so as not to lose subject-specific knowledge and make the relevant connections to engage students, returning to his point that integrating subjects was not as simple as it may have seemed.

A further idea borrowed by some researchers to make sense of MLE was the consideration of an MLE as an assemblage (Carvalho et al., 2020; Charteris et al., 2017; Dovey & Fisher, 2014). Charteris et al. (2017) framed ILE as an educational assemblage

which they explained as joining together different kinds of entities to produce something new. This was illustrated with the concept of ILE by proposing that they "represent an assemblage of architecture and pedagogies that produce something new in the quality and goal of schooling" (p. 811)—namely 21st-century skills and competencies. Dovey and Fisher (2014) considered the learning environments in their research as complex adaptive assemblages because of the interconnectedness of the learning environments' different elements. They were complex in that they explored the multiple possibilities of the space and adaptive because the varying spaces within the learning environments were flexible and could be adapted for different types of learning.

As mentioned earlier, in the research by Charteris et al. (2017), some participants perceived the Ministry of Education policy shift to require adopting ILE as a form of social control over educators. In their work, Charteris et al. propose ILE and how education is operated within them as a state apparatus of Deleuze's "societies of control" (1992, p. 4). The researchers interpreted this change in control as a literal de-territorialisation of the educators' space caused by the assemblage of ILE in an effort to future-proof education. This was because teachers may no longer have had a specific or dedicated physical space to work in an ILE or a specific class of students. Participants in the research remarked on these aspects of ILE led to resistance from the teachers who felt they needed their own territory.

The theoretical perspectives, considered in relation to learning environments in this section, provided alternative perspectives on how MLE and ILE can be considered beyond any presumed potential effect spatial qualities may have had on teaching and learning and vice versa. The perspectives considered here go beyond the simple consideration of the classroom as a place where the curriculum is learned. They demonstrated ways in which the act of operating education in MLEs may be theorised or experienced by those in the space, such as the consideration of a de-territorialisation of the space or any perceived misalignment between space as designed by architects and the use of the space in reality.

OECD Literature

The previous two segments were written to lay the foundation for the reader regarding how the physical space of the learning environment has been conceptualised to impact teaching and learning and identify why teaching and learning practices need to be developed to prepare learners for the 21st century. This section provides an overview of OECD research and literature relevant to this thesis. As stated in Chapter One, learning environment literature related to and commissioned by the Organisation for Economic Co-operation and Development (OECD) has influenced the development of MLEs in the New Zealand context (Benade, 2017a; Bolstad & Gilbert, 2012; Carvalho, 2019; Education Review Office [ERO], 2018). OECD learning environment literature also provides two key concepts used in this thesis to help make sense of the MLE of the participating schools: the 7 Principles of Learning (Istance & Dumont, 2010) (see table 2) and pedagogical core and organisational structure (OECD, 2013).

The OECD was founded in 1961 between 12 European countries, the United States of America and Canada (OECD, 2018). New Zealand joined the organisation in 1973 and is one of the current 37 member countries. The OECD website explains that its mission is to promote the economic and social well-being of people worldwide and aims to do this by providing a platform where member countries can share experiences and find solutions to common problems. One way the organisation is working towards finding solutions is by comparing different countries' schooling systems to see how they prepare their learners for the 21st century. As also stated in Chapter One, the OECD (2015) says of the schools of the day that they

> need to prepare students for more rapid economic and social change than ever before, for jobs that have not yet been created, to use technologies that have not yet been invented, and to solve problems that we do not yet know will arise. (p. 3)

When explaining the 7 Principles of Learning, the authors, Istance and Dumont (2010), provided a detailed explanation of each principle, making clear they were not new concepts, but the strength of the principles lay in them being employed together. They

advised that the most effective way to implement the 7 Principles of Learning in schools and create effective learning environments was by focusing on change led by teacher knowledge. This idea was reflected in later OECD (2013) research which stated that innovative practices in schools may include but need not be guided by a change in physical space, as has been the situation in New Zealand.

Istance and Dumont (2010) pointed out that engaging with the 7 Principles in the classroom required forethought, reflection and flexibility from teachers. The flexibility was related to how the principles needed to be employed differently in different learning environments depending on context, learning content and specific educators and learners. For example, learning principle five was "be demanding for each learner but without excessive overload" (p. 317). Employing this principle required a teacher to be aware of their individual learners and facilitate the learning in a demanding but not excessive way for each individual.

The 40 case studies explored in *Innovative learning environments* (OECD, 2013) and used to demonstrate the concepts of pedagogical core and organisational structure were also examples of learning environments where the 7 Principles of Learning were employed in the classroom. The pedagogical core of a learning environment is comprised of four elements: learners, educators, resources and content. Pedagogical core refers to how these elements are understood; for example, learners may mean students of a specific age traditionally considered to be learning at a specific level. In the New Zealand schooling context, this can be demonstrated with year 10 students who are generally 13, turning 14 in the academic year they are in that level. Educators may refer to teachers or others who help within the classroom. Resources are the elements that can be used in the classroom to aid in learning; according to OECD research, this is the category where the physical space of a learning environment can be found. The final element, content, refers to the curriculum used (both subject-specific and dispositional) and the topic of a lesson; 21st-century skills and competencies fall within the content element. Organisational structure refers to how the elements of the pedagogical core are organised and breaks them down into more detail under

the categories of regrouping learners, regrouping educators, learning time, and pedagogy and assessment. The idea of regrouping learners and educators and specifically paying attention to learning time, pedagogy and assessment are emphasised in OECD literature because of the perceived need to be innovative both in the way students are taught and what they learn.

Innovative learning environments (OECD, 2013) built on the 7 Principles of Learning first introduced in *The nature of learning: Using research to inspire* (Dumont et al., 2010) and demonstrated these principles in action in case studies. In this document, three further dimensions (innovate the pedagogical core, become "formative organisations" with strong leadership, and open up the partnerships) were added to the 7 Principles of Learning to create "Guiding characteristics of contemporary learning environments" (OECD, 2013, p. 188). The same ideas were developed again and explained with further examples in the series' final publication as the ILE 7+3 framework (OECD, 2015).

A further document commissioned by the OECD and relevant to this research was a working paper referred to earlier by Ananiadou and Claro (2009) titled *21st Century skills and competencies for new millennium learners in OECD countries*. Ananiadou and Claro explored working papers and organisational definitions of 21st-century skills and competencies. The authors noted that the concept of 21st-century skills and competencies was not only associated with education but was also referred to by researchers, policymakers and those in the private sector.

Ananiadou and Claro (2009) also sent a questionnaire survey to all departments or ministries of education in OECD countries to gather information on teaching and assessing 21st-century skills and competencies in schools. Seventeen countries, including New Zealand, responded to the survey. With that information, the authors evaluated if and how countries were exploring the concept of teaching 21st-century skills and competencies in schools. Many responding countries, including New Zealand, incorporated the concept of 21st-century skills and competencies into the curriculum as part of a more significant educational reform. For example, in New Zealand, this happened when te reo Māori (Māori language) was added to

the New Zealand curriculum, or in Australia and Poland, when a core national curriculum was also introduced. In other countries, the inclusion of 21st-century skills and competencies was a specific initiative or motivated by international studies, such as those conducted by the OECD. Countries such as the Netherlands did not report a specific time or incentive to include this aspect of education, just that it took place with the evolution of learning in that country.

Some countries responded to the questionnaire by selecting from a provided list of 21st-century skills and competencies. Other countries, such as New Zealand, broke the concept down into "a smaller set of broader 'key' competencies or skills" (Ananiadou & Claro, 2009, p. 13) valued in the educational context of that country and integrated into the curriculum instead of being focused on separately within the school environment. The response from New Zealand made specific references to the five key competencies of the NZC document (MoE, 2007). Survey respondents also commented on teacher awareness of 21st-century skills and competencies from the perspective of teacher training. Many countries conveyed that teachers were aware of the concept of 21st-century skills and competencies; however, there were few examples of any training on specific 21st-century skills and competencies. In New Zealand, it was suggested there was specific training on the key competencies but not any other specific 21st-century skills and competencies.

In conclusion, information gathered by Ananiadou and Claro (2009) reported that in the responding countries, "there are few specific definitions of these skills and competencies at a national or regional level and virtually no clear formative or summative assessment policies for these skills" (p. 4), even though they were generally mentioned in regulations and guidelines for compulsory education. This information will be relevant when exploring research sub-question B: What do the educators and learners in the MLEs of the participating schools consider 21st-century skills and competencies to be?

The main ideas from these documents were that education systems needed to change to better prepare learners for the 21st century (Ananiadou & Claro, 2009; OECD, 2013, 2015) and that the 7 Principles of Learning needed to be present in the learning environment for it

to be judged effective to this goal (Dumont et al., 2010; OECD, 2013, 2015). This section also provided greater definition of the key concepts of pedagogical core and organisational structure used in the findings of this thesis to explore the operation of the MLEs in the four participating schools. The 7 Principles of Learning and multiple examples of context-specific learning environments provided as case studies by the OECD (2013, 2015) are promoted as guidance to those implementing MLEs and ILEs in the New Zealand context (Carvalho, 2020; Couch, 2018; ERO, 2018; MoE, n.d-b, 2017).

Critique of Ministry of Education Learning Environment Rationale and Policy

The first part of the present chapter explored how the space of a learning environment has been understood to, and is or was imagined will, influence teaching and learning practices employed within the space. It also provided information related to why it is assumed the education system in New Zealand needed to evolve to help better prepare learners with 21st-century skills and competencies. Additionally, it provided more detail on OECD research which has influenced the New Zealand turn to focusing on classrooms as learning environments to support 21st-century teaching and learning and the present research. The following section addresses literature directly related to the New Zealand Ministry of Education's documentation regarding MLE.

The key competencies and the NZC have been mentioned in previous sections. The current NZC is a New Zealand Ministry of Education document that was established in 2007; the previous curriculum had been in action since 1992. In the foreword of the NZC, it is explained that the document is "a framework designed to ensure that all young New Zealanders are equipped with the knowledge, competencies, and values they will need to be successful citizens in the 21st century" (p. 4). This objective is echoed in *The New Zealand School Property Strategy 2011 – 2021* (MoE, 2011).

As explained in the introduction chapter, both *The New Zealand School Property Strategy 2011 – 2021* (MoE, 2011) and the ILE Tool (MoE, 2010) are now of historical interest. However, they are critical to this thesis as they constituted the conceptual and planning building blocks for significant government investment in infrastructure that has shaped the physical learning environment and influenced the organisational structure of those learning environments for thousands of students and teachers. Further to this, they were the starting points for the documents that have replaced them such as the most recent property strategy (MoE, 2020a).

The rationale provided in the 2011 – 2021 property strategy as to why school property needed to be changed rested on the key assumption "that the state will continue to provide a national education system" (MoE, 2011, p. 2) and that this will continue to operate out of school buildings. Changes were set out under three strategic goals predicated by the need to improve and modernise the infrastructure of outdated buildings, respond to increases in population growth and repair schools affected by the 2010 and 2011 Canterbury earthquakes.

Damage from the Canterbury earthquakes meant many schools in the area needed to be closed, amalgamated, and rebuilt. The turn towards developing MLE in New Zealand schools began before these earthquakes, but all of the Canterbury schools that needed to be rebuilt/built were developed in line with the 2011 – 2021 property strategy and made modern learning environments as a concept very visible to the public of New Zealand. One way the spaces were made visible was with digital media. When they appeared in news articles on television and in digital media, the public was made aware that the physical design of the classrooms being built was vastly different from the traditional single-cell classrooms that many New Zealanders knew during their school years. Stuff.co.nz, is self-purported as "New Zealand's largest and most popular news site" (Stuff, 2018, para.1). Opinions on MLEs on this site varied as can be seen from some news article titles such as: "Blenheim Pupils Praise Flexibility of Modern Learning Environments" (Kitt, 2017), "Teachers Struggle With Modern Learning Environments" (Redmond, 2017a), "'Difficult to

Justify' Investment in Modern Learning Environments" (Redmond, 2017b), or "'Flexible Learning': an Education Fad or a Positive Move For kids?" (Long & Cann, 2017). Digital media, in the form of public opinion, added a loud voice to the discourse of MLEs. Although popular opinion did not add to the policy, theoretical or methodological understandings, it was easily accessible and is essential to be aware of when considering the context of the environment in which MLEs existed as it may have influenced any acceptance or resistance of the spaces by parents, teachers, students, and broader school communities.

The three strategic goals of *The New Zealand School Property Strategy 2011 – 2021* (MoE, 2011) were to make sure property was well-managed, was fit for purpose, and that New Zealand had a high-performing portfolio of schools. Fit for purpose is expanded on throughout the strategy to mean "through further work to ensure that school design and capital projects deliver internal environments that support educational achievement" (p. 1) and "state schools are safe environments that empower students and teachers to succeed" (p. 9). When directly addressing this goal, it was stated that

> approaches to teaching and learning have changed over the last 20 years. While classrooms are still the most highly utilised areas in schools, they need to respond to these changes as their performance is critical to modern education delivery" (p. 13).

The wording of the three quotes was written in a way that anthropomorphised the physical space and implied the environments themselves (alone) could perform, had the ability to support educational achievement, empower students and teachers to succeed, and respond to changes in teaching and learning approaches. When providing context for this strategy, it is stated that "decisions that influence the look and feel of school property are important because they have long lasting implications that can either enhance or constrain subsequent decisions for education" (p. 2).

In 2017, when carrying out a critical examination of policy evolution regarding school property under the national government, Benade (2017a) observed a lack of research grounded in classroom experience concerning the development of said policies. He also identified a "presumption that the construction of flexible learning spaces will significantly

support the required changes to learning and teaching required to meet the demands of the 21st century" (p. 99). This presumption was related to literature reviewed in previous sections of this chapter that commented on the supposed potential of the spatial qualities of a learning environment to support 21st-century teaching and learning (such as Fisher, 2005 and Nair & Fielding 2005). Benade (2017a) noted that requiring the adoption of spaces designed in line with the ILE Tool meant that teaching and learning would cease to take place in non-MLE environments. The presumption of the potential of the physical space led to a linear assumption that changing the physical space where teaching and learning happen would change teaching and learning practices. This idea is comparable to Dovey and Fisher (2014), whom it was noted earlier suggested that the focus on requiring specific architectural design may coerce teachers to use different pedagogical practices.

Benade's (2017a) critique included an analysis of press releases between 2015 and 2017 by the then Minister of Education. Those press releases maintained that school infrastructure built to MLE standards would support 21st-century teaching and learning and raise student achievement. According to Benade, these press releases did not contain information regarding how the spaces would support 21st-century teaching and learning and raise achievement, just assurances from the Ministry of Education that they would. In a later article, Benade (2021) commented on a Cabinet Paper (Hipkins, 2018) by the current Minister of Education regarding a comprehensive school property reform. Benade noted that like the previous Minister of Education, Hipkins restated the need to future-proof schooling facilities to support educational outcomes but did not state how this should be done beyond improving school property infrastructure.

In a more current analysis of policy and discourse concerning the Ministry of education and the physical design of learning environments in New Zealand, Starkey and Wood (2021) found similar to Benade. Starkey and Wood (2021) undertook research to gain insight into what may have led to the need for this particular thread of policy in education beyond the rationale offered in the 2011 – 2021 strategy. The overarching need identified in the research of Starkey and Wood was the necessity of having school buildings appropriate

for contemporary education. This problem was then broken down into further two issues: "the quality and aesthetic of buildings" and whether the buildings were "fit for purpose for 'modern' ways of teaching and learning" (Starkey & Wood, 2021, p. 6).

The aesthetic of buildings was indicated to link to school attendance and student, parental, whānau[7] and community perception of schools; the thought being upgrading facilities may increase favourable perceptions of schools and increase enrolments. Concerning school buildings being fit for purpose, Starkey and Wood (2021) advised that within the documents they reviewed, there was a perception or assumption that traditional cellular classrooms could not be used flexibly, that they were inhibitive to changing or innovating teaching and learning practices, rendering them unfit for modern ways of teaching and learning.

When discussing their findings, Starkey and Wood (2021) signalled that the idea of being fit for purpose for modern ways of teaching and learning had been co-opted onto the idea of infrastructure being fit for purpose. They suggested this was done to justify the types and designs of buildings schools had been adopting, such as those designed regarding the ILE Tool. As well as the assumption that traditional classrooms inhibited innovative practices, the authors reported a further assumption: that the physical space of a learning environment shaped learning outcomes. Additionally, they reported that the documents "rely on an unquestioned assumption about 'modern' learning which is represented to be entirely different from 'traditional' learning" (p. 13). The authors informed the reader that the documents they reviewed in their article based the need for change on the increased use of digital technologies and did not define what modern teaching and learning practices were. The same documents were inclined to overestimate the worth of modernising buildings and undefined modern practices and underestimated the role of teachers.

[7] Whānau is a word in te reo Māori used in the context of this thesis to signify family and extended family.

Ministry of Education Guidance

An initial paucity of guidance by the New Zealand Ministry of Education regarding modifying teaching and learning practices in line with the modified space of MLE was reported in Chapter one. The guidance that was available is reviewed in this section. During the time, *The New Zealand School Property Strategy 2011-2012* (MoE, 2011) was in currency the Ministry of Education's central portal of information regarding all aspects of MLEs was the Internet, specifically their flexible learning space (FLS) webpage (MoE, 2017) and their innovative learning environment (ILE) webpage (MoE, n.d-b). Searching the original ILE webpage now brings up an error message. It is reflected on here because it was a primary source of official information when the MLEs in the schools participating in this research were implemented and now seems to have been silenced. On the original ILE site (MoE, n.d-b), ILEs were described as environments where the NZC was being expressed in the ways it was intended. Expressions of the NZC were not elaborated on; instead, the reader was reminded that ILEs were meant to be flexible, evolve and change, and keep pace with the future.

Navigating through the original ILE pages (MoE, n.d-b) led to case studies from New Zealand primary, intermediate, and secondary schools that adopted MLE building and design standards by purposefully building new learning environments or renovating existing ones. The case studies can still be found through a link on the *Designing Learning Environments* (MoE, 2021b) web page, which also offers further up-to-date information from the Ministry of Education on school property (MoE, 2021c, 2021d). The information in the case studies offers guidance from those transitioning or who have transitioned to an MLE who discussed how they had found it essential to have a clear vision for the school and the new space. In addition to case studies, the *Designing Learning Environment* includes a link to the SEPE survey. Other information regarding assessing existing space, advice on design, planning and financing the development of MLEs and information on core physical elements included in the new space, such as lighting, heating and acoustics, is also found on the same webpage.

The idea that ILE are meant to be environments where the NZC is being expressed in the ways it was intended, giving details on how and why the space of a learning environment needs to change, and not explaining how to modify pedagogical practices in line with these changes, assumes three things from a school community. The first assumption is an acceptance that pedagogy needs to be modified, the second is that educators would know how to modify pedagogy, and the third is a commitment to trial and error while experimenting with aligning pedagogy and the physical space. This is where the OECD research (Istance & Dumont, 2010; OECD, 2013, 2015) can be implemented as guidance. The 40 case studies in the 2013 work offer different ways the pedagogical core of different schools in their specific contexts organised their pedagogical core to carry out contemporary teaching and learning. This is also where the case studies mentioned on the previous page could help schools organise their spaces. The Ministry of Education provides scaffolding with the curriculum document (MoE, 2007) and the current property strategy (MoE, 2020), however, because MLE were new to the New Zealand context, a period of experimentation was necessary as educators and researchers explored what worked in the New Zealand context. This experimentation needed to be carried out at the same time as keeping learners central and also completing all other tasks and jobs vital for student achievement.

In October 2015, the Ministry of Education released a document titled *Designing schools in New Zealand - requirements and guidelines*. These requirements and guidelines were mandatory from 1 January 2016 and are still in currency (MoE, 2015). This document, created in consultation with architects, educators and engineers, offers guidance and sets out Ministry of Education expectations for developing school property projects. This document was published four years and four months after the 2011 - 2021 school property strategy. The document has two parts: the first addresses processes and compliance requirements, such as school property entitlement, information on the design delivery process and cost management. The second part discusses design principles, including research into effective pedagogy and learning and what changes in space may mean for teacher practice. The second part is asserted to form "a critical link between the National Curriculum and the

design of environments that will support the learning outcome to which it aspires" (p. 5). This Ministry of Education document is essential to be aware of regarding MLE. If there is any "ambiguity or contradiction" (p. 6) between this document and any Project Brief created in renovating or establishing a school, it is stated within this document that it is to take precedence.

In 2016, two further documents (Wall, 2016a, 2016b) were published by the Ministry of Education as tools to consult for guidance when developing school facilities. They were promoted to help understand the potential of how design features of an MLE may impact student learning and achievement and generally understand how the impact of the built environment may affect teaching and learning practices in the New Zealand context. The first was primarily a literature review based on information from the international context, and the second was explicitly written for the New Zealand context with a view to cultural inclusivity. It included information gained by consulting experts in the areas of Māori and Pasifika education. Both of these documents concluded by stating that the physical environment alone would not increase positive student outcomes. As with the earlier mentioned literature (such as Fisher, 2005; Nair & Fielding, 2005), these documents (Wall, 2016a, 2016b) remarked on the potential of the architecture to support specific pedagogies but unfortunately did not include research based in the classroom.

In 2020 the following and current school property strategy document *Te rautaki rawa kura: The school property strategy 2030* (MoE, 2020a) was published. This document is current at the time of writing this thesis. This document contains no reference to the ILE tool, which, as mentioned, has been replaced with the SEPE survey (MoE, n.d-a, 2021b). Large flexible teaching and learning spaces are still advocated for, *Designing schools in New Zealand - requirements and guidelines* (2015) is maintained for guidance, but the approach to developing learning environments in this document has the potential to more practically align teaching and learning practices to the physical space, goals, visions and operation of the schools in their particular contexts.

In this strategy (MoE, 2020), learning environments are referred to as quality learning environments (QLE). When describing QLE, this document explains this concept is broken into three parts: "Condition", which is dependent on "the owner's perspective" (p. 28), in this instance, the owner is the Ministry of Education; "Operational Efficiency", dependent on "the bill payer's perspective" (p. 29) which is the public; and "Fitness for Purpose", which is dependent upon "the occupier's perspective" (p. 29). The occupiers are the school, led by the BOT, with the primary goal of student achievement. Fitness for purpose is explained to mean that the "basic functionality of the buildings needs to align with the teaching and learning practices at each school" (p. 29). This idea deviates from the previous property strategy with the wording for fitness of purpose appeared to anthropomorphise the space and acknowledges that the environment alone does not perform, support achievement, or respond to changes in modern education. The environment needs to be aligned with the pedagogical practices of the school to be an effective learning space. Although the Ministry of Education still advocates for large, flexible, open spaces, *Te rautaki rawa kura: The school property strategy 2030* offers more flexibility and agency to the school in the design of learning environments which was not the case with MLE.

It is important to comment again on the nomenclature used for these learning environments in the New Zealand context. Key documents that were instrumental in developing MLE are no longer easily accessible. The term modern learning environment and acronym MLE are no longer used by the Ministry of Education who were the original proprietors of this term, although some of the contemporary documents referred to for guidance, such as *Designing schools in New Zealand - requirements and guidelines* (MoE, 2015) still contained MLE terminology. FLS is still used with relevance to the infrastructure of the learning environment, but ILE refers to the pedagogical practices employed within the space as opposed to the physical structure of a learning environment. In the 2030 property strategy (MoE, 2020), QLE applies to the infrastructure of the learning environment that the

Ministry of Education provides and is then filled up with the pedagogical core and organisational structure of the space as defined by the school.

Learning Environment Research

The previous parts of this literature review have been written to offer a foundation of ideas, research, reports, and policies that influenced or were relevant to the Ministry of Education and the development of MLE(s) in New Zealand state-owned schools. The next part of this review references research that more directly addressed the relationship between any impact the physical space of a learning environment may have on the reality of teaching and learning in the classroom or vice versa.

In general, the literature reviewed in the following sections addresses research related to learning environments where modifications have been made to the physical learning environment in contrast to pedagogical changes happening in existing learning environments. This focus is because of the requirement to adopt MLE centred on modifications of the physical space, as opposed to environments that have solely changed or innovated teaching and learning practices. This review does not address any innovative practices beyond a reorganisation of the elements of the pedagogical core because the focus of this thesis was the daily operation of learning environments, not innovative practice.

Mapping the Environment

Some New Zealand and Australian learning environment researchers (Bradbeer et al., 2017; Carvalho et al., 2020; Dovey & Fisher, 2014; Imms et al., 2017) have approached learning environments by first mapping the environment to comprehend the type and frequency of learning environment(s) present in schools and the perceived impact on teaching and learning. The Innovative Learning Environments and Teacher Change ILETC project ran between 2016 and 2019, was based in Australia and was coordinated by the

University of Melbourne's Learning Environments Applied Research Network[8]. This multi-disciplinary project included educational researchers, architects, school designers and other partner organisations, including the New Zealand Ministry of Education. The ILETC project was developed in response to the OECD (2013) call for a paradigm shift in education from students retaining knowledge to developing knowledge. These OECD ideas regarding learning environments and developing 21st-century skills and competencies in students led to significant investment in policy and learning environment development in both Australia and New Zealand and other countries (Byers & Imms, 2017).

The ILETC project aimed to explore whether ILEs were a change agent that could create an educational paradigm shift by either facilitating improved teacher practice or disrupting embedded practice enough that new teaching practices occurred (Byers & Imms, 2017). This question was to be addressed by exploring the educational potential of ILEs by observing best practice and developing guidance and strategies to better achieve the educational potential of ILEs. This research was also a response to the initial lack of guidance on how to operate these spaces and the lack of knowledge of what happened within these spaces. When learning environments began to gain momentum as a topic of interest, researchers associated with the ILETC project began to explore participant perspectives of the types of learning environments at their schools by asking school principals what types of learning environments and teaching and learning practices were in action in their schools (Imms et al., 2017). Participants responded by applying the spatial typology developed by Dovey and Fisher (2014) to the school environment.

Dovey and Fisher's (2014) spatial typology was developed through research based on the potential of the architectural design of learning environments to aid teaching and learning in accordance with constructivist educational theory. The authors developed a list of key teaching and learning practices based on constructivist educational theory, such as student-centred and personalised learning, promoted to aid in the OECD championed

[8] A gateway for information on this project is http://www.iletc.com.au.

educational paradigm shift and 21st-century teaching and learning. They analysed 59 award-winning middle schools (for learners aged 12–15) from throughout the world. All of the included schools were architecturally designed to engage with 21st-century teaching and learning. Based on their research, Dovey and Fisher (2014) developed a five-part spatial typology. These typologies can be loosely placed on a continuum from closed cellular classrooms (Type A) to large open plan flexible spaces (Type E). A Type A learning environment was when "clusters of traditional close classrooms are entered from a corridor" (p. 10). Type B learning environments were identical to Type A, but the corridor spaces were included as part of the learning environment. Type C learning environments often had flexible walls that meant one or two spaces could be joined together. A Type D learning environment was described as multiple learning spaces that could be opened up to create one large learning environment. The final spatial type was Type E, which contained learning areas that could not structurally be sectioned off from other learning areas and converted into single closed learning spaces.

When the ILETC project began, there was no existing database that contained information on the types of learning environments present in schools. School principals or their nominated delegate from 822 primary and secondary schools in Australia and New Zealand responded with information that began to map learning environments. Of the total respondents, 41% were from New Zealand schools. In the overall study, 58% of all learning environments were perceived by the survey respondents as Type A, with 7% and 14% respectively being Type D and Type E (Imms et al., 2017). Specifically, in New Zealand, 56% of schools identified as Type A, with 8% and 16% respectively being Type D and Type E (Bradbeer et al., 2017).

Imms et al. (2017) explored the total dataset and found better teacher mind frames and deeper student learning in spaces defined as more open and flexible, which indicated that space might make a difference. However, Bradbeer et al. (2017) took a more detailed look at the New Zealand survey results and complemented these responses with workshops carried out with teachers. In workshop discussions, teachers argued that the type of learning

environment was not particularly influential in carrying out 21st-century teaching and learning. According to the teachers who participated in the workshops, 21st-century teaching and learning were happening regardless of the type of classroom and the type of pedagogy used. This result contradicted the findings by Imms et al. (2017). This contradiction may have been because the overall result recorded the perspective of principals, but the work shops conducted by Bradbeer et al. focused on teachers' perspectives, and the people in these different roles may have had different perspectives and understandings.

Further research has been carried out to specifically map the New Zealand learning environment landscape (Carvalho et al., 2020). In this research, school leaders and classroom teachers were asked to reflect on the Ministry of Education's description of ILEs as learning environments that included

> the physical, social, and pedagogical context in which learning occurs. An innovative environment supports strength-based teaching and learning. It offers students and teachers flexibility, agency, ubiquity, and connectedness. Working in an innovative learning environment where teaching and learning is collaborative, reflection and enquiries are shared, and community engaged lead to a more robust, continuously improving community of practice. (Carvalho et al., 2020, p. 314)

Similar to the research by Imms et al. (2017), participants were asked to indicate their perception of the type of environments they had at their school. In particular, the participants in the research by Carvalho et al. (2020) were asked to indicate if, in their perception of the above description, the school they worked at contained an ILE, a traditional learning environment, a learning environment in transition to becoming ILE, or if they were reverting to a traditional learning environment from an ILE. Data suggested that both teacher and leader respondents at primary and secondary schools were more likely to have considered their learning environment in transition instead of having achieved an ILE. An overall conclusion from this study was that timely support is crucial considering that many respondents judged their environments to be in transition. If the transition were unsuccessful, teachers, students and leaders may develop resistance to change when

attempting to align pedagogy with the physical environment.

In a further study related to the ILETC project, Bradbeer et al. (2019) carried out a systematic literature review, which explored how the concept of learning environments was defined. The researchers reviewed 12 studies from the United States, Asia and Australia and found that within the individual studies, the term learning environment was "multifarious, inconsistent, and conditional on the aspect and focus" (p. 29) of the individual studies.

The research reviewed in this section indicates attempts to categorise and record the number and type of learning environments present in schools. This information has been provided to show that there are many different types of learning environments and that learning environments can be perceived and categorised in different ways. The selected typology or definition seems to be dependent on the perspective of the participants and may be shaped by their role within the school and their experience within the learning environment.

Pedagogical Practices

The final section of this review reports on research grounded in the experiences of those operating directly with MLE. Specifically, this section reports on research that explored the effectiveness of learning environments, transitions into modified learning environments, and the perceived affordances of those environments, including teacher collaboration.

The main methods employed by researchers to explore learning environments were case study or survey. Surveys were used to gather data from multiple sites (Ananiadou & Claro, 2009; Bradbeer et al., 2017; Imms et al., 2017), for example, when mapping learning environments (Carvalho et al., 2020). Single and multiple case studies have been used to explore how the same aspect is understood in context. An example of a single case study was Fletcher et al. (2017), who explored one New Zealand primary school leadership team known to the researchers for leading effective change to FLS. An example of multiple case study research that explored the same topic and different contexts was Blackmore et al. (2011),

who focused on 12 schools in the Australian state of Victoria to explore "to what extent do innovative learning environments contribute to improved cognitive, affective and social learning outcomes for students?" (p.2). French et al. (2020) also carried out multiple case study research; they included four schools, two in New Zealand and two in Australia and explored what elements helped create effective transitions to ILE. Further learning environment research methodology has included systematic literature reviews to gain understandings through time and from different international contexts (Bradbeer et al., 2019; Byers et al., 2018).

Learning environment research, undertaken within the classroom, often took place in spaces identified as ILE because of the innovative practices they employ (Blackmore et al., 2011; ERO, 2018; OECD, 2013). They either self-identify as ILE or were known to the wider educational community to be examples of where innovative practices were employed. Some learning environment research carried out as case studies included purposefully built MLE and renovated MLE. Other learning environment research was undertaken in spaces where the physical environment had changed because of policy initiatives. Specific aspects of teaching and learning were studied in most spaces to explore any impact of the physical environment on teaching and learning.

Effectiveness or impact of ILE. In research that addressed the effectiveness or impact of specific learning environments (including their purposeful pedagogical practices), each school's context shaped the rationale for the formation and aims of those learning environments. All schools were focused on developing teaching and learning practices to improve student outcomes. However, the particular outcomes focused on at each school were related to different goals such as raising students' literacy or numeracy, developing language skills that were valued in broader society, life skills that would be valuable outside of the classroom (such as learning to grow vegetables), re-engaging students with the schooling system (Blackmore et al., 2011; OECD, 2013, 2015) or creating inclusive environments (Osborne, 2016a). In this research, effectiveness was achieved by the alignment of the physical space, pedagogical practices and goals of the school or learning environment in

question (Blackmore et al., 2011; Cleveland, 2018; ERO, 2018; OECD, 2013, 2015; Osborne, 2016a) instead of any general goals of effectiveness.

A study that included purpose-built and renovated learning environments with spatial qualities and affordances presumed to support innovative practice reported that modernised infrastructure did not necessarily lead to innovative practices (Blackmore et al., 2011). The researchers also found that when innovative practices were employed to support the goals of the learning environment in question, those goals were successfully achieved regardless of whether the learning environment was purpose-built or not (Blackmore et al., 2011; Cleveland, 2018; ERO, 2018; OECD, 2013). For example, in the instance of the work by Cleveland (2018), "the effectiveness of innovative learning environments is primarily associated with how well particular pedagogy's, curricula, assessment practices and social factors are supported by, or aligned with, particular environments" (p. 72), and it was noted that this alignment took time.

Blackmore et al. (2011) assessed "it is evident that there is a necessary change in spatial, temporal, cultural, structural, communicative, social and semiotic practices by school communities as they mobilise the discourses of reform through the re-/design of learning environments" (p. 3) for a learning environment to be effective. In their research, they also contended that the learning environment's effectiveness was affected by the purpose and rationale of the learning environment as well as internal and external pressures (including policy) and professional accountability. Part of professional accountability included teachers' spatial literacy (Blackmore et al., 2011; Charteris & Smardon, 2018; Cleveland, 2018). The concept of spatial literacy was explained as "when teachers understand and know how to use the affordances of particular classroom spaces" (Charteris & Smardon, 2018, p. 23).

Considering that it takes time to align pedagogical practice and physical space and for teachers to develop their spatial literacy, studies revealed that new pedagogical practices, such as focusing on student-centred teaching and learning, emerged with the learning environment as time passed (Cleveland. 2018; ERO, 2018; Fletcher et al., 2020). Initially, some aspects of teaching in modified learning environments were reported to be quite

jarring for research participants, especially when considered in comparison to individual teacher practice in single-cell classrooms. An example was team teaching; after some time carrying out this new practice, teachers reflected that team teaching offered freedom from traditional roles they felt inhibited their practice (Cleveland. 2018; ERO, 2018; Fletcher et al., 2020).

Two studies that directly explored how the learning environment may have impacted teaching and learning were conducted by researchers from the earlier mentioned ILETC project. These studies were systematic literature reviews that addressed the impact of the learning environment on students' deeper learning and achievement (Byers et al., 2018) and teacher mind frames (Bradbeer et al., 2019). The rationale for the first review by Byers et al. (2018) rested on the original goal of the ILETC project, which was to explore whether ILE were a change agent that could create an educational paradigm shift. As mentioned, the study by Imms et al. (2017) reported the physical space may have some impact on teaching and learning practices, but the research by Bradbeer et al. (2017), which further explored New Zealand specific data from the same study, reported 21st-century teaching and learning was happening in the classroom regardless of the physical space. Byers et al. (2018) concluded that the research in their systematic literature review "confirms the frequently stated claim little empirical evidence exists to link student learning outcomes to spatial design" (p. 38). The little empirical evidence that became evident during the systematic review showed that spatial design may have positively impacted student learning outcomes. One proposal for this positive impact was the quality standards or building performance of ILEs, such as lighting and air quality, creating a more amicable learning environment; another proposition was that there may have been a focus on student-centred learning instead of teacher-directed learning in the studied learning environments.

Successful transitions. Developing purposefully designed and renovated learning environments at existing schools requires a transition for those who operate within the space. The transition may be as simple as a beginning teacher transitioning into their first role as a graduate teacher or a student transitioning into a new school that is architecturally

different to their previous school. Transitions may also be more complex and happen to a class of students and their teacher(s) during the school year or be for an established teacher with many years of teaching in a pre-MLE space who needs to align their pedagogical practices with the new physical environment.

Research that explored teacher team and full school transitions found that the staff and community commitment to and involvement in a new approach to teaching and learning help determine how effective the transition would be (Bergsagel et al., 2007; Bergsagel & Sauer, 2007; Bissett, 2014). Research also found that effective leadership led to effective transitions from pre-MLE to MLE (based on the infrastructure being changed) and ILE (based on the pedagogical practices) (Bissett, 2014; Fletcher et al. 2017; Osborne 2016b) and identified professional development for teachers and leaders as key in leading and sustaining effective change (Bissett, 2014; Bradbeer et al., 2019; Carvalho et al., 2020). Additionally, developing a culture where teachers felt secure to risk and were encouraged to reflect were identified to help with successful transitions (Cleveland, 2018; French et al., 2020).

Overall purposeful actions such as embracing new ways of teaching, creating new routines and keeping each other accountable were identified as crucial in successful transitions to MLE and ILE (Cleveland, 2018; French et al., 2020; Osborne 2016b). Purposeful action included developing specific roles within the school to help with new teaching methods such as middle leadership to help support teachers with curriculum and management of the learning environment. This aspect of effective transition also included purposefully encouraging specific actions while simultaneously discouraging others, such as taking away teachers' fixed desks (French et al., 2020). This action encouraged teachers to move throughout the learning environment and use the space differently from how they previously had when the desk was in a fixed location, an action that increased engagement with students (French et al., 2020).

Purposeful action as a characteristic of successful transition was present at all schools across all research that focused on transitions even though each school was a unique case within its own context, and each set of research approached the topic from a different angle.

In general, successful transitions to learning environments happened when teaching and learning practices were aligned with the physical space (Bisset, 2014; Cleveland, 2018; Fletcher et al., 2017; French et al., 2020). Successful transitions to MLE and ILE are important because they help avoid teachers reverting to previous or traditional teaching practices (Carvalho et al., 2020, French et al., 2020).

Collaboration. Teacher collaboration was an affordance of modernised learning environments centred on in some learning environment research (Alterator & Deed, 2013; Bradbeer, 2016, 2020; Campbell, et al., 2013; Charteris & Smardon, 2018). Teacher collaboration is promoted by the Ministry of Education (2015) to aid in creating a more student-centred classroom practice. Research that explored teacher collaboration, in general, expressed that it may help create a professional learning community where teachers share tasks and observe and develop pedagogical practices (Brix et al., 2014; Halverson, 2003; Lingard et al., 2000; Lomos et al., 2011; Owen, 2014). Collaboration may also provide an opportunity for peer coaching and mentoring to develop teacher practice and lead to professional cross-pollination and fundamental changes in pedagogical practices to support a more student-centred pedagogy (Bradbeer, 2016; Charteris & Smardon, 2018; MOE, 2015).

Part of the focus on student-centred pedagogy was the increased student-teacher ratio available when teachers worked collaboratively in a single learning environment (Starkey &Wood, 2021). In their research that analysed documents to explore reasons for the turn toward MLE by the Ministry of Education, Starkey and Wood (2021) identified a lack of commentary on student-teacher ratios and how this may have affected the ability to carry out student-centred teaching (a pedagogical practice promoted to help support 21st-century teaching and learning). Starkey and Wood (2021) observed that the discourse of policy and related documents reviewed for their article investigating the Ministry of Education turn toward MLE indicated that collaborative teaching would address higher ratios of teachers to students. The authors advised that research that addressed effective student-centred practice recognised higher teacher-to-student ratios, could aid in this type of pedagogy, not collaborative teacher practice. Starkey and Wood signalled, from this perspective, there were

tensions at the conjuncture between the requirements and design standards of MLEs and desired best practices for modern teaching; the central tension indicated here is student-teacher ratios.

Research regarding initial teacher education (ITE) and collaborative teaching signals the need to develop graduate teachers who are adaptable and have flexible and relational capabilities (Whyte, 2017). Whyte's research argued that more appropriate theoretical and pragmatic course work was needed in ITE programmes to foster these capabilities purposefully. A report by the Education Review Office (2017) on newly graduated teachers and their confidence to teach also argued that training on capabilities related to collaborative teaching would increase the confidence of beginner teachers and better prepare them for life in the classroom, especially if they were to find employment at a school where they would be working in an FLS.

It is important to note that as a general concept, some teachers in some schools have been collaborating in team meetings, office spaces and staffrooms for years. This type of collaboration has often been based on teachers' individual volition to work together. The type of collaboration required in MLE is a more complex endeavour influenced by teacher understanding of the shared spatial, social and material elements of an NGLE (Bradbeer, 2016). What may work for teachers will be different and change as teacher-teams change, and more time, understanding and experience are gained in NGLEs (Bradbeer, 2016; Cleveland, 2018). The type of teacher collaboration required in an MLE needs to happen at a higher frequency than when teachers worked individually and can be affected by organisational structure and pedagogical understanding of the school, particularly the understandings of leadership (Bissett, 2014; Fletcher et al., 2017; Charteris & Smardon, 2018).

Bradbeer (2016) mentioned the "aspirational tone that frequently runs through the design literature, often making the assumption that changes in teaching and learning will occur as a result of new spaces" (p. 75). However, he, along with others, argued that specific professional learning targeted at teacher collaboration in learning environments is needed to

improve teachers' spatial literacy to help teachers align the physical space with teaching and learning practices (Bradbeer et al., 2019; Carvalho et al., 2020; Charteris & Smardon, 2018; Fletcher et al., 2020). Bradbeer (2016) also advised consideration of professional development "in-situ" (p. 86) because of the previously acknowledged complex nature of teacher collaboration and the impact of spatial qualities of specific learning environments on that collaboration. The alignment of space and pedagogy was mentioned in the previous sections as key for the effectiveness of an MLE and successful transitions to MLE.

Deprivatisation. Just as teacher collaboration may aid in creating a more student-centred classroom practice, and therefore affect students' experiences in the classroom, so too may teacher collaboration impact the teachers' experience in the classroom (Bradbeer, 2016, 2020). One way teachers' experiences in the classroom have been reported to be impacted is by the increased visibility within modified learning environments, the importance placed on teacher collaboration and the consequential deprivatisation of teacher practice (Alterator & Deed, 2013; Bradbeer, 2016, 2020; Campbell et al., 2013; Charteris & Smardon, 2018; Fletcher et al., 2017; Fletcher et al., 2020; Prain et al., 2014; Saltmarsh et al., 2015; Wells, 2018).

Charteris and Smardon (2018) defined the deprivatisation of teaching as "when teaching becomes a publicly profiled activity. School leaders and colleagues access classrooms formally and/or informally to undertake practices such as peer coaching, team teaching, and collegial observations" (p. 14). Within educational research that explores professional development in the classroom, the purposeful deprivatisation of teacher practice is framed as a tool to create a professional learning community in situ (Brix et al., 2014; Halverson, 2003; Lingard et al., 2000; Lomos et al., 2011; Owen, 2014). It is suggested that in a purposeful professional learning community in the classroom teachers will be able to learn from and teach each other by observing others practice in action and hold each other accountable to tasks and pedagogical standards. Learning environment research that reflects on deprivatisation with specific reference to school environments classified as non-traditional or open classrooms (Alterator & Deed, 2013; Campbell et al., 2013; Prain et al.,

2014; Saltmarsh et al., 2015) indicates one reason for modifying the physical space and removing walls or replacing them with glass was to purposefully increase visibility of private practice.

All literature referenced under the subheading that referred to deprivatisation of teacher practice (regardless of the learning environment) stated that relational trust was a crucial element related to successfully employing the deprivatisation of teacher practice as a tool for professional development in the classroom. It is also noted that the consideration of deprivatisation of practice as a one size fits all form of professional learning did not adequately address the complex nature of teaching and teaching together in modified learning environments. Further, it is noted that although the physical space and design of a learning environment may have been perceived to offer an environment conducive to teacher collaboration, and although the deprivatisation of practice (due to the affordances of the learning environment) may have had the potential to create a professional learning community for teachers, the space alone did not make this happen.

Affordances. An affordance of the physical space asserted earlier in this review was the increased physical space of the learning environment which allowed for multiple and different pedagogical practices to be carried out simultaneously within the single space. Affordances detailed by the Ministry of Education included increased access to technology and improved quality of the learning environment, including acoustics, light, and air quality (MoE, 2011, 2015, 2020, 2021b). Research that directly explored digital technology as a tool to help with collaborative teaching found that digital technologies in ILE, specifically cloud-based information communication technology, as an affordance of the modified space of an MLE that could aid in collaborative approaches to teaching such as communicating, planning and report writing (Fletcher et al., 2020). Findings in the same study also indicated that respondents perceived technology could impact teaching and learning but that those

technologies were more effective when proper professional development was included when implementing technologies.

Young et al. (2020) specifically explored the concept of affordances of learning environments by focusing on educators' (the reality of the use of the space) and architects' (the potential of the space) perceptions of the affordances of ILEs, to investigate how the physical space of the learning environment may or may not have enhanced students' deeper learning with pedagogical possibilities afforded by ILEs. The authors' findings referred to the idea "that affordances within the environment exist regardless of whether they are perceived by users or not, but may lie latent until actualised by individuals" (p. 695). With this idea in mind, Young et al. noted that the architect participants across all sites identified fewer affordances than teacher participants. It was surmised that this could be "due to the complexity of human activities that are better known to inhabitants" (p. 711). In general, however, both architect and educator participants perceived fewer affordances for deeper learning within traditional classrooms than ILEs, an idea in line with Byers et al. (2018) and Imms et al. (2017).

Learning environments have also been considered for how the potential affordances may affect pedagogical practices and specific curriculum subjects. This was precisely what Trask (2019) investigated in her thesis, which explored how and what 21st-century ideals may have looked like in an FLS regarding the senior science curriculum and assessments. Trask's research examined the interplay between the New Zealand curriculum, national New Zealand assessment, FLS, digital technologies, the traditional view of the science teacher and 21st-century learning as personalisation and choice for both teachers and students. The interactions of these elements created and eased tensions between the elements while at the same time reinforcing that digital technologies and the physical space of FLS, when employed correctly, could benefit both teachers and students. The importance of the teacher's role, understanding and ability within the classroom was highlighted, particularly when scaffolding personalised learning.

The findings uncovered in the research by Trask (2019) pointed toward recognising the multidimensional identities of students and teachers in the science classroom; she concluded that teachers and students were "multiply positioned"(p. 290) in the learning environment. The discourse of traditional science learning required students to display an understanding of conceptual science knowledge, while the discourse of 21st-century science learning required students to display personalisation and choice within their work, and the teachers were to facilitate both types of learning. The focus on multiple types of learning seemed to sit in the space between curriculum learning and dispositional learning, an idea considered by Bojesen (2017) and Thompson (2018) from the educational philosopher's perspective earlier in this chapter.

Best Practice Literature. As detailed case studies and research with a focus on pedagogical practice have begun to emerge, it appears some of these could be used as guidance or tools for reflection when implementing or transitioning to MLE. Many of these have already been mentioned here, such as Trask (2019), McPhail (2018) and Benade (2017b). One such document prepared for the New Zealand context by the educational authority Education Review Office (2018) was *Leading innovative learning in New Zealand schools*. This publication contained case studies of 12 New Zealand schools, including primary, intermediate and secondary schools. The specific schools were included because they were seen to be successfully preparing students for the 21st century and were doing this in an innovative way which they did by engaging with the New Zealand curriculum, digital technologies and flexible learning spaces. Not all flexible learning spaces at these schools were purpose-built or renovated MLEs; rather, the spaces were used in a flexible way. This document was written to help give "leaders and teachers the confidence to change what they need to change and to put in place evidence-supported practices that will equip all the students to be successful in the future" (p. 6) regardless of whether they had new/renovated buildings, or were operating learning in pre-MLE spaces.

Another document that provided a detailed account of the operation of an MLE was

by Wright (2018). In this work, the author reports the emerging story of a newly established New Zealand secondary school was reported. This research is a longitudinal "snapshot", an ethnographic study created by a series of one-day visits during the five years of the project. The research itself explored the development of a new school by mapping the journey through interviews with school leaders, teachers, parents and foundation students. The research offered an in-depth description of the genesis of the school and reported the historical, political and economic context of New Zealand in which the school came into being in a way that other schools that adopted MLEs may have been able to find reflection.

Additionally, when introducing the ILETC project earlier, it was observed that a significant goal of the project was to explore the educational potential of ILEs by observing best practice and developing guidance and strategies to achieve their educational potential. As such, several guidance documents have been produced (Mahat & Imms, 2020a, 2020b, 2020c, 2020d, 2020e, 2020f, 2020g). These documents, written as facilitator and workshop guides, address student learning (2020c, 2020e), the ILE journey (2020a, 2020d, 2020g), and teacher mind frames, practices and beliefs (2020b, 2020f). They are designed to be used in workshops that require participants to work collaboratively and use their collective knowledge to reflect on their personal beliefs and understandings and imagine the potential of the learning environments. The activities included in the workshops also require participants to consider specific students and other teachers, their beliefs, abilities and backgrounds. Through purposeful action and reflection, participants are provided with ideas to help understand the physical space as a resource and develop strategies and teacher agency to manage change.

Summary

The literature reviewed in the first section provided a foundation to begin to understand how learning environments have been conceptualised to have the potential to aid in teaching and learning and why research evinces it is necessary to focus on developing 21st-century skills and competencies in learners. This section included ideas from architects and

designers, the OECD, and researchers who have theoretically analysed learning environments. Some of this research was grounded in research undertaken within the classroom, but the section concluded by stating that research undertaken in modern learning environments in the New Zealand context from the perspectives of those who operate within the classroom is necessary to understand better the reality of the use of the spaces as opposed to only the potential. The overarching research question of this thesis has been designed to address this gap and explore the reality of learning environments in New Zealand secondary schools by asking: How are the MLE(s) in the participating New Zealand secondary schools being used to develop 21st-century skills and competencies in learners?

The second section of this literature review addressed Ministry of Education and Ministry of Education related literature influential in the turn toward MLE. This literature included policy and guidance documents that have helped shape MLE and the understanding of MLE and a critique of those documents. Within this section, it can be seen that the Ministry of Education initially used research that explored the potential as opposed to the reality of learning environments, put too much emphasis on the physical building to improve educational experiences, did not offer enough agency to the people who use the space or adequately understand the complex nature of teaching.

The final section explored research that had been undertaken within the classroom. This research began to bridge the gap between the potential of the affordances of MLE offered in the first section of this review and the reality of implementing the spaces as directed by the Ministry of Education in the second section. This research in the third section came from different perspectives such as educational philosophers, architects, leadership and teachers. Each piece of research explored single or related aspects of MLE such as transitions to MLE, perception of learning environments, deeper learning, and the effectiveness or impact of the physical space on teaching and learning, and commented on affordances of the physical space, for example, the physical space itself, teacher collaboration and deprivatisation of teacher practice.

In line with the idea of pedagogical architecture, the literature in this chapter focused on documents that explored either the potential impact of the physical learning environment on teaching and learning or teaching and learning practices perceived to help develop 21st-century citizens. The three sections of literature summarised in this chapter form a foundation of understanding for this thesis which is built on in the next chapter. Chapter Three defines the methods and methodology employed to respond to the research questions, achieve the research aim and begin to address the gap in the literature between the potential of MLE and the reality of the use of the learning environments in practice.

Chapter Three: Methodology and Methods

Introduction

This study aimed to explore the reality of the operation of MLEs in the participating secondary schools from the varying perspectives of those involved in daily teaching and learning within MLEs. Table 3 contains a summary of the elements used in this project to make meaning in this research.

Table 3
Elements of the Methodological Framework Used in this Thesis

Element	Employed in this thesis
Methodology	Qualitative Reflective
Ontology	Relativism Interpretivism
Epistemology	Social constructionism Perspectivism
Methods	A multi-site approach Document review Focus group discussion Semi-structured interview Thematic analysis
Ethical considerations	University of Waikato ethical standards

The aim of this study and elements in Table 3 were guided by the overarching research question of the study:

- How are MLE being used in the participating New Zealand secondary schools to develop 21st-century skills and competencies in learners?

The following sub-research questions were created to gain a more detailed understanding of the overarching question:

a) What do educators and learners in the MLEs in the participating schools consider 21st-century skills and competencies to be?

b) What do the MLEs in the participating schools look like at their pedagogical core, and what is the organisational structure of these learning environments?
c) In the MLEs at the participating schools, what are the educators' perspectives of the OECD's 7 Principles of Learning?

The present chapter offers a synopsis of the methodological approaches employed within this research, an overview of the methods used to achieve these approaches and comments on ethical considerations.

Qualitative Research and Interpretation

A qualitative approach was chosen for this research because qualitative research attempts to understand the social world (people doing things together) by investigating the interpretations of that world by its participants (Bryman, 2016). The first step in qualitative research is accepting that there is not just one way (single truth) to view the world. The second step is endeavouring to interpret the phenomena under study—in this instance, the operation of the MLEs in the participating schools—in terms of the understandings people bring to them. For qualitative research, understandings (participant detailed responses) are gathered by methods such as document review and interviews, which contain perspectives and experiences of the specific phenomenon which is the focus of the study. Scholars of qualitative research acknowledge that it is generally impossible to thoroughly comprehend every aspect of a phenomenon because a researcher can only work with the available or accessible information (Bryman, 2016; Denzin & Lincoln, 2000; Jackson et al., 2007).

Qualitative research holds the researcher as the main instrument of data collection (Denzin & Lincoln, 2000; Janesick, 1999; Ortlipp, 2008). Therefore, any interpretation is related to the perspectives of those who participate in research and those who report research. Denzin and Lincoln (2000) commented that "all research is interpretive; it is guided by a set of beliefs and feelings about the world and how it should be understood and studied" (p. 19). Schwandt (2000) asserted that understanding is interpretation and that

"reaching an understanding is not a matter of setting aside, escaping, managing, or checking one's own standpoint, prejudgements, vices, or prejudice. On the contrary, understanding requires the engagement of one's vices" (p. 195). A reflective journal was kept during data collection as part of the research process to increase transparency and visibility in my thinking and add to the rigour of the qualitative approach (Janesick, 1999; Ortlipp, 2008).

My beliefs, and feelings about the world and how it should be studied stemmed from my initial research experiences which were within the field of social anthropology. Beginning there I understood qualitative research as a way to explore a topic of interest, gain insight into a field site and give voice to participants who did not necessarily or normally have their voices heard. When teaching in the MLE my colleagues and I commented that it felt like our voices were not being heard. We did not know why the learning environment had needed to change and we were not given clear guidance on how to operate in the new space. It felt like the MLE was something that had been done to us. Then I read the articles and studies that are in the literature review where it seemed architects suggested what would be suitable for schools without consulting those who would use the spaces. Other researchers proposed theories on the potential of modified learning environments to prepare learning for the 21st century. Other researchers still went to schools to gain insight into their specific questions or record perspectives of leadership on how they judged the teacher mindset or the student experiences and did not necessarily consult teachers or students. With these ideas and understandings in mind, this research was designed with data collection and analysis techniques to offer primacy to participant responses and make visible what I understood as underrepresented voices. The research questions and data collection methods were designed to explore what was important for those operating within MLE.

Fay (1996) contended that to interpret and make meaning of others' actions, the interpreter must be aware of the language of those they were interpreting. Fay also said that to have some understanding of this language, one must "know the social rules and conventions which specify what a certain movement or object counts as" (1996, p. 115). As the researcher, a layer I brought to this interpretation was my experience as a teacher in an

MLE. Another layer added to the interpretation of the information in this thesis was versions of the political, pedagogical and philosophical perspectives and understandings of MLEs learned when reading relevant literature. This interpretation could be seen when considering the research sub-questions designed with the OECD's terminology, as the OECD educational research was promoted as guidance in MLEs by the New Zealand Ministry of Education (Carvalho, 2020; Couch, 2018; ERO, 2018).

Conceptual Framing of Interpretation

As stated, qualitative researchers endeavour to interpret the phenomena of study in terms of the understandings people bring to them. To explore how the participants came to their understandings, Heidegger's interpretivist ontological approach and the idea of "the way we come to terms with the things themselves" (1967, p. 50) were considered. The "things themselves" in the context of this thesis were operating teaching and learning in the MLEs at the participating schools.

Relativism. Ontology is concerned with the nature of reality (Denzin & Lincoln, 2000; Fay, 1996; Smith & Deemer, 2000). Initially, in research and philosophy, it was believed that it was possible to unveil, find, or discover a single reality, objective truth or piece of knowledge. However, the history of human thought has made it apparent "that there is no possibility of theory-free observation or knowledge" (Smith & Deemer, 2000 p. 877) because, as observed earlier, all research is interpretive guided by the framework of understanding brought to the research by the researcher (Denzin & Lincoln, 2000; Fay, 1996; Schwandt, 2000). This means there can be no single objective or interpretive truth, an idea aligned with qualitative research.

This research took the ontological stance of relativism which maintains there is no single objective truth, argues that "the only access to reality is the experience of it" (Fay, 1996, p. 79) and that there can be multiple constructed realities (Denzin & Lincoln, 2000). In this research, each participant's response (perspective) was considered a single reality. Accepting that all observation and knowledge are theory-laden, it follows that one cannot

simply observe another person's reality to understand or interpret it correctly; that observation is the theory-laden reality of the interpreter.

Relativism has been criticised for being reductive; the idea concerns judging what reality to report and which truth to believe. The response of every participant could be considered relative, but researchers must judge what to report, just as researchers must judge what research tools to use. The judgment is based on relative context, and that context is based on the relative context ad infinitum. Critiquing relativism Smith and Deerer (2000) contend that the research method was proposed as a theory-free way to judge credible and valid data, but the method itself is open to interpretation. Consequently, the methodological framework of research is critical as it lays out the researcher's choices, understandings, and justification. So although there may be different ways to understand aspects of the methodological framework, by describing the context-specific methodological framework of research, researchers' understanding should be made clear.

The approach undertaken in this thesis to explore the operation of the MLEs in the participating schools used semi-structured interviews and focus group discussions as data gathering techniques to collect participants' realities and allow some awareness of the way those participants came to terms with teaching and learning in MLEs. Additionally, because the Ministry of Education advocated for teacher collaboration in MLEs (MoE, 2015), this research approach was also designed to offer insight into how those individual perspectives (realities), experiences and understandings came together to construct the daily operation of the MLEs in the schools that participated in this research. This exploration is important from the relativist context because if all realities were charged as credible and valid, then when people work in situations together, how will they manage their differences and disagreements? This point will be revisited in the discussion.

Social Constructionism. While ontology is concerned with the nature of reality, epistemology is concerned with knowledge. This research employed the epistemological concept of social constructionism. Constructionism begins with the basic idea of constructivism: knowing is not passive, but our thoughts are active in our minds in the

construction of knowledge (Schwandt, 2000). A social constructionist perspective builds on this idea to suggest that knowledge and experiences of phenomena, such as teaching and learning in MLEs, are the outcomes of interactions between individuals constructed together, rather than in the isolation of a person's mind (Berger & Luckmann, 1966, 2016; Bryman, 2016; Burr, 2019; Denzin & Lincoln, 2000; Schwandt, 2000) or "grounded in an observable and definable external reality" (Burr, 2019, p. 118).

Berger and Luckmann (1966, 2016) were two of the originators of the sociology of social constructionism, specifically regarding the social construction of knowledge and realities. In their theory, they considered "reality as it is available to the commonsense of the ordinary members of society" and "knowledge that guides conduct in everyday life" (2016, p. 110). They suggested the intersubjective commonsense world, the world that exists between conscious minds and is shared by more than one mind, originates in individual minds, then through communication, repetition and habit becomes taken for granted (commonsense). This process is both constructed through and maintained by interactions with one another.

One fundamental way people interact and communicate is with language. The way language was used to construct reality was not the focus of this thesis. How participants' understandings and experiences help to construct reality was a focus, therefore language was not focused on beyond acknowledging it as a tool for communicating realities. However, language is a central device in the process of social constructionism (Berger & Luckman, 1966, 2016; Burr 2015, 2019) and requires further comment. Language is initially used "when 'talking to myself' in solitary thought" (Berger & Luckmann, 1966, p. 54), where ideas are formed. Following this, language is used when communicating those ideas to others. Those ideas, communicated to others, get repeated and can become a commonsense reality. They are then passed on to the next generation, where they are simply accepted as commonsense. This process of habitualisation, institutionalisation and internalisation through language and communication constructs and perpetuates individual and intersubjective realities (Berger & Luckman, 2016). This process of social constructionism was employed to consider how the daily operation of an MLE may have come to be

constructed. In this thesis, *daily operation* was understood as comparable to the *commonsense reality* of the everyday use of MLEs in their particular contexts.

Burr (2015, 2019) addressed social constructionism and the idea of multiple realities from the perspective of psychology and contended that if a single person existed in multiple realities, that person could be understood as "fractured" (Burr, 2019, p. 123). This contradicts the idea that an individual contains a single self that defines who they truly are. Multiple constructed realities could be observed when a student behaves differently in different areas of their life. Interactions with peers, teachers or parents each have a different commonsense reality and knowledge that guides the conduct in that reality, such as the appropriate language to use or behaviour to portray.

Perspectivism. Consider again a single perspective as a single reality; when that perspective is communicated to another person, a further intersubjective reality is socially constructed. Therefore, an additional building block added to the social constructionist epistemology is perspectivism. Varying perspectives were already evident throughout the first chapters of this thesis, for example, with the varying terminology used for MLEs, or the varying aspects and connected aspects researchers of learning environments have considered for their focus. Perspectivism was included in the conceptual framing of this thesis because it was considered that a social constructionist perspective alone did not lay a strong enough foundation when aiming to gain insight into MLE as a phenomenon that was experienced both individually and collectively.

When defining perspectivism, Fay (1996) asked the reader to contemplate the scientist. Scientists not only gather facts, but they also sort them. Sorting and, therefore, the description of facts is only possible when a person has a framework to distinguish between significant and superficial facts and establish the credibility and validity of that fact. Fay noted that a fact was not a phenomenon itself "but *phenomena under a particular description*" (p. 73) (italics in original), a concept comparable to "the way we come to terms with the things themselves" (Heidegger, 1967, p. 50) in comparison to focusing on the thing itself. Without a framework to distinguish between facts and choose what to describe, it is

not possible to offer a description. These ideas beg the question of where a person's conceptual framework and perspective come from.

Heidegger's (1967) ontological concept of "Being" (to be read as existing [Wheeler, 2011]) is relevant to this question. When exploring the meaning of existing, Heidegger observed that when a person[9] comes across an entity outside of themself, they interpret that entity. The person being considered in this context is the participant and the entity being interpreted is an MLE. Heidegger expanded on *entity* with the term *totality of involvement* (Wheeler, 2011) to acknowledge that entities do not exist in isolation but also in the interpretation they are given by the person who interprets them.

Summarising Heidegger's work, Wollan (2003) noted it is important to remember that the person doing the interpreting is "situated in a particular place and a particular time, with many other relations and attitudes to many other things" (p. 33). This web of situation, time, relations, and attitudes helps form a person's perspective, interpret an entity, and understand and experience their reality. This interpretation is another thread added to the web, which adds to the interpretation, meaning that the person is both influenced by, and influences understandings around an entity. These perspectives and understandings become apparent in interactions between individuals.

Further to this point, Wollan (2003) defined the idea of a "concrete situation" and suggested the concrete situation of the interpreter governs their every interpretation:

> There is no such thing as presupposition less, "prejudiceless" interpretation .... The interpreter cannot free himself from his own facticity, from the ontological condition of always already having a finite temporal situation as a horizon within which the [entities][10] he understands have their initial meaning for him. (p. 32)

Regarding social constructionism Berger and Luckmann (1966, 2016) commented on "the

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[9] Translations of Heidegger's work use the term Being both as a noun and a verb. When considered as a verb Being can be read as existing as mentioned here. When referred to as a noun a Being means the "thing that is being", which Heidegger asserts as identifiable because they are aware of being. For ease of understanding in this context "existing" and "person" are used respectively to signify the difference.
[10] The original word used here in Wollan's work was "Being" but my reading and interpretation of Heidegger's work suggests "entities" better serves understanding this point in relation to this thesis.

inevitable historicity of human thought" (1966, p. 19), as did Burr (2019), who suggested that a person's individual framework to distinguish between significant and superficial facts was shaped by when (historically) and where (culturally) they experienced the world. Fay (1996) also asserted, "Human knowers cannot look at reality directly in some unmediated manner, no matter how much they try to purge their minds of prior ideas and concepts" (p. 76). Writing on relativism Smith and Deemer (2000) make a similar comment that people should "abandon hope for knowledge that is not embedded within our historical, cultural, and engendered ways of being" (p. 886). These ideas suggest the participants' perspectives that come together to form the intersubjective reality of the operation of an MLE may be historically and culturally situated. Further to this any understanding or interpretation of an entity (an MLE or aspects of an MLE such as education in general or teaching or learning) may always be influenced by a person's initial understanding of that entity.

In the same way that an individual has a conceptual framework to judge significant and superficial facts, the ideas of relativism, social constructionism, and perspectivism are part of the conceptual framework of this thesis. This framework also includes consideration of how participant perspectives may come to be (the idea of the participants' concrete situation), and how they may have affected the construction of the operation of an MLE. Together these elements inform a way to make sense of participant responses and the research questions.

A Multisite Approach

A qualitative multisite approach to research facilitates exploration of the specific phenomena of interest across multiple sites while acknowledging the varying context of the sites (Audet & d'Amboise, 2001; Herriott & Firestone, 1983; Jenkins et al., 2018; Lewin & Stuart, 2002, 2003). Within this approach, a common research focus and core framework of data collection and analysis methods are employed, but there is flexibility when exploring the common focus based on the acknowledgement of the varying contexts of the sites (Audet & d'Amboise, 2001; Lewin & Stuart, 2002, 2003). Multisite approaches to qualitative research

evolved from case study approaches in the 1970s and 1980s to increase transferability, applicability[11] (Leung, 2015; Noble & Smith, 2015) and trustworthiness of findings across sites while preserving in-depth description and site-specific understandings (Herriott & Firestone, 1983; Jenkins et al., 2018).

In the current research, the specific phenomenon was the operation of the MLE in the four participating New Zealand secondary schools. The different sites were the participating schools. It was assumed that the contexts of the schools might affect the organisational structure of those schools and, by association, the individual MLEs. Recognition of the contexts that the MLEs existed within granted a view of MLEs as part of a school compared to viewing them only as separate learning environments (classrooms).

The common focus, guided by the overarching research question, was to explore the daily operation of the MLEs at the participating schools by recording the perspectives and understandings of the participants involved in the operation of the learning environments with reference to developing 21st-century skills and competencies in learners. In order to explore the common focus, a core framework for data collection was undertaken at each site. Data collection was purposefully designed in a way that allowed the exploration of common concepts from a variety of sources (the participating schools and participants: principals, teachers and students), gathered with a variety of techniques (document review, individual semi-structured interview, and focus group discussion, discussed in detail shortly).

The same framework for data collection was carried out at each school to create consistency and rigour for this project. Gathering multiple perspectives and understandings through a range of data collection methods was a part of the purposeful design of this research to aid in the trustworthiness of the study (Baxter & Jack, 2008; Bryman, 2016; Denzin & Lincoln, 2000). Exploring a common focus through a core framework (the specific methodology and methods described in this chapter) at multiple sites and recognising the varying contexts of those sites, a multisite approach could make both inductive and

[11] *Applicability* in this context refers to consideration "given to whether findings can be applied to other context settings or groups" (Noble & Smith, 2015, p. 34).

deductive theorising possible (Audet & d'Amboise, 2001; Lewin & Stuart, 2002, 2003); an idea in line with the thematic analysis applied to findings as explored later in this chapter.

Using a range of collection techniques, collecting multiple perspectives of a common focus, and doing so at multiple sites are all similar to a case study approach (Audet & d'Amboise, 2001; Baxter & Jack, 2008; Lewin & Stuart, 2002, 2003; Stake, 2000). However, a case study approach requires the information gained to be bound to the specific cases. Reporting in-depth on specific cases enhances the description of the case but tends to mask similarities and differences across sites inhibiting the ability to explore the applicability of findings across sites (Jenkins et al., 2018). In the current study, the schools themselves were not a research focus, the organisation of the MLE(s) within the schools were. Any understanding of the contexts the MLEs existed within played a supportive role in exploring the operation of those MLE and answering the research questions, therefore a case study approach was not deemed appropriate.

A multisite approach which engages with cross-site, issue-specific reporting can facilitate the exploration of applicability but has been critiqued to do so at the expense of site-specific context and description (Herriott & Firestone, 1983; Jenkins et al., 2018). Therefore to honour the specific sites, Chapter Four Findings I contains context-specific information and is also issue-specific responding to research sub-question A. Chapter Five Findings II contains cross-site issue-specific information in response to research sub-questions B and C. In the final findings chapter (Chapter Six Findings III), the idea of applicability is referenced, and participant voice is brought forward to explore the general but still specific issue of the operation of MLE in the participating schools. As outlined, the flexibility of the multisite research design allows for an appropriate approach at each site (Lewin & Stuart, 2002, 2003). One example of the appropriate approach at each site can be demonstrated with consideration of the contexts reported in Chapter Four. A scaffolding was applied to report school contexts, but the reported information varied depending on the information gained during data collection at each school.

A multisite approach was also deemed more appropriate than a case study approach

for this project because of time and resource constraints, principally because there was only a single researcher. Case study approaches often recommend multiple researchers to remove bias and create rigour within a study (Baxter & Jack, 2008; Herriott & Firestone, 1983; Stake, 2000; Yin, 2005), however, multiple researchers then need to spend time creating shared understandings of the project, its aims and goals. Within multisite research for projects where up to four sites are included, a single researcher can be considered a standardised tool for data collection (Herriott &Firestone, 1983). Their understandings are applied across all sites, understandings need to be clearly explained, but the use of a single researcher can allow for greater in-depth study and recognition of specific (context) and general (applicable across sites) aspects of sites which can then help with context-specific reporting and exploration of applicability in the findings.

In sum, a multisite approach was employed to allow participant understandings and experiences of the operation of the MLEs at the participating schools to be explored through a core framework and allow flexibility in the approach in each context. This approach was also employed because it was understood that it is an appropriate approach for a single researcher, would allow the exploration of specific (context) and general (applicable across sites) aspects of experiences of MLEs, and allow the possibility of both inductive and deductive theorising during the research process.

Participant Selection

All state-owned schools were to adopt MLE when property funding became available, this meant newly built schools have 100% MLE environments and other schools have varying percentages of MLE based on the specific 10 year property plan of the school and available funding. During teacher training my classmates reported back about their experiences on practicum and I became mindful of the varying percentage of MLE that schools in our catchment area head. This is where I became aware of the four schools that I later approached to participate in this study. Each of the four participating New Zealand secondary schools was built or renovated in line with *The New Zealand Property Strategy*

2011-2021 (MoE, 2011), but each had a different type, amount, or percentage of MLE. This is shown in Table 4. This method of non-random sampling (Onwuegbuzie & Collins, 2007) was employed, to maximise understanding around the enactment of the directive to adopt MLEs in New Zealand secondary schools instead of looking only at schools that had a particular type, amount, or percentage of MLE.

Table 4
Overview/summary of participants

School	Type of MLE	Year Level taught in MLE	Teacher Disciplines	Year level of student participants	Number of participants
Kahurangi College	80% New build 20% traditional existing structure	Whole school	English Arts Social Studies	7, 10, 12 and 13	Principal 1 Teacher 3 Student 5
Whero College	Two new identical MLE that replaced outdated prefabricated classrooms	7 and 8	English Maths Social Studies Science Physical Education Te reo Māori	7 and 8	Principal 1 Teacher 7 Student 6
Kōwhai College	Whole school New Build - no pre-existing structure or school	Whole School but Year 9 and 10 were the focus in this study	English Maths Social Studies Science	10	Principal 1 Teacher 11 Student 3
Kākāriki College	One MLE in renovated and refurbished existing structure	9 and 10	English Maths Social Studies Science Physical Education	9 and 10	Principal 1 Teacher 4 Student 5

Research suggests a minimum sample size when conducting a multisite or case study approach to research is at least three sites (Audet & d'Amboise, 2001; Onwuegbuzie & Collins, 2007). This amount was to allow for the possibility of researchers to generalise the findings across sites to lead to a better understanding of a phenomenon. More practical reasons also influenced the decision to approach four schools to participate in this research. The first was that if one of the participating schools had needed to withdraw from the

research at any time, there still would have been three to include in this project. The second was the amount of time available for data collection, consequently I only contacted schools that were within a two-hour driving distance from my home.

This project was undertaken to explore the perspectives, understandings and experiences of three "types" of participants: principals, teachers and students. Once a school was identified, the school principal was approached via email at which time the project was briefly introduced. Following this, I met with the principals in person for initial conversations where the principals began to tell the story of their school's journey to MLE(s), and explained the physical design of the space and learning philosophies employed at their school. I was taken on an informal tour of the school and introduced to potential teacher participants. Principals at all four schools consented to their school being included in this research and themselves participating in a digitally recorded semi-structured interview for information given to principals (see Appendix A).

The following step was to approach potential teacher participants. The one criterion for teachers to participate was that they taught in an MLE at the school. Teachers were recruited in various ways at the different schools, predominantly I presented this research at their team meetings or visited learning environments where teachers were teaching. When teachers showed an interest in participating they were presented with an information letter, consent form, questions, and concepts to be discussed (see Appendix B).

Student participants were identified by teachers, and the project was explained to students. I asked to talk with six students for the focus group discussion, three male and three female. The students did not need to be from the same MLE or the same year level, and their teachers did not need to be a teacher participant. The one criterion was that they learned in an MLE. Students who indicated they wanted to participate were given an information sheet to look over with their parent or caregiver, a consent form that required both their and their caregiver's signature, and the list of questions to be addressed in the focus group (see Appendix C). One of the requirements for students to participate was that they brought the signed consent form with them. Some did not, and this affected the number

of students in each focus group, which ranged between three and six participants, as shown in Table 4.

There were 48 participants in total. The specific breakdown of participants at each school is represented in Table 4. Further detail is provided on the participating schools and participants in Chapter Four Findings I. Ethical considerations regarding participants are commented on at the end of this chapter.

Data Gathering

All interviews and focus group discussions happened on school premises during school time, were digitally recorded with two devices and then transcribed. Principal and teacher participants were each invited to participate in a single, individual, semi-structured interview. Interviews with principals regarded their school's journey to MLE(s), including how teachers were selected to work in the MLE(s), how learners and educators were prepared to transition to the MLE(s) and the principals' understandings of 21st-century skills and competencies.

Semi-structured interviews were employed with teachers as a data-gathering technique to elicit the participants' understanding and interpretations of the pedagogical core and organisational structure (OECD, 2013) of the MLE they worked within. Further to this, teachers were also asked what they considered 21st-century skills and competencies to be and their perception of the OECD's 7 Principles of Learning[12] (Istance & Dumont, 2010; OECD 2013, 2015) in relation to the MLE in which they taught. These concepts were chosen because the reviewed literature indicated that these should be underpinning concepts of the operation of MLEs.

The semi-structured interviews took place individually to allow the opportunity for open responses from the participants, as their leaders, colleagues and students would not be present to judge their interpretation or response. Semi-structured interviews were chosen as a data-gathering technique as they should permit the participants more control over the

[12] See Table 2 for the list of the 7 Principles of Learning.

content and structure of the interview than a more structured interview would. This technique would also allow participants to focus on what they felt was necessary to discuss about their experience in an MLE, providing greater detail and depth of data (Fontana & Frey, 2000). A further benefit of this technique was that it gave primacy to the participants' understandings, interpretations and responses (Fontana & Frey, 2000).

A focus group discussion was employed at each school to gather understandings, experiences and perspectives from students who learned in MLEs. Fontana and Frey (2000) advised that the term "focus group" applied to situations where the researcher asked specific questions about a topic to a group. The group interviewing technique was employed because, in contrast to an individual interview situation, a focus group of peers may provide a supportive situation to give the students the courage to speak up about their opinions. Fontana and Frey (2000) suggested that this technique could also be successfully used to aid respondents' recall of an event and add layers of detail to explanations by triggering responses from other group members and group memories. In focus group discussions, the students were asked the following lead questions:

- Have you learned in an MLE before?
- How does learning in the MLE compare to other learning you have done (within the school and in previous schools)?
- What is good about learning in an MLE?
- What is not good about learning in an MLE?
- What would you change about the MLE?

This project also included a document review conducted to garner demographic and contextual information about the schools. Information for the document review was accessed from online sources such as the school's website or the most current Education Review Office report, collected from the school (such as a physical copy of the school charter) during data collection. Gathering this information was important because as stated the MLEs did not exist in isolation, they existed within the contexts of the participating schools and it was assumed those contexts affected the organisational structure of those schools and by

association the MLEs. Recording the contexts within which the MLEs were shaped aided in building a deeper, more comprehensive understanding of the contexts in which the operations of the MLEs were constructed (Baxter & Jack, 2008; Lewin & Stuart, 2002, 2003; Stake, 2000;).

Data Analysis

The demographic and contextual information gathered about the schools from the document review during data collection was used to indicate the context within which the MLEs operated. This information was combined with information from interviews loosely based around participants' explanations and understandings of the elements of the pedagogical core and organisational structure of these elements (OECD, 2013) to create a synopsis of the context and operation of the MLE(s) in each of the participating schools. This information was used to inform Chapter Four Findings I.

Data analysis for the information gathered via semi-structured interviews and focus group discussions was completed via thematic analysis. "Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data" (Braun & Clark, 2006, p.79) (brackets in original). Thematic analysis is not linked to a specific theorist or framework. This lack of clear and concise guidelines could be considered a limitation of this type of data analysis; however, the lack of affiliation to a specific theorist or framework can also provide a flexible research tool to gain a rich and detailed account of data within the qualitative paradigm (Braun & Clark, 2019).

Initially, undertaking thematic analysis by coding with NVIVO software was considered. After attempting to use NVIVO for interview transcripts, I realised that as the main instrument of data collection, I had a multi-dimensional view, including tone, context, and body language, that the mono-dimensional words on a page did not. Therefore, considering the depth of analysis that I understood this awareness might add to the flexibility of thematic analysis as a tool, I carried out this process without the aid of software. This step in data analysis was carried out this way to develop an in-depth coding and analysis

to gain a better participant voice presence, a goal in line with offering participant responses primacy (Braun & Clark, 2006). When considering thematic analysis, the researcher's active role in identifying themes, selecting which are of interest and reporting to readers is considered a resource and must be acknowledged (Braun & Clark, 2006, 2019; Braun et al., 2019). The reflective journal mentioned earlier was continued throughout the process of thematic analysis to provide transparency during this stage of the research (Janesick, 1999; Ortlipp, 2008).

A *theme* in relation to thematic analysis helps to understand something important about the data concerning the research question, and it often reflects a pattern of shared meaning organised around a central concept (Braun & Clark, 2006, 2019; Braun et al. 2019). Specifically, the thematic analysis undertaken in this research took two separate approaches. Findings Chapter II is a domain summary (Braun et al., 2019) in response to research sub-questions B and C. A Domain Summary "*summarises* what participants said in relation to a topic or issue" (p. 846) (italics in original). Braun et al. (2019) made the distinction that this type of thematic analysis typically reported "surface level meaning" in response to a particular interview question and could include underdeveloped themes. However, a domain summary was considered the most effective way to respond to the aforementioned sub-questions and the chapter was developed further to include not only responses to the questions but participants' reported perspectives and motivations for the responses as well.

Findings Chapter III was accomplished with reflexive thematic analysis. The aim of reflective thematic analysis is not to summarise data but to "provide a coherent and compelling interpretation of the data, grounded in the data" (Braun et al., 2019, p. 848). The methodology applied during this stage of analysis to distinguish what to report was the primacy offered to participant responses. Primacy revealed the frequency of references to the conceptual ideas *Increased Interactions*, *Teacher Teams* and *Enablers and Constraints*, these were the themes that emerged from the analysis which are reported in the final findings chapter.

In their 2019 work, Braun et al. summarised six phases of thematic analysis:

familiarisation, generating codes, constructing themes, revising, defining themes and writing the report. Familiarisation with the data began when writing reflective journal entries after each interview or focus group discussion. This familiarisation continued as the recorded interviews were re-listened to while they were being transcribed and included making further notes in the journal. These notes were related to individual transcripts, transcript sets within schools, and transcripts across all four participating schools, always with the overarching research and sub-questions in mind. Familiarisation also led to beginning to make sense of ideas that were emerging in the data without specific reference to the research questions.

Braun et al. (2019) noted that the next step in thematic analysis, generating codes, had two general orientations: inductive, meaning the process begins from the data; and deductive, based on various ideas and concepts the researcher had in mind. This method of analysis aligned with the multisite approach which used a core framework to explore a specific research focus but also allowed flexibility in the approach at different sites (Audet & d'Amboise, 2001; Lewin & Stuart, 2002, 2003). Initially, the themes used to code the data were the concepts and elements of pedagogical core, organisational structure, 21st-century skills and competencies and the 7 Principles of Learning. These were the deductive themes the analysis began with. Inductive themes were also included, based on their frequency and importance to participants. These inductive themes and codes could be considered "latent" themes (Braun & Clark, 2006, p.84) and were not necessarily related to the main concepts but were noticed in the previous phase based on their prevalence (or lack thereof). The flexibility of reflective thematic analysis meant that the themes evolved and changed (Braun & Clark, 2006, 2019; Braun et al., 2019). Some latent themes, such as the deprivatisation of practice, helped understand how aspects of MLEs came to be organised and operationalised within the space (discussed in Chapter Seven). This was one way to see the operation of the space as socially constructed through shared meaning. In this sense, "thematic analysis can be a method that works both to reflect reality and to unpick or unravel the surface of 'reality'" (Braun & Clark, 2006, p. 81).

Once codes were generated, the construction of themes began. In this process, similar codes were collated around a central organising concept, such as relationships and interactions. Initially, it was noticed that at all schools teacher participants spoke about relationships and interactions with their colleagues because of the teacher-team organisation of the MLEs, and this became a code. Next, it was noticed that teachers also spoke about interactions with leadership, which also became a code. Once the common concept of relationships and interactions was identified, it became apparent to see teachers speaking about interactions with students as well, then students talking about interactions and relationships with their peers and teachers.

The following two phases of revising and defining themes were iterative. To continue with the previous theme, relationships and interaction, further parts of data were coded into this theme until it was noticed that all participants spoke about interactions with others in their MLE. At this point, it was observed that the comments coded into this theme were all related to how those interactions impacted participants' experiences of teaching and learning in their MLE. These comments were further observed to extend beyond the classroom to include the community and students' caregivers. During further revision and defining, these interactions were noted to also include interactions between different MLEs within the same schools and interactions between the MLEs and other areas of the same school.

While working on defining individual codes, the connections between codes became visible. On closer inspection, using inductive analysis to review and define the story the data was telling, it became apparent that there was a common theme across all reported relationships and interactions. When participants spoke about interactions and relationships, they were commenting on how the increased number of people simultaneously timetabled into an MLE increased the frequency of interactions they had with others which in turn impacted their experience in their MLE. Braun et al. (2019) explained that these "phases seek to ensure that themes, *and* theme names, clearly, comprehensively *and* concisely capture what is meaningful about the data, related to the research question" (p. 857) (italics in original). With this in mind, although some teacher participants spoke of

friendships with other teachers, the concept of relationship was discarded from the theme title. This decision was made because *Increased Interactions*, in general, seemed to be a better fit as an "umbrella term" to be able to talk about the varying ways participants reported interactions with reference to their experiences and understandings of MLE, which seemed important considering all interview and focus group transcripts included reference to these concepts.

The final of the six phases of reflective thematic analysis was producing a report (Braun et al., 2019). Producing the report meant writing the Findings chapters, which took various forms throughout the process. The steps continued to be repeated throughout the last phase to make sure the themes clearly and comprehensively reported what was interpreted as meaningful when offering primacy to participant responses and also keeping the overarching research questions in mind.

Ethical Considerations

This research was granted ethical approval through the University of Waikato and was conducted in compliance with this institution's ethical standards. Like many academic and professional associations, the University of Waikato's ethical standards emphasises four main guidelines when conducting research with human participants: informed consent, not being deceptive, privacy and confidentiality, and accuracy (Christians, 2000; University of Waikato, n.d.).

Informed consent was gained from all participants. All participants were fully informed by conversation and written documentation about the goal of the project and their rights to decline to participate or withdraw their data from the project. This information included how the findings would be used and how data would be stored. Furthermore, both my chief supervisor's and my contact details were included in the written information should participants have had any questions or wanted to address any concerns or complaints. School principals were each approached in the same manner, but teacher and student

participants were approached in a socially appropriate manner according to the culture of the school as guided by the principal.

Concerning student participants, I felt gathering student voice was necessary because the learners' education (in the context of their life) was being carried out within MLEs, which meant they were affected by MLEs. Lundy (2007) has developed a framework for working with student voice which is inspired by Article 12 of the United Nations Convention of the Rights of the Child, which she quotes

> states Parties shall assure the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, the views of the child being given due weight in accordance with the age and maturity of the child. (p. 927)

The framework by Lundy consists of four elements: space, voice, audience and influence (p. 933). Each of these elements have been addressed concerning student voice in this project. By facilitating the focus group discussions, an opportunity was created for students who gave their informed consent to express their voices and views. The students have been listened to by the researcher, and their voices have been written into the findings and discussion of this research. The thesis will be available to the schools and the wider public once published to be acted on as appropriate. Additionally, specific to this project, student voice was collected to add another dimension and further understanding to the daily operation of each MLE that this research aimed to explore.

When explaining deception and ethics, Christians (2000) advised that "in emphasising informed consent, social science codes of ethics formally oppose deception" (p. 139). To mitigate any deception, I was transparent with my participants when answering any questions and explaining my motivations, and understandings for undertaking this project and developing the specific questions and concepts used to semi-structure interviews or guide focus group discussions.

Privacy and confidentiality, specifically anonymity, were especially important to this project. The participating schools were not identified in this thesis as doing so may have

made it easier to identify individual participants. Pseudonyms were created for each school. Part of not identifying schools included not taking any photos or creating any sketches of the physical design of the learning environments as these may also have been recognisable. Throughout the thesis the participants are referred to only by their role (principal, teacher, or student) and the school where they participated from, this is because of the small number of participants at each school. Offering more information or attributing particular comments to particular participants may have made the participants more identifiable. Each school had a specific set of terms they used in conjunction with the concept of MLE. The spaces each had a name, and within the spaces, different participants had different titles and roles. To maintain the anonymity of schools and participants, the specific terminology of the schools was not used. The pseudonyms for the schools were Kākāriki College, Kōwhai College, Whero College, and Kahurangi College. Kākāriki, kōwhai, whero and kahurangi are names of colours in te reo Māori (green, yellow, red and blue, respectively).

The fourth general guideline for ethical consideration when conducting research with human participants is accuracy. Accuracy regarding ethics includes the concepts of clarity and rigour. These ideas refer to the way data is recorded and having consistent approaches to methods and processes, such as transcribing and analysing, and consistency in applying the theoretical framework described earlier. In consideration of this guideline, once interviews were transcribed, transcripts were offered back to principal and teacher participants to check that the contents of the transcript conveyed what they had contributed. All teacher and principal participants took advantage of this option, and nobody altered their transcript. Students were aware they would not be offered back the focus group discussion transcriptions as the focus group discussions were collective conversations. Additionally this guideline refers to truthfully reporting data even if that data were to make the researcher uncomfortable or appear in contradiction to the research questions or hypothesis. Further to that, accuracy refers to other literature included in the research, correctly giving credit to the researcher and reporting others' work. This research has complied with these standards.

Summary

In review, this study emphasises the perspectives, experiences and understandings of principals, teachers and students who were involved in the daily operation of MLE in four New Zealand secondary schools. This thesis is an attempt to convey and interpret their reality of operating education in such an environment.

This chapter began by introducing the reader to Table 2, which contained a summary of the elements of the methodological framework that were then defined and justified within this chapter. Qualitative methodology was introduced, as was the idea of interpretation and the researcher as the main instrument of data collection. These elements also included social constructionist and perspectivist epistemological stances and an ontological stance of relativism. The work of Fay (1996) was used to explore the idea of perspectivism, and then the work of Heidegger (1967) was used to explore the ontological concept of being and where one's personal perspective may originate. The concept of a multi-site approach was introduced, as were the methods of participant selection and data analysis.

In total, four principals, 25 teachers and 19 students across four schools participated in this research via individual semi-structured interviews (principals and teachers) and focus group discussions (students). This chapter concluded with a discussion on ethical considerations within this research, including the reasons for school and participant anonymity and justification for the pseudonyms of the schools that contained the MLEs that were the focus of this study.

Chapter Four Findings I: The Pedagogical Core and Organisational Structure of the Participating Schools

Introduction: Findings

The following three chapters report the findings from this study. As explained in the methodology chapter, data was collected by individual semi-structured interviews with four principals and 25 teachers as well as four focus group discussions, with a total of 19 students from the four participating schools. The current chapter outlines the context of the four participating schools and begins to respond to research sub-question A: What do the MLEs in the participating schools look like at the pedagogical core, and what is the organisational structure of these learning environments? The second findings chapter *Awareness and Comprehension of 21st-Century Skills and Competencies and The 7 Principles of Learning* is a domain summary (Braun & Clarke, 2006, 2019; Braun et al., 2019) of responses to research sub-questions B: What do the educators and learners in the MLE in the participating schools consider 21st-century skills and competencies to be? and sub-question C: What are the educators' perspectives of the OECD's seven principles of learning? The third findings chapter *Increased Interactions, Teacher Teams and Enablers and Constraints* was written by reflexive thematic analysis (Braun & Clarke, 2006, 2019; Braun et al., 2019) and reports the themes that emerged via thematic analysis of all interview and focus group discussion transcripts.

School Contexts

The context surrounding the implementation of MLEs in New Zealand was reported in Chapters One and Two. The current chapter outlines the contexts of the four schools that participated in this study. As previously stated, it was assumed that the contexts of the

schools might affect the organisational structures of those schools and, by association, the individual MLEs. This is part of the reason that a multisite approach to this research focus was chosen: to allow a focus on a specific phenomenon but allow flexibility in approaching that focus at different research sites (Audet & d'Amboise, 2001; Lewin & Stuart, 2002, 2003).

Each school profile contains information on pedagogy and assessment at that school as well as:

- The general *school context*, including demographic information.
- A description of the *physical space* of the MLE(s).
- A description of the *organisational structure: students and teachers*.
- A description of the *organisational structure: learning time*.
- Information on each school's *journey*[13] to MLE, including how the school was organised before MLE spaces were constructed.

These school contexts were constructed with information from participant interviews, document review of school prospectus, charter, website, Education Review Office reports, and other statistical information found on the Ministry of Education website Education Counts (MoE, 2021).

In Chapters One and Two it was reported that pedagogical core and organisational structure were concepts defined by the OECD (2013). They were originally used by the OECD to demonstrate how core elements of the learning environment (educators, learners, content and resources) could be organised to create innovative practices in ways that were perceived to help develop 21st-century citizens in the contexts of the case studies addressed in *Innovative Learning Environments* (OECD, 2013). The focus of the current research was not to explore innovative practices but to report how the MLE in the participating schools were operated, therefore there is no specific comment on innovative practices. Instead,

[13] Journey is a term used throughout learning environment literature (see, for example, ERO, 2018) in recognition that the implementation of an MLE is an ongoing process as opposed to a fixed destination.

pedagogical core and organisational structure are used as scaffolding to explore the operation of MLE in the participating schools.

Kahurangi College

School Context

Kahurangi College is a state-owned, co-educational secondary school that caters for Year 7 to 13 students who are all taught in English medium. At the time of data collection, the student population of less than 450 consisted of 52% male and 48% female students; 85% of these students were of Māori ethnicity, 13% were of Pākehā/European ethnicity and about 1% each Pasifika and Asian ethnicity.

The school website presented a supportive, inclusive culture designed to promote student well-being and raise personal and academic achievement for all students through an integrated curriculum founded on the key competencies of the NZC: thinking; using language, symbols and text; managing self; relating to others; and participating and contributing (MoE, 2007, pp. 12–13). This secondary school was established by an amalgamation of the town's original intermediate and high schools. The principal reported that at this time, the curriculum was redeveloped in consultation with local iwi to deepen understandings of Māori ways of being; with community industry leaders, to identify industry desired skills and competencies; and with family and whānau aspirations for their youth, to aid in developing skills and competencies valued for life outside of school.

The Physical Space

When the new school was formed, new buildings were built, and a small number of the original buildings were incorporated into the new school campus. All new buildings were built in line with *The School Property Strategy 2011-2021* (MoE, 2011). The physical spaces of the two MLEs at this school were each equivalent to nine traditional classrooms[14]. They

[14] To remind the reader, a classroom built in the 1920s was 8m x 7m, and a classroom built in the 1950s was 10m x 7m (Benade, 2019, p. 214). Both of these sizes could be considered "traditional"

were large, open, interconnected teaching and learning areas, with partial internal walls and breakout spaces. The communal teacher office was within the space and had glass walls and doors to allow visibility in and out.

The principal reported that staff were heavily involved in the consultation process of the design of the school, and building placement and layout were designed in consultation with local iwi with reference to local landmarks. Many buildings were multipurpose and learning often cross-curricular, integrating two or more school curriculum subjects, such as Mathematics and Physical Education.

The Organisational Structure: Students and Teachers

In the junior school, Year 7 and 8 areas in the MLE were run as home bases where students could socialise and work with their peers. This was also where the students were taught the curriculum subjects, English, Mathematics and Social Studies, in their year level cohorts. Year cohorts were taught by a team of teachers for these subjects. These teachers planned together but had varying responsibility for different subjects and different students. At times, Year 7 and 8 were purposefully assigned to the MLE together to help the junior cohort of students become familiar with each other (for example, assembly). At the time of data collection, a teacher reported the aspiration to teach the two year levels in composite but explained that they were not yet taught that way because of the necessities of timetabling.

The senior students were organised by curriculum subject. The senior school class size and number of assigned teachers differed depending on the number of students who chose a curriculum subject. Some teachers consulted each other in their subject area regarding lesson content, but there may have only been one teacher present in the class if the class consisted of a smaller number of students—teachers of curriculum subjects that had higher numbers of students designed and taught together in teams of three. Depending on the area of the school (junior or senior), teachers were organised into year group teams or

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depending on the previous size of a classroom in a renovated school or a person's previous experience of education.

teams based on the curriculum subject they taught. Each team had a leader.

The Organisational Structure: Learning Time

Kahurangi College employed a five-day timetable. Each day was divided into three equal learning blocks, separated by interval and lunch and bracketed by the school bell. Year 7 and 8 students began the day with combined Year 7 and 8 form classes, where the whole cohort was broken into smaller groups that contained both Year 7 and 8 students. The student roll was then taken and any pastoral issues were addressed. Following this, learning time began, and students were separated into their year levels. Learning was needs-based in the junior school, which meant students might be placed with a different teacher for each subject, or students might be with the same teacher for all three subjects depending on what teachers judged would most support the students' learning. Curriculum content in this area of the school ran on a two-year cycle, addressing a different topic each term for the eight terms (each school term is ten weeks, and there are four terms a year). It was explained that the intention was that students would not repeat a topic for their two years in the junior school.

In the senior school, students each had five subjects, one subject per school day. This organisation meant that each day the senior students had a single curriculum focus and stayed with the same teacher (or team of teachers) to focus on that one subject for all three blocks of learning. Both students and teachers expressed finding benefits and dedicating a whole day to a subject. It allowed time for a deeper more in-depth visit with a subject and the extended amount of time with a single subject allowed students to practice their self-management and self-directed learning skills to a higher degree. Students were concerned that if they needed to miss a day of school, they would miss a whole day of a subject which made it a lot harder to catch up with the necessary learning. This organisation was explained in comparison to the previous system where there were shorter more prescribed lessons, the learning day was divided into five lessons (learning blocks), with a different curriculum subject and teacher per lesson.

Due to the size of the learning areas, multiple year levels of students and multiple curriculum subjects were scheduled into the MLEs simultaneously. This organisation might mean that a Year 12 group would be learning next to a Year 7 group, or that in the senior school, there may be multilevel learning groups; for example, Level 2 and Level 3 English students may learn together with a team of teachers. The principal, teachers and students all commented on valuing this organisation as it increased interactions between students who may not normally have interacted during learning time because of their year level, subject choice or timetable.

The Journey

Carrying out a document review related to the development of this college, it became apparent that the previous schools' sites were in disrepair in the years leading up to the construction of the new college buildings. Planning that the schools would be closed, the Ministry of Education and the schools' Boards of Trustees had carried out minimal maintenance on the sites. At the same time, no planning had commenced for the new school campus to be built. Plans for the new facilities started to come in over 18 months after the school was amalgamated, during which time students and staff made do with the facilities available to them.

Pre-amalgamation, student academic achievement was low at both the intermediate and secondary schools compared to national results; therefore, while working on achieving equitable school facilities for students, the staff began redesigning the curriculum in an integrated cross-curricular way. These teaching and learning programmes targeted the key competencies of the NZC and skills and competencies identified by iwi, whānau and community leaders of industries as desirable for the future of life and work outside of school. The programmes also took the specific students, teachers' strengths and community context into more significant consideration than pre-amalgamation teaching and learning programmes, which focused more on gaining curriculum subject content knowledge. When the redesigned programmes were put into action, student achievement began to increase.

Initially, the community were resistant to changes but once this success was demonstrated to the community, they became more and more supportive of the integrated curriculum that was quite different from the type of learning that was visible when they had attended school.

The principal credited part of the increase in student achievement to staff employed when the school was designed. These staff members were aware of the curriculum programmes. They could envision facilities appropriate for higher achievement in some curriculum areas and influence the design of those areas while at the same time integrating these newly available facilities into the redesigned curriculum.

Whero College

School Context

Whero College is a state-owned, co-educational secondary school where Year 7 to 13 students are taught. Most students learn in English medium, and a small number of students learn in Māori medium. At the time of data collection, the student population of around 700 had a slightly higher number of male than female students. At this school, 54% of the students were of Pākehā/European ethnicity, 35% of Māori ethnicity, and less than 3% of each Pasifika, Asian and Middle Eastern, Latin American and African (MELAA) ethnicities were also represented in the student population.

Whero College was established in the early 1930s and had strong intergenerational links to the local community. The school's prospectus offered an environment and staff keen to blend the traditional with the modern to meet the needs of the 21st-century learner. The school charter states a leading philosophy of the school emphasises a connected curriculum: community connections, horizontal connections between curriculum subjects and connections to students' aims and interests both within and outside the classroom. The school's vision is to build transferable skills in students through personalised learning to help them achieve in school and beyond.

The Physical Space

At the time of data collection, Whero College contained two identical MLEs

connected by a covered walkway. The MLEs were newly built where older prefabricated buildings had been removed and were physically separated from other areas of the school. These two spaces were identical apart from the colour schemes. The buildings were rectangular; each occupied a space larger than six traditional single-cell classrooms. The internal walls of the MLE were sliding glass. When these walls were extended, each of the four corners could be closed, creating four classrooms and leaving an open space in the middle where students could work together during specific times. Each corner had internal access to the outside. Each MLE contained a breakout room, a bathroom and a kitchenette.

These two spaces were the dedicated homeroom and main learning area for Year 7 and 8 students. These students were taught in composite for all their subjects both within and outside of the MLE. Both students and teachers commented on appreciating the composite organisation in the MLE. It meant that students were supported to learn at the level they were achieving as opposed to their age. The rest of the school did not learn in composite. At the time of data collection, these two MLE were the only spaces considered MLE at this school.

The Organisational Structure: Students and Teachers

Each of the corners of the MLEs acted as a closable teaching space, comparable to a classroom. A teacher was assigned to each of those spaces, which doubled as their office. Students were then assigned to those teachers. Those teachers oversaw the pastoral care and learning in that space for those students. The same teachers were also the first line of contact for students' parents and caregivers. At least one teacher had completed a secondary school initial teacher education (ITE) programme and most of the other teachers had completed a primary school ITE programme. In New Zealand, a person who has completed ITE to become a primary trained teacher can teach up to Year 10, and those who have completed a secondary school ITE can teach from Year 7.

The teachers assigned to the different MLE had different timetable commitments. Teachers in one MLE were assigned to that MLE full-time, where they taught all subjects,

including Physical Education and Te Reo Māori. The teachers in the other MLE had various roles and commitments within the school, such as the year level learning leader whose focus was curriculum, beginner teacher, or the dean whose focus was student pastoral care. These roles meant that some teachers in this MLE required more release time than the teachers in the first MLE. Consequently, some of the students' learning in the second MLE usually carried out in that MLE was facilitated by other teachers from the school, sometimes in other classrooms (for example, Physical Education or Te Reo Māori). All students left the MLEs for technology options and Science, which required other specialist teachers and classrooms.

Organising students into the MLE spaces was a multi-layered process incorporating information from primary schools related to academic and behavioural assessments, Whero College teacher assessments and consideration of both student and teacher personalities, while at the same time trying to divide the students as evenly as possible based on year level and gender. Class size varied each year depending on the number of students in the Year 7 and 8 cohort. The highest number reported was around 30 students dedicated to one teacher/teaching space. Although both of the MLEs were designed to be the same as far as physical space, the number of teachers and students, personalities and commitments meant the spaces were run differently. An example of considering students' and teachers' personalities was if a student was assessed to require stability in the classroom, they would not be placed with a teacher who had other commitments within the school and may be regularly called away.

While the MLEs were new property additions to the school, teachers and students commented that families were beginning to claim affiliation to one space over the other. The example offered was when an older child in a family had been assigned to an MLE, families were beginning to expect that any subsequent children from the same direct or extended family should also be assigned to that MLE when they reached Year 7. This family assumption about the organisation of students in the MLEs was quite different to the way the teachers organised the space where students may or may not have the same teacher for both of the years they were in the MLEs and may or may not stay in the same MLE for the two

years they are in Year 7 and 8.

The Organisational Structure: Learning Time

Whero College employed a ten-day timetable with four lessons a day separated by interval and lunch. Lesson length varied, and interval (morning break) occurred in the middle of lesson two, splitting it in half. When the Year 7 and 8 students were not timetabled into the MLE or one of the four spaces in either of the MLE was unoccupied, teachers of senior students sometimes brought their classes into the MLE and treated the individual spaces as separate classrooms.

At the start of the day, all Year 7 and 8 students of the specific MLE gathered together for an assembly. This time was used to give daily notices and take the first roll. At this time, there may also have been short activities to help create cohesion within the MLE group. At other times, both MLE groups would join as a cohort. Further to this, throughout the year, specific activities were organised for the separate year groups, so students also had an opportunity to become familiar with each other as a year group cohort.

The teachers within each MLE formed a team and planned together for their students in their MLE. The teachers of both MLEs together formed the junior team. At this school the timetable was purposefully organised so that all teachers in the separate MLEs had noncontact time at the same time which was dedicated to collaborative planning. This part of the organisation of the timetable was appreciated by teachers and considered significant by the principal who asserted it was a positive way to support teachers transitioning into MLE and to support them working collaboratively as teams. The junior team would meet at least once a week after school to collaborate and communicate. A single teacher was the learning leader for the combined MLE team. Social Studies learning objectives were generally employed as a starting point to design cross-curricular lesson content, and, ultimately, the learning leader decided on the learning objectives to be addressed.

Within both MLEs, lesson content worked towards the same assessment rubric, but the specific topic of that content was decided upon by the teachers of each MLE. To design

content, the teachers would take into consideration their own and their students' interests. Outside of school hours, teachers used digital tools such as Google Docs to continue planning collaboratively. Teachers gave examples from within their MLE teams of breaking down planning into teachers' strengths and interests (subject) to divide the work rather than each teacher repeating the same planning for each subject. This organisation meant that students were exposed to the same material students in the other classes in the same MLE were exposed. Their dedicated teacher was generally the one teaching this content, and that may not have been the teacher who planned the content.

As the year progressed and teachers and students became more confident and comfortable with learning in the MLE, the students were organised differently. During this time, teachers would align the timetables within the MLE so that all classes worked on the same curriculum subject simultaneously, for example, maths or novel studies, instead of what was written on each student's timetable. This organisation then meant the students could be reorganised; in some cases, broken into ability groups where they would work with the most appropriately skilled teacher, in other cases, regrouped based on their interests.

The Journey

Before the physical environment began changing, Whero College had a long-standing interest in engaging with a connected curriculum in the junior school; the leadership had come to believe that students being able to draw connections between subjects was a more powerful place to support their learning than having siloed, isolated subjects.

While the MLE spaces were being built, staff spent a year developing a learning philosophy and exploring pedagogies. They travelled to other schools around New Zealand that had MLEs to look at other existing examples of MLEs in operation and tried to create the best mix from all they had learned for the students in their community. During the preparation time, the staff also informed students and parents about how learning may look in these new spaces, acknowledging that they felt community and parent support of the school and the students were both critical.

Kōwhai College

School Context

Kōwhai College is an urban, state-owned, co-educational secondary school. It caters for Year 7 to 13 students who are taught in English medium. At the time of data collection, the student population of just over 1300 was made up of 51% female and 49% male students. Around 64% of the students were of Pākehā/European ethnicity, and 24% of Māori ethnicity. The remainder of the student population consisted of 6% Asian ethnicity, 3% Pasifika ethnicity and around 1% each of MELAA and OTHER.

Kōwhai College was an entirely new school built to help address population growth. Students first started attending this college about eight years prior to data collection. The school's charter presented teachers who were dedicated to contemporary pedagogy and future-focused learning, the key competencies of the NZC and authentic learning opportunities as essential elements used at the college to support students. These elements were employed in various ways to offer personalised learning experiences and academic and vocational pathways to aid students in becoming valuable, participating and contributing members of society.

The Physical Space

This school was a new build, developed by the Ministry of Education in an urban area to meet the demands of population growth. In general, the school as a whole could be considered a modern learning environment, as all of the learning environments (classrooms) of this two storey college were designed by architects to technical standards. The contemporary design of the school included a lot of glass in both the internal and external walls and windows, and large open spaces which were not closable. As there was no school community before the physical building of the school was created there was minimal input from the school community, or the principal who began their position a year into the build of the school.

Kōwhai College was divided into three parts: junior, which accommodated Year 7 and

8; middle, which accommodated Year 9 and 10; and senior, which accommodated the remaining year levels. All teacher and student participants at Kōwhai College were members of the Year 9 and 10 teams. The organisation of students, teachers, content and resources of those year levels are the focus of the remainder of this profile and the findings in this thesis. At the time of data collection, four MLEs were dedicated to Year 9 and 10 students.

The MLEs in question were located in close vicinity to each other. Upstairs MLEs could be accessed via the external upstairs walkway or via an internal staircase entered at the same entrance as the downstairs MLE. The spaces each occupied the size of multiple traditional single-cell classrooms. Some of the MLEs were very open spaces with a wet area for Science signified by a change in floor surface, but at least one MLE had a Science area with closable doors. Each MLE contained two breakout spaces sectioned off from the main learning area by glass walls and doors. In each MLE, the teacher team had taken control of one of these spaces to create their communal office. Office space was initially planned to be in the middle of the open learning area.

The Organisational Structure: Students and Teachers

Each MLE was assigned four specialist teachers, one each for English, Mathematics, Social Studies and Science. Four classes of about 30 students each, two classes from Year 9 and two classes from Year 10 (around 120 students total) were also assigned to each MLE. The four specialist teachers assigned to each MLE formed a team. Each of those teams had a leader. Each leader had graduated from a primary school ITE programme. The teachers assigned to each MLE were responsible for teaching their subject of specialisation to both the Year 9 and Year 10 classes assigned to that MLE.

The organisation of the students, teachers and curriculum subjects differed within each MLE, as did pedagogical practices which were reported to be based on the team leader's perspective. Within the teams members worked together for the pastoral care of their specific students. One of the MLE teams decided to do this by meeting every morning before school started to address any concerns, other teams congregated in their communal office

spaces when time allowed, and the last team had an official meeting once a week. In some teams, teachers also met to design lesson content, and in other teams, members were given a template rubric from the leader and needed to design lesson content to fit with the template. In some teams, teachers took the initiative to design cross-curricular lessons without direction from the leader. In some teams, this was met with approval by the leader; in other teams, it was met with the leader's disapproval. All teams used digital tools (such as Google Docs) to meet and plan outside school hours. Together, these teams formed the middle school teaching team and would meet as an entire team once or twice a term. Members of the teams would also meet with their schoolwide curriculum team.

The subject specialist teachers were not always the only teachers in the space. Every morning within the MLEs, students met in groups with a teacher in charge of their pastoral care. This teacher may or may not have been one of the four subject specialist teachers. The only teachers who taught exclusively in the MLE were the team leaders. Other teachers also taught their subject of specialism in the senior school or may have been assigned to a different Year 9–10 MLE for part of their timetable. At other times teachers from the junior or senior parts of the school who were not generally assigned to a Year 9–10 MLE may have been assigned to a Year 9–10 MLE to fill a space in their timetable.

There were times when both year groups were assigned to the MLE simultaneously, and also times when only one year group was assigned to the MLE. When both year groups were present in the MLE, they usually did not work in composite. When one year group was assigned to the MLE (two classes of students), they may have learned as a cohort in some of the MLEs. Students left the MLE for option subjects, at which time, depending upon their chosen options, they may have been mixed with other students from within the same year group but from a different MLE.

The Organisational Structure: Learning Time

Kōwhai College employed a five-day timetable. Each day was divided into three equal blocks. When students were timetabled to their MLE, a specific subject and teacher were

written on their timetable, and they often stayed with a specific set of students (class). For example, a Year 9 student who was timetabled to have English in the MLE may have an English lesson just as if that MLE were imagined as a traditional class, while three other classes of students had three other subjects with their subject specialist teachers within the same open space. In some MLEs, as the year progressed, the segregation of subjects and classes was dissolved, and learning content became more cross-curricular.

At this college, at the beginning of each year, schoolwide themes were introduced. These themes were open to interpretation and assumed to apply to all subject areas. Teachers could use the themes as inspiration for developing content and adhering to the curriculum objectives. Examples of these themes were *Revolution* or *Beneath the Surface*. These themes could be springboards to create cross-curricular learning for curriculum integration, such as studying novels regarding social revolutions in English and the real revolutions in Social Studies or used for students unsure of what they might like to study for a personal project. Students explained they were also encouraged to use the posters on the walls as inspiration for personal projects. When doing so they would be guided by the teacher to the NZC where they would need to navigate to the correct subject and learning level and choose their learning objective.

Another way curriculum learning was organised was that a curriculum leader might have supplied teachers with topics to be addressed at the beginning of the year or the term. The specific order in which these topics were addressed was up to the individual teachers. In some spaces, teachers organised curriculum to take student interests or current events into account and designed learning to flow from these starting points. Alternatively, as mentioned above, regarding reading novels about revolutions in English and learning about real revolutions in Social Studies, teachers came together to create horizontal connections to integrate separate curriculum subjects within their MLE.

The Journey

This school's MLE journey began about 10 years before data collection in a geographical area of New Zealand with high population growth and no existing secondary

school. The school was designed by an architectural firm that has built other schools nationally and internationally and bases its designs on research related to schools worldwide that are seen as leaders in pedagogy. The principal was appointed nine months before the school opened; at this time, the school's architectural design had already been established and construction was well underway.

As construction finished at the school, the principal began appointing teachers who reflected on pedagogy and began to design curriculum together in teams. Teachers were hired with the understanding they would need to employ 21st century teaching and learning pedagogy and all teachers reported they wanted to challenge and evolve their practice in this way. All teachers mentioned that they would not like to go back to teaching in a non-MLE classroom but some reported they were not supported to pursue 21st-century pedagogy to the degree they believed they would be from their introduction interviews.

The first year the school was open, only Year 7–9 students attended. Each year another year level was included in the school. Roll growth was increasing, and there were plans to extend the school campus, but until such time as that happened, prefabricated buildings had been brought onto the site to use as learning environments for the junior school.

Community was important at this college. The MLEs themselves acted as learning communities, and one block of learning a fortnight was dedicated to citizenship, where students learned about supporting each other and becoming good citizens. As Kōwhai College has grown—both the student roll and their learning results—its reputation has also increased in the community.

Kākāriki College

School Context

Kākāriki College was established in the late 1950s. It is a rural, state-owned, co-educational secondary school where Year 9 to 13 students all learn in English medium. At the time of data collection, the student population of around 250 was made up of 55% male and

45% female students. Around 50% of students were of Pākehā/European ethnicity, around 42% of Māori ethnicity, 4% Asian, and 2% each coming from Pasifika ethnicity and international students.

The town community, in general, is largely not transient, and it was common to have brothers, sisters, cousins or other extended family members in the same year group or learning environment. The school prospectus of Kākāriki College offered a flexible, integrated curriculum to aid students in finding their individual pathways to what the students themselves identified as success which varied by student. Holding close to the school motto, which said that through collective effort, great things can be achieved, the students from the college had a history of high achievement on the sports field and good pass rates for the National Certificate of Educational Achievement (NCEA)[15].

The Physical Space

Kākāriki College contained a single MLE situated within the walls of an already existing structure redesigned and renovated to MLE standards. The structure was physically separated from other areas of the school. It was a large, open-plan building that occupied the size of about seven traditional single-cell classrooms. Specifically, the area consisted of three larger spaces and three smaller nooks, all of which could not be closed and two breakout rooms that could be closed. The breakout spaces and nooks were each smaller than the size of a traditional classroom and could hold between 10-20 students. The teachers had a dedicated communal office space that could be accessed externally or internally from within the MLE. The office walls included large windows; this meant teachers could observe students while they were in the office during their non-contact time.

The principal started at the school when the MLE was being designed and had some influence over the design. The principal had come from a school with large glass doors that could open and close for flexible learning but had witnessed these doors often closed and the

[15] NCEA "is the main national qualification for secondary school students in New Zealand. NCEA is recognised by employers, and used for selection by universities and polytechnics, both in New Zealand and overseas" (New Zealand Qualifications Authority, n.d).

space being used as traditional classrooms, so made sure there were no closable classroom-sized spaces in the MLE at Kākāriki College.

The Organisational Structure: Students and Teachers

The MLE was the main learning space for all Year 9 and 10 students. At the time of gathering data, this was 65 Year 9 students and 45 Year 10 students. The Year 9 group and the Year 10 group were each considered a cohort, and for content and lesson planning were not broken down further into classes. Part of the time in the MLE, the students were taught in their separate year groups, during which time lesson content was based on a combination of curriculum subjects (English, Mathematics, Science and Social Studies). Students left the space for options (technology classes, Te Reo Māori and Art), Physical Education and Science when learning required specialist spaces or tools. When students were taught in their separate year group, usually only one year group was timetabled into the MLE.

Throughout the week, there were dedicated times when both year groups were in the space together. When this happened, part of the time, students were taught in composite groups containing both Year 9 and 10 students, and lesson content was based on literacy or numeracy. When learning was organised this way, students were ability grouped for literacy but not for numeracy. At other times, when both year levels were timetabled into the MLE simultaneously, students had the option to work on projects individually, in collaboration with others in their year group, or in collaboration with students in the other year group.

In the MLE at Kākāriki College, teachers were divided into year group teams; these teams ranged between three to six teachers depending on the number of students in the year group. There was a junior school leader who oversaw both teams, and each year group team had a learning leader. Year level teacher teams were divided by the timetable; half taught for one part of the timetable line, half taught for another part of the timetable, and some of those teachers also taught together in a different part of the timetable. The year group's learning leader was assigned continuously to the MLE whenever that year group was in the space. Apart from the learning leaders and the junior school leader, all teachers also taught at least

one timetable line outside of the MLE. Sometimes teachers from other areas of the school were assigned to the MLE to fill a gap within their timetable.

When designing lesson content teachers at this school said it was very important that students came up with topics of interest themselves. When students were unsure of what they were interested in exploring the teachers based content on what they knew about the students. They mentioned that part of the function of the team was to hold each other accountable and keep the students at the centre of learning as opposed to defaulting to focusing on content that a teacher was either familiar with or interested in.

Each teacher in the MLE had a group of students for which they were their academic tutor. These students may have all been from one year group or a mixture from both year groups. Depending on everybody's availability, teachers would meet individually with their students or with all of their students as a group. This teacher was also the first contact for parents and charged with taking a greater interest in these specific students' pastoral and curriculum needs. Teachers taught as a team, taking collective responsibility for students' learning instead of an individual teacher having responsibility for a specific curriculum subject.

While teaching in the MLE, teachers at Kākāriki College had purposeful roles, but these roles were fluid. This meant that depending upon the content, the student needs and the teacher's strengths, these roles changed. The principal explained that some teachers were hired because of their teaching strengths, others because of their curriculum knowledge, and others because of their availability due to the teacher shortage in New Zealand and the school's rural location. The learning leaders for both the Year 9 and 10 teams had graduated from primary ITE programmes, and the rest of the teachers in the teams were either secondary or primary trained.

The Organisational Structure: Learning Time

Kākāriki College employed a five-day timetable; daily lessons were divided into three equal blocks separated by interval and lunch. On Friday, the whole school did a type of

project-based inquiry, and students were immersed in the same chosen subject all day. Students were generally locked out of the MLE before school, after school and during breaks.

The teams within the MLE planned and taught as year group teams and a combined junior school team. Ultimately, each learning leader decided on the general topic of learning, but this was done in conference with team members, considering student interests, parent requests and what learning the teachers in the senior school wanted the students to gain in preparation for the curriculum demands of the higher year levels. Often, Social Studies learning objectives were employed as a starting point to design learning aims. Once this was decided on, all team members would contribute to designing and creating student learning content. Teachers used digital tools (such as Google Docs) to connect outside school hours when planning needed to continue.

In the senior school, students were no longer taught as a whole year group; they were separated by their subject classes. There was one line in the timetable where the Year 11 students were timetabled to the MLE as a year group to continue supporting students transitioning into the senior school.

The Journey

At Kākāriki College, previous to the buildings being renovated to MLE standard, staff had already begun to alter the school's traditional organisational structure, which the principal described as siloed subjects and streamed classes. Altering this school's traditional structure had involved a concentrated effort in creating a whole school focus on students and their learning instead of individual staff having separate pastoral or curriculum goals.

The school engaged with the wider local community and participated in community projects to support learners. When reflecting on the context of this college, it is important to acknowledge community which was one powerful support used to focus on the students. Considering that the local population was largely not transient, staff were conscious that the students, who came from very diverse backgrounds, would grow up together to be the future of the community. By dissolving the traditional streamed classes and teaching students to

interact with others they may not have mixed with within the previous structure, staff were aware of building the foundation for the community's future beyond school.

Summary

Each school context was developed with information gained during interviews and by document review. In general when participants spoke about the pedagogical core and organisational structure(s) of the MLE(s) at their school they made comparisons by describing how things had been organised or shared projections to the future of how they may like to organise the operation of the space in the future. What is reported here is a snapshot, a photo of a blurred situation in action, to offer the reader some understanding of the context that the participants reported their experiences and understandings from and about.

It is important to remind the reader that the MLE(s) in each of the schools were a part of the school. As noted, the year 7 and 8 students in the MLE at Whero College learned in composite, but the rest of the school did not learn in composite. At Kōwhai College there was an emphasis on the year 9 and 10 students undertaking integrated curriculum passion projects. In year 11 students were required to revert to projects which focused on single curriculum subjects. Senior teachers commented on needing to retrain the students to be with one subject as opposed to continuing with work within an integrated curriculum. The interactions between the different organisational structures of the different areas of the school were reported to create tension.

It can be seen that all of the participating schools contained each of these elements of the pedagogical core: educators, learners, content and resources (OECD, 2013), but they were organised, understood and explained differently at each school. This chapter reported on how these elements were understood and organised in the individual participating schools, but comments can also be made on some common understandings across schools.

In all schools, educators were referred to as teachers and only qualified teachers were given this title. Some of the teachers had completed primary ITE, and others had completed

secondary ITE; this will be discussed in the *Teacher Team* section in Chapter Six Findings III. Learners were referred to as students at all schools. Students were organised differently in different MLEs in different schools. Some students were taught in class groups, others were taught as full-year cohorts, while others were taught in composite within class or cohort groups.

In general, it was reported that students were taught some combination of English, Mathematics and Social Studies in the MLEs. Some students were also taught Science in the MLE if it contained specialist areas and tools for learning, others were taught scientific theory in the MLE but moved spaces when specific tools were required for learning. When other specialist areas or tools were required for learning (such as technology subjects), students left their assigned MLEs.

In three of the four schools, the learning day was divided into three blocks of learning, and in the fourth, it was divided into four, and the specific content and approach to learning differed in different MLEs (including within the same school). More detail will be added to the understandings of these elements and their organisation in the following chapters where further findings are reported.

Chapter Five Findings II: Awareness and Comprehension of 21st-Century Skills and Competencies and the 7 Principles of Learning

Introduction

Research sub-questions B and C address participants' understandings of 21st-century skills and competencies and the OECD's 7 Principles of Learning respectively. As acknowledged, the development of MLE in the New Zealand context was to improve property infrastructure and support 21st-century teaching and learning (MoE, 2011). Research suggested there was a gap between the education that was being provided (in New Zealand and the world) and the education that was presumed to be needed to develop 21st-century citizens (Bergsagel et al., 2007; Bergsagel & Sauer, 2007; Bolstad & Gilbert, 2012; Dumont & Benavides, 2010; Fisher, 2005; Nair & Fielding, 2005; OECD, 2013, 2015). The way MLE were initially proposed to the New Zealand educational community seemed to imply that these learning environments would be a bridge to cross this gap across which would flow 21st-century skills and competencies.

The 7 Principles of Learning[16] were first introduced in the final chapter of the OECD publication *The nature of learning: Using research to inspire practice* (Dumont et al., 2010). The 7 Principles of Learning represent the key transversal conclusions from this publication, the aim of which was "to inform educational policy and practice via evidence-based reflection on how learning environments should be designed" (Ischinger, 2010, p. 4) to develop and support knowledge gain in the 21st century. In this document it was contended that "the 7 Principles of Learning should be present in a learning environment for it to be

[16] See Table 2 for the list of these principles.

judged truly effective" (Istance & Dumont, 2010, p. 326).

This chapter is separated into two sections which address research sub-question B and C respectively. The content of this chapter was developed through a domain summary (Braun et al., 2019) of participant responses to these two questions. Participants' responses are reported first by sharing initial reactions to awareness of the concept in question. The section on 21st-century skills and competencies includes the specific skills and competencies principals, teachers and students proposed and their motivations for proposing what they did. The section on the 7 Principles of Learning concludes by addressing each learning principle separately.

Research sub-question B: What do educators and learners in MLEs in the participating schools consider 21st-century skills and competencies to be?

Initial Reaction

During data collection, all 48 participants were asked what they considered 21st-century skills and competencies to be. Initially, the students in the focus group discussions at both Kākāriki College and Kahurangi College responded that they were unfamiliar with this term. At Whero College students commented that this concept referred to technologies and questioned "What is the point in having books when you can use a Chromebook?" Perspectives on technology use as a 21st-century skill or competency will be reported further shortly. When considering what they understood 21st-century skills and competencies to be, one student at Kōwhai College said:

> You have to be outspoken. Because you have got so many different people you are kind of expected to talk to new people, and they push you to. "Ok, today we are having a full MLE activity. You have to go with someone you don't know." You definitely have to voice your opinions more, and with today's society, with technology and social media and stuff, you get all the issues that come with that, and you have to

> be quite resilient.

The second student responded by adding:

> Also, problem-based learning because especially in our MLE, learning has a lot of finding answers to things and going through that process of trial and error and succeeding, which I think is a lot of the market we have today, future jobs and stuff.

This student went on to say that in their opinion, by doing these things, the teachers were thinking "we need to prepare our students". The student commented they thought their teachers were trying to do this by helping students find concepts and topics they were passionate about and could contribute to: "Research projects or issues in today that you can explore, and it gets you into a direction you can enjoy for a future career."

When asked what they thought 21st-century skills and competencies are, teachers offered varying initial responses. Three teachers at Whero College began their responses: "I was going to be geeky and [study], but I ran out of time"; "I hate this question because I don't know"; and the third teacher asked me for an example. A teacher at Kahurangi College said: "I don't know if this is what you want to know, you got me a bit blindsided there." The responses of students and teachers reported here suggest many were unfamiliar with the concept of 21st-century skills and competencies.

At Kōwhai College, one teacher asked for clarification of the question by asking if I was interested in "21st-century skills and competencies for teachers or students?" Another teacher at Kōwhai College asked for clarification by saying, "What do *I consider* or what *are considered* 21st-century skills and competencies?" Each of these rephrasings of my original question demonstrated varying interpretations of the same question.

At Kākāriki College teachers initially responded with ideas such as: "Our biggest thing here ...", or "what we are trying to develop in the kids here". These responses suggested the teachers were collectively engaging with how to help the students in their classes. An observation that reveals teachers were not focusing on 21st-century skills and competencies as defined by the school, developing a generic version of 21st-century skills and competencies thought appropriate for all learners in general or promoting their personal/individual

understandings of this concept.

When asked what they considered 21st-century skills and competencies, all four principals commented on and referred me to the New Zealand Curriculum (NZC) document, specifically, the key competencies: thinking; using language, symbols and text; managing self; relating to others; and participating and contributing (MoE, 2007, p. 7). The key competencies are reported further in the following section.

Participant Perspectives and Motivations for their responses

With regard to participants asking for clarification on my question "what do you consider 21st-century skills and competencies to be?" I encouraged participants to respond in the way they deemed most appropriate because I wanted to give primacy to their understandings.

At Kākāriki College and Kahurangi College where students had initially commented that they were unfamiliar with the concept of 21st-century skills and competencies they later attempted to guess. At Kākāriki College a student asked: "Is it sort of problem-solving things? Like skills to learn things?" At Kahurangi College, one student said "computers", another said "being able to use technology" and another suggested "collaboration with others". As reported at Whero College, students understood this concept in relation to "technologies", and the students in the focus group discussion at Kōwhai College spoke about 21st-century skills and competencies in relation to the future and what they had experienced of learning in their classrooms.

When contemplating what they considered 21st-century skills and competencies to be, at least one teacher at each school questioned how one should know what these are. Considering how quickly society is changing, a teacher at Whero College stated of their students, "they don't know what they are going to do" in their lives after school, and a colleague of this teacher suggested similarly, "I cannot teach them specific skills for a specific job that probably doesn't even exist yet." At Kahurangi College, a teacher asked: "Are there going to be enough jobs? What are those jobs going to look like?" At Kōwhai College, a

teacher contended that they were continually thinking "how can we prepare them? What are the best skills to prepare them with?" They then proposed that "21st-century skills and pedagogy is in itself an ever-developing kind of concept." At Kākāriki College, a teacher advised that in their experience, any specific skills a student "might use in a job, they would learn on a job pretty quick"; therefore they advocated, "more importantly because of the internet and so on, things that they need to know are critical thinking" and the ability to "make a sensible judgement".

As previously stated, the four principals spoke of the key competencies of the NZC in relation to 21st-century skills and competencies. When commenting on how one should know what 21st-century skills and competencies are, the principal at Kahurangi College said they consulted employers outside of school for guidance on how to prepare students for future employment:

> They want apprenticeships and people to come in, they're not even interested in NCEA level 2. "No, not interested, can they get in to work on time? Can they think? If there is a problem, have they got a skill to be able to work out a problem, like a strategy? Will they get on with their workmates? Will they contribute to how this company is going to work?"

This principal went on to say, "And I thought, oh my god, you know nothing about the key competencies and you just describe the whole lot." At Whero College the principal also commented on consulting employers and the local community on how to prepare students for their future. They reiterated that those they consult are not necessarily interested in the "content or body of knowledge" that a student has learned.

Some teacher and principal participants began explaining their perception of 21st-century skills and competencies by making other comparisons, for example, by offering their idea of what a 21st-century learner was previously considered. At Whero College, a teacher commented this was "someone that could collaborate, be creative, was technically savvy, could listen to other people, could come up with their own ideas." Other teachers made comparisons by reporting what they understood the concept of 21st-century skills and

competencies used to mean. Another Whero College teacher did this by saying, "some things haven't changed over time in terms of, self-reliance, problem-solving, interacting with other people." At Kōwhai College, the principal spoke of their personal journey in education and what I had shared of my own experience of the cellular classrooms in the 90s, by saying: "We came through box and corridor, chalk and talk. There must have been something good in there. Here I am leading a school of modern 21st-century learning." The principal went on to compare our experience of education to what they observed of education today, their point being, with regard to 21st-century skills and competencies: "What we got exposed to is still relevant, you have got to take everything that we have got, all of the good stuff and you have got to put it with a whole lot of new stuff."

Some teachers who were also parents considered 21st-century skills and competencies in relation to what they observed of their children's experiences of learning, in comparison to their personal opinion of contemporary learning, for example: "My own children went to quite traditional schools where the teacher stands in the front and transmits the knowledge and I feel like that probably got the results that they needed" to achieve at school at the time, but "didn't necessarily give [their children] the tools they needed in order to be successful" outside of school. The principal at Whero College said in comparison to when their own children were at school "the jobs that are out there now didn't exist". The principal then compared the education they observe now to their own education and said, "If I think back to when I went through school, it was way different, mind you, that was 100 years ago." Another teacher advised they understood the concept to mean "teaching kids all those different things rather than pure content teaching, which is thought of being the mode for the last couple of hundred years". The comparisons and hyperbole in these examples seemed to be employed by participants to illustrate why learning in the contemporary classroom may be different today from what it used to be: to give students the tools they need to be successful in society today.

The question remained, however, considering the quickly changing nature of contemporary society, how should teachers know what 21st-century skills and competencies

to develop in learners? As one teacher commented: "Everything is important, you can't forget anything. There are just not enough hours in the day to teach everything." The principal of Kōwhai College proposed: "You are dealing with a whole lot of unknowns and you need some knowns to be able to turn up the next day." The principal went on to say that, therefore, "you deal with those [knowns] and as you do one of the knowns and you add them together the unknowns become clearer and less fuzzy and then out of that becomes a direction."

Proposed 21st-Century Skills and Competencies

Participants did not make an explicit distinction between what they considered a skill or a competency and there were no agreed-upon lists or definitions of 21st-century skills and competencies at any of the four participating schools. There were, however, some common concepts[17] proposed by participants across the four schools. Table 5 on the following page contains the complete list of 23 concepts principal and teacher participants offered when they proposed 21st-century skills and competencies. To be included in this table, the concept needed to be mentioned by more than one participant. In Table 5, the reader will also find the frequency at which these concepts were suggested and a breakdown of what was proposed at each school. The small size of the data set means no generalisations can be made, but the table is a clear way to display the information gathered and separate it into school sets.

The following pages summarise the responses that provide the data for Table 5. First however it is important to comment on the nature of those responses. I am very aware that my role as a researcher is based on an interpretation of my participants' responses and that my participants' responses are based on their interpretations of what is happening around them based on their concrete perspectives as explored in Chapter Three. To demonstrate this, Table 6 on page 115, contains excerpts from the transcripts of the seven individual

[17] Within this chapter used the term concept to indicate the variable understanding and meaning a participant may have had, or interpretation I may bring to the research as opposed to a specifically defined term.

participants counted in Table 5, who proposed the concept "interact with others".

Table 5
21st-Century Skills or Competencies Proposed by Teacher and Principal Participants at the Participating Schools

	Participating school				
21st-century skill or competency	Kākāriki College	Whero College	Kahurangi College	Kōwhai College	Total
Collaborate	1	1	0	6	8
Interact with others	0	1	3	3	7
Tech savvy	0	2	1	4	7
Communicate	0	2	2	2	6
Problem solve*	1	2	1	2	6
Resilience	2	0	1	3	6
Critical thinking	1	1	0	3	5
Key competencies*	1	1	2	1	5
Manage self	1	0	2	2	5
Adaptability	1	1	0	2	4
Read and write	1	3	0	0	4
Think for themselves	1	2	1	0	4
Citizen	0	1	0	2	3
Creative	0	1	0	2	3
Initiative	1	0	1	1	3
Accept failure	1	1	0	0	2
Confidence	1	1	0	0	2
Digital skills	1	0	1	0	2
Independence	1	0	0	1	2
Integrate	0	0	0	2	2
Participate and contribute	0	1	1	0	2
Perseverance	1	0	0	1	2
Risk	1	0	1	0	2

Note. * indicates skills or competencies suggested at all participating schools.

The excerpts in Table 6 on the following page contain all that those participants said when they were asked what they consider 21st-century skills and competencies to be. The portion of the excerpt pertaining to the concept "interact with others" has been underlined. Depending on a participant's perspective and personal understanding of this concept, this category might also include "teamwork", or the ability to "work in a team", which were

concepts other participants proposed. "Interact with others" may also be comparable to the ability to "collaborate" which was considered a separate skill or competency in Table 5.

Table 6
Transcript Excerpts Illustrating When Participants Propose the 21st Century Skill or Competency "Interact with Others"

Participant	Transcript excerpt
Whero College Teacher	Common-sense and being able to think for yourself. How to find a job, or talk with people, solve problems, things like that. Some things haven't changed over time in terms of self-reliance, problem solving, interacting with other people. It is probably even more and more necessary now that students can look to what they're doing and understand what they have to do to be able to improve their work or improve themselves along with all the usual social skills, talking to people, researching this that and the other. Accepting failure and learning how to fail and learning how to get through failure and improve.
Kahurangi College Teacher	Knowing your way around the internet. Being able to communicate both via technology and in-person. Being able to work as a team, a diverse team towards a common goal; you need to be able to manage yourself and how you relate to others. So that's still the old core competencies there. They will search 'Gallipoli', and that's it. They don't know how to search. It is breaking it down, the language of searching or how to use Google—as the most obvious platform. Networking as a 21st-century competency, and that is networking both via technology as well as in person.
Kahurangi College Teacher	I would suggest now; communication is king. I would say initiative would be something where it is kind of not always needing to be in that space where your hand is being held. Creativity. I think the ones who are going to end up in employment long term will be those who are able to communicate, those who are able to work with others, and those who are able to problem solve. Regardless of whether it is typed or it is written, or it is spoken, we have to be able to communicate our ideas competently and in a way that really clearly outlines what we're wanting to say.
Kahurangi College Principal	For us, one of the key focuses, actually priority, before the curriculum, is the key competencies. Relating to others, participating and contributing, managing self, that is the biggest thing that has to be taught to children that are in a modern learning environment.
Kōwhai College Teacher	It is basically the ability to critically think, the ability to work with different cultures, different people. IT.
Kōwhai College Teacher	Managing self. Using appropriate tools, so using ICT if it is available and the best way to do it. Being able to ask people for help. Being able to tell when someone is giving you help, and accepting it, because they do not know when they are being helped sometimes. Being able to work with others or alone, as appropriate, and to decide between them. I think that is really about it. Having the skills and then having the judgement to choose between them.
Kōwhai College Teacher	Time management, the ability to ask the right questions because we have got the internet, you can find out content at will, but you need to know the questions to ask to find what you need. Obviously being able to get along with a wide range of people, be quite resilient, perseverance and things like that as well.

The content of Table 6 has been included in this section to draw the readers' attention to the fact that because there was no agreed-upon lists or definitions of 21st-century skills or competencies at the participating schools, there was room for interpretation in the

participants' words when wanting to understand one teacher's words in relation to another.

The most commonly suggested concept regarding 21st-century skill or competency was "collaborate". This was suggested by eight teacher and principal participants (and one student from Kahurangi College mentioned earlier). Following this "tech savvy" and "interact with others" were each suggested by seven participants (students at both Whero College and Kahurangi College also suggested skills and competencies related to "technology"). "Tech savvy" included participants suggesting the ability to use "ICT", "knowing their way around the Internet" and "learning to use technology properly".

Two teachers explicitly stated that "digital skills" were a 21st-century skill or competency. "Digital skills" is listed separately from "tech savvy" because the comments related to "digital skills" seemed to be related to the ability to use a device as opposed to technology and the internet. In contrast to the perceived need to develop "tech savvy" students, a teacher at Kōwhai College suggested the increase in the use of technology and digital skills meant that different skills, such as creativity, and the abilities to problem solve and be innovative, were becoming more important. "OK so you can Google stuff, but I think creativity is going to be important because it is going to be how to solve solutions, how do we innovate new ideas, that kind of thing." A further Kōwhai College teacher explicitly stated that "not using IT" was a 21st-century skill or competency. Previous to teaching at Kōwhai College, this teacher mentioned they had taught at quite a "traditional school". This teacher commented of their time teaching at the traditional school, that developing students' "digital skills" was considered quite important in regard to the philosophy of the school. According to their experience at Kōwhai College, a school which this teacher considered to "have a future-focused view on education", they mentioned: "Now more than I see students being able to use devices, I see being more who you are as a person, as a 21st-century skill."

A teacher at Whero College, when talking about what they consider 21st-century skills and competencies to be, had a comparable point in relation to the concept "tech savvy":

> I would say work on the computer, but really, as much as I'm a fan of the students being able to use the computer and learn how to use it better and to their advantage,

I think some of them just need to learn how to write with a pen or pencil.

In another interview at the same school, the teacher commented that in their opinion, communication skills were very important to teach students because "technology is all around us anyway". This teacher seemed to imply students would learn to understand how to use technology to some level almost by osmosis. Another teacher at Whero College expressed a similar view of technology and explained in their estimation "common sense and being able to think for yourself" should be considered important 21st-century skills. This teacher illustrated their point in relation to technology, suggesting that it has become

> so instantaneous and supportive, there seems to be less and less reliance on being able to think for yourself and do stuff for yourself, and more reliance on "uncle Google will tell me" or "I don't need to know that because I can just look it up", or "Mum and Dad will help me out".

A teacher at Kahurangi College considered 21st-century skills and competencies and said of technology use, in and out of school, that on social media platforms such as YouTube or TikTok students were often exposed to a low level of language and limited vocabulary. They went on to say exposure to this type of language did not support teaching students proper communication and comprehension skills: "'This is what I am doing today.' Showing them places in the world, or things, or whatever they're doing. So they're not actually getting that depth of understanding or needing any depth of comprehension skills." Teachers at other schools also made comments that suggested the increased use of, or focus on, technology can lead to a loss of people skills. One teacher at Kōwhai College did this by saying that students "are pretty tech-savvy, which supposedly is a 21st-century skill, but they are unable to communicate in a different way outside that device".

The participants' varying views of the concept of "tech savvy" skills and competencies were interesting to note considering one of the original goals in future-proofing school facilities with the development of MLEs was that they are wired for ICT to enable schools upgraded and easier access to technology (MoE, 2011). After listing skills or competencies they understood as important, a teacher at Whero College commented: "Although I feel like

all of those things are valid we placed so much emphasis on that, I am wondering because I am so old-school that we are missing some of the basics?" To illustrate this idea the teacher explained:

> Kids that can't do simple maths in their head, kids that can't really engage with other people because they are so used to focusing on themselves, "What do I know, what can I be? Because all good ideas are going to come from me." The socialisation skills, in the last 10 years I feel they have really tanked the more that we spend on technology.

In an interview at Kahurangi College, a teacher made a comparable point to "missing some of the basics" by saying interaction with their students can often include the teacher making comments such as, "No, no don't use that language. Don't behave that sort of way. Don't be overly familiar." This teacher speculated their students were not learning these things at home and were, therefore, coming to "rely on us for it, both subconsciously and consciously". The principal of the school shared a similar opinion: "It is their communication skills that are really lacking; it is their knowledge of the appropriate situational language. 'G'day bro, how you going? Aou, what you doin' here?'" The principal went on to say: "You don't speak like that to a guy who is about to offer you a job! They don't know that." Like the teacher, they speculated: "Where do they learn that?" In total, six participants suggested the ability to communicate, including "talk to others", was a concept related to 21st-century skills or competencies.

Considering "missing some of the basics" at the end of an interview at a different school, in an MLE that had internal toilet facilities for students, a teacher commented on needing to explain to students to keep the toilet tidy and clean in a recognition that there are many students who use the space. This teacher went on to say that during shared meals at school or during out-of-classroom activities that included eating, they often noticed and spent time explaining and demonstrating to students how to use knives or forks properly. These examples could also be understood as students "missing some of the basics".

Two skills or competencies were listed by participants at all four schools. The first

was "problem solve", suggested by six teacher and principal participants (and by students from Kākāriki College and Kōwhai College). The second was "key competencies", suggested by five participants. Individually, the five key competencies of the New Zealand curriculum are: thinking; using language, symbols and text; managing self; relating to others; and participating and contributing (MoE, 2007, pp. 12–13). Depending on participants' meaning and personal understanding, these key competencies may be understood to be listed as separate concepts in Table 5 as well: "interact with others", "manage self", "read and write", "think for themselves" and "participate and contribute". As noted earlier each principle directed me towards the key competencies of the NZC when I asked what they consider 21st-century skills and competencies to be. Each principal also suggested the varying organisation of MLEs in general, and pedagogy employed in the spaces could aid students in acquiring the key competencies. One example is from Whero College where the principal valued the increased options to differentiate students' learning in the different spaces of the MLEs at their school. This differentiation would allow students opportunities to practise the key competencies in groups where they were comfortable and where the abilities of others around them could also challenge them.

At Kōwhai College, the principal raised the pedagogical practice of personalising learning and "authentic learning opportunities" focused on students' areas of interest to help develop the key competencies in learners. They argued that schools need to make sure student learning is purposeful for developing and supporting the students' future in comparison to learning as content or knowledge acquisition.

The principal at Kākāriki College equated the abilities of the key competencies to skills to help make sense of the world as lifelong learners:

> I look at a lot of adults, and I think a lot of us feel like rats in a cage and we are stumbling about and we are trying to make sense of the world that we exist within. A big part of what you try and do is enable kids to try and make sense of what is going on within their own context. To provide them some freedom to identify that context because if you enforce your own context on them then they will only ever see the

> world through your eyes and that is not what you want to try and do.

More specifically, the principal indicated that the possibility of grouping with and being instructed by different sets of people for different activities and being exposed to other people's ideas and life experiences has potential to help with developing the key competencies in learners. The principal maintained that students' increased autonomy and freedom to make decisions in the MLE regarding their and others' learning, in comparison to the pedagogy and size of the more traditional classroom, has the potential to aid in developing these competencies as well. The principal's final statement on this topic was "I think that being with *others* is one of the unexplored benefits of running in a broader modern learning environment".

Teachers and principals at all participating schools commented on the specific key competency "manage self" signifying it as an essential competency or skill for students to develop when learning in an MLE. The principal at Kahurangi college contended "Managing self has to be a priority, or you won't survive." They demonstrated the point by saying

> How do you get on with other kids? In a normal traditional classroom, you can be seated in that corner, and the person that you hate is sitting in another corner, and you'll never ever come across each other. In a modern learning environment, you are up, you are walking around, and you are moving past, with people, all the time. You have got to be able to get on with people in that space. You have also got to be respectful of their space.

As will be reported in the final findings chapter teachers at Kākāriki College were employing the increased interaction of the larger-scale physical space of their MLE to aid students in teaching and learning "nice person skills". It was also reported that a teacher at Kōwhai College recognised "there is a whole lot of learning tolerance and supporting other people and looking out for other people" happening in their MLE. All of these examples could also be considered as students "relating to others", another of the key competencies.

Teacher and principal participants also offered dispositions of "resilience", "adaptability", and the ability to show "initiative" as 21st-century skills and competencies.

The skills or competencies to take "risks", show "perseverance", have "confidence", "accept failure", and be "independent", were all suggested by two participants each from different schools. The skills and competencies that were suggested with less frequency appeared to be related to dispositions the teachers saw as positive for their students' character while the more frequently suggested skills and competencies appeared to be related to schooling or to what teachers saw as valuable skills for once students left school.

As well as commenting on the pedagogical practices in the MLEs some teachers commented on the physical space of MLEs and how this could enable or constrain the development of 21st-century skills and competencies in students. A teacher at Kōwhai College explained, in their estimation, the difference between 21st-century and 20th-century learning was that there are so many more distractions. Considering the necessity of learning to manage oneself in these learning environments, another teacher at Kōwhai College, suggested: "I think especially with the new layout of schools, that makes for an independent learner." A teacher at Whero College commented similarly, "With this sort of environment it is easy, and it is hard to get away with just sitting there doing nothing." They expanded their point saying, "it is easy for the fact that there are 120 students in here. It is hard that there are four teachers that could be at any one point in time in one class." A teacher at Kahurangi College mentioned that they considered "in a modern learning environment you can actually" develop the desired skills and competencies more effectively "than in a single cell classroom". The teacher was commenting on the increased visibility and increased number of teachers and students and the increased physical space, a concept reported in the final findings chapter.

Section Summary

There was no agreed upon list of 21st-century skills or competencies at any of the participating schools. Participants had varying awareness of this concept but there was evidence of individual teachers considering this concept in their practice. Instead of reporting any common understanding participants used pronouns in their responses to my

questions. This could be seen clearly when teachers shared their motivations, perspectives and rationales for their perspectives on 21st-century skills and competencies: "What *I* want *my* kids to have ...", "... those kind of people skills *I* see are really important", "The way *I* look at it is *I* want them to be productive in whatever they choose to be", "Rather than *me* regurgitate what *I* believe *I* prefer to look at what *I* value and what *I* want for *my* kids", or "Those type of things *I* think are probably more important than a particular bit of content knowledge". These responses suggested teachers relied on their personal pedagogy and philosophy in deciding what skills or competencies were important to develop in the students they taught.

Research sub-question C: In the MLEs at the participating schools, what are the educators' perspectives of the OECD's 7 Principles of Learning?

Initial Reactions

This question was not designed in order to elevate or disprove the credibility of the 7 Principles of Learning. Rather, it was to investigate teacher participants' awareness and perceptions of this concept that I had understood from literature to be advocated as guidance within the classroom. Specifically, the goal of this question was to explore 1) if the teachers were aware of the 7 Principles of Learning and 2) regardless of if they were previously aware of these principles, how they perceived the 7 Principles of Learning in relation to working within an MLE

As noted, the list of questions and concepts intended to be used for teacher semi-structured interviews were made available to participants prior to data collection (see Appendix B). Teachers had an opportunity to read these before interviews and were aware they would be asked about their perceptions of the OECD's 7 Principles of Learning. When asked about this concept teachers responded with such answers as: "I opened them up last

night to go 'what are those?'"; "Originally, I had no idea what you are talking about"; "No, where did they come from?"; and "No. I had no idea."

One teacher at Kōwhai College was explicitly aware of this concept because their principal had shared the document with heads of departments during a leadership meeting. Six other teachers at both Kōwhai College and Kahurangi College gave responses that suggested they were vaguely familiar with the principles, but they were not "in the front of my mind", or they were aware of them, but did not know about them in-depth. The remaining 16 teachers said they were not aware of the 7 Principles of Learning at all. Thus, some teachers at Kōwhai College and Kahurangi College were aware of the 7 Principles of Learning to some degree and the teacher participants at Whero College and Kākāriki College were unaware of the 7 Principles of Learning at all.

The 16 teacher participants who were unaware of the principles asked how, when and where they should have come to know about this concept. One teacher who had recently completed their initial teacher education commented: "I had to look them up. I thought it might have been something we did at university, but I hadn't." A different teacher who initially responded that they did not know about these principles, then revised their answer and stated that they might have seen them: "They may have come across my desk, but we get so many different things come across our view, there is not enough time in the day to be able to get through it." This comment suggests that as well as not necessarily having enough time to become aware of this concept, if they were aware of it, they may not have enough time to reflect on how to implement these concepts.

After being made aware of the 7 Principles of Learning teachers commented that they found them interesting, could understand why they existed, and in their experiences could "see why things fall apart" in the MLE when they are not in action. Teachers commented that they were "kind of fundamental principles that you would think would get thrashed into us at Teachers College", and suggested that "if you ask most people they would just say these things you just do as a teacher, how can you actually not do this?" Another teacher mentioned they could see “there is the potential for all of these to be in every learning space,

regardless of whether it is open plan or modern or not modern." Additionally, teachers expressed that "without being acutely aware of them, they are fundamental to how we do things". This response suggested teachers were carrying out these principles in the classroom although they had not been specifically called the 7 Principles of Learning as a concept. Many teachers commented to learn about the 7 Principles of Learning in the interview was affirming to their practice when before being conscious of them they were just doing their best without guidance which led to second-guessing themselves.

The specific principles

The following section addresses teacher perception of each of the 7 Principles of Learning. The perceptions are reported in general as opposed to being accredited to specific teachers because perceptions were based on a common experience of teaching in an MLE.

Learning Principle One: Make learning central, encourage engagement, and be where learners come to understand themselves as learners (15/25)[18]. Of the fifteen teachers who spoke to this principle many responded affirmatively to this learning principle with such comments as "definitely", or "yeah, we definitely do that, it is integral to learning". Other responses were less affirmative with comments such as "we try really hard to do this". Teachers then spoke about the different sorts of learning they were providing to encourage students to engage, for example, with the ways learning content was described as organised in the previous chapter. Other examples include withdrawing students for other learning such as coding classes and beginning a gardening group. Another way teachers commented that they were encouraging students and engaging them in learning in their MLE was by acknowledging to students "I actually don't know the answer, can you find out and let me know?" They were engaging students in learning to learn as opposed to giving them answers. In this way, teachers were "trying to get engaged in whatever it is, wherever [the students] are at, and everybody is at a different point".

[18] This number denotes the number of participants who spoke directly to the specific principle.

Other teachers spoke specifically about "encouraging engagement" in the classroom as opposed to encouraging learning. One teacher said, "if you were to go out there now you would be able to see people standing up, leaning over somebody else and they are not currently working. They are engaged though, with whatever it is". This teacher suggested that principle one is just natural: "every teacher, no matter what system you are in, wants to engage to learn". Teachers also spoke about developing a common learning language to help students learn to understand themselves as learners. At two separate schools, two different teachers demonstrated this idea with assessment rubrics designed to illustrate to students where their work appeared in comparison to how it had been graded. This organisation within the space was to allow students to see what they were doing well and what they could do to improve as learners.

When teachers spoke to Learning Principle One, some contended that the learners are the central aspect of any classroom. In high contrast, however, a teacher contended "I think that too often we say as teachers that our students are in the centre and that it is all about them". They went on to say from what they have observed, what happens in the classroom is more about the teacher's level of comfort. Other teachers suggested individual teacher pedagogy could be confusing for students as it means students need to learn how to behave in specific classes or for specific teachers and in every classroom it was different. They suggested if learners were truly being taught to understand themselves as learners surely the organisation and operation of the classroom should be based on students as opposed to the authority or pedagogy of the teacher.

Learning Principle Two: Ensure that learning is social and often collaborative (14/25). All teachers initially responded affirmatively to this principle suggesting many of the MLE were "definitely social and collaborative". This idea was quickly followed, however, by the recognition that being social and collaborative was not easy for all students and that the effectiveness of being social and collaborative in the classroom to aid in learning was directly related to the effectiveness of classroom management. Social engineering and clear expectations of student behaviour were proposed to help students

learn to socialise, one teacher said in their class there was an “understanding with the students that they will mix and they will work with people outside their peer groups and that they do not always have control over whom they work with”.

Other teachers argued that their space was a little “too social”, or that it was hard to purposefully organise collaborative learning because the social aspect got in the way. Half of those who responded to this principle suggested if students who did not usually mix for learning or mix socially were instructed to work together, they seemed to take the time to be social as opposed to using collaborative time for learning. One teacher summed up these responses by saying “I would guess it is probably about 80% social, 20% that real collaborative learning. To me it should probably be flipped, but it does happen”. It appeared many teachers saw this principle in action but that actions needed to be refined to make the principle more effective for learning.

All teachers who appreciated the social nature of their MLE reported part of the reason they encouraged social and collaborative learning was because they understood learning these skills would help students in life outside of school when they enter the workforce and need to work with varying people from varying backgrounds. Three teachers in different MLE suggested that the environment of an MLE enables a greater possibility to be collaborative, one teacher suggesting in general they thought "a lot of these principles of learning are easier in our [MLE] environment” in comparison to where they had taught in traditional classrooms.

Learning Principle Three: Be highly attuned to learners' motivations and the importance of emotions (13/25). Many of those who responded to this learning principle considered it in relation to students’ motivation to learn. More than one teacher indicated that they consider student motivation and emotions in relation to pastoral care, that when students are “going through things”, it can be challenging for them to be at school and “it is hard for them to learn when they are dealing with all the stuff”. Another teacher invoked the concept of lack of time and said “it is so important and we talk about it all the time but is it coming through in our daily practice? It feels like we are too driven by 'you have

to teach this, and you have to assess that' to spend the time on student emotions." A different teacher also aware of student emotions mentioned of their teaching career: “over the last ten years, I have seen more emotionally needy kids than I have ever before”.

Teachers also spoke of motivations and emotions in relation to what students learn, suggesting a broad curriculum can help students find more things they are motivated to be interested in. A math teacher suggested emotions related to curriculum subjects are something to be conscious of, and that in their experience students can be quite anxious about maths. One teacher who was a parent suggested teachers who are parents “are probably aware more of emotions and motivations than someone who hasn’t had children”. A different teacher suggested it was essential to consider a student’s motivation beyond the classroom and their drive (or lack of) to come to school.

One teacher who was very interested in student motivation said it was an aspect of schooling that in their experience was very important but that not all teachers understood how or why to motivate students. A further teacher suggested it was a student’s lack of motivation that would lead the student to failure. Like this teacher, others suggested the vast array of things that could affect a student’s motivation can be “the hardest bit with the harder students, figuring out what makes them go”. They then mentioned that helping the more challenging students figure out what makes them go can give the biggest reward.

One teacher suggested because of the increased number of students in an MLE it may be harder to be in tune with students’ emotions but “in the end, it bubbles to the surface, but it may take a little bit longer in this environment because you do not see the students as often”. In contrast, a teacher from a different MLE argued that emotions and motivations are critical to whatever learning environment a student is being taught in, but that they think “in the MLE, other learners and teachers can help you become more attuned because they are there [together] as opposed to a single-cell where it is just you and your 20 odd kids”. Other teachers who responded to this question also suggested that motivations and emotions may be different in different environments, that the MLE may not be the best place for some students and cautioned to keep in mind an MLE is “not a one size fits all solution”. These

teachers suggested to truly cater to all students there need to be options for where students learn. In this instance, a student may “be much better off in a single-cell class to reduce anxiety and therefore make them better learners.”

Learning Principle Four: Be acutely sensitive to individual differences including prior knowledge (11/25). The idea of considering individual differences was understood differently by different teachers. One teacher's first reaction was to consider physical and behavioural differences, to know how to best support students. Other teachers suggested that regardless of the learning environment without knowing students’ prior knowledge and their individual differences you cannot teach them properly.

Specifically related to MLE where teachers are assigned to teams, one teacher suggested it can be easy to neglect student differences in prior knowledge when individual teacher pedagogy is not aligned to team members. They said

> You have got 60 pairs of eyes looking at you and if you are not working the right way with the two people next to you, all of a sudden you're just going through the motions and you'll lose that connection.

This response suggested a focus on team teaching (and learning to team teach in-situ), could take away time that could otherwise be used to tap into “whatever prior knowledge we can tap into”, which “will help them learn”, as another teacher put it.

Other teachers suggested taking individual differences and prior knowledge into consideration was something their team talked about, but there was not always time to follow through to implement the ideas into student learning. They commented that students need a general basic knowledge that can be built on at secondary school, but because of the individual differences, multiple variables can influence that prior knowledge being gained.

Learning Principle Five: Be demanding for each learner but without excessive overload (13/25). The majority of those who responded to this principle commented achieving this learning principle can be "tricky". The number of students and teachers in the learning environment can make finding a balance and not being overloaded with work difficult. At the same time this principle was regarded as fundamental by all

respondents. To clarify their understanding of the principle one teacher elaborated to say "having high expectations of both the students and teachers as professionals". An example of how a Mathematics teacher explained their attempt to "be demanding for each learner but without excessive overload", was to use accessible low threshold, high ceiling tasks. These tasks were designed to be accessible by all but also extend those who could be extended.

More than one teacher spoke about homework in relation to this principle and reported conversations with their colleagues and heads of departments regarding the fact that students got homework in all subjects not only in the MLE and being aware of that without overloading students. A teacher regarded principle five and referred back to principle three, considering individual differences and prior knowledge; they then suggested different students need to be held to different standards, increasing or decreasing expectations based on those individual differences. Two teachers from different schools admittedly recognised "excessive overloading of students" in their practice and spoke of the recognition that learners learn at different speeds, acknowledging some students just need more time. One of these teachers acknowledged that excessive overload could make a student give up. A different teacher, however, suggested encouraging students to keep going at the time of overload because "learning happens when there is a struggle".

Another teacher, also focusing on the "excessive overload" part of the principle suggested that classroom practice can overload the students. In their opinion, in the MLE "they've got two systems running, open-learning where the students learn naturally, and then the curriculum and they don't always merge nicely". A further teacher focusing on overload suggested that a student could be "overloaded by noise as well or lighting" or having clutter on the walls. This teacher went on to suggest that some of the things that can overload a student "are out of the teachers' control".

With regard to this principle and MLE, some suggested the physical space of MLE and organisational structure of team teaching can help with overload as a teacher can sit with the student who needs more help because within that space everyone can see everybody else, so the teacher can still keep their eyes on the rest of the students.

Learning Principle Six: Use assessments consistent with these aims, with strong emphasis on formative feedback (12/25). Over half of those who responded to this principle mentioned that in their MLE formative feedback was something they were "working on" and "should be doing more of". This included learning to give students specific feedback and "getting the staff on the same page" as to how and what sort of feedback to give, as well as not carrying out assessments only for assessment's sake. At one school, a teacher explained that "assessment falls out of what we do, we don't do an assessment prior to getting student voice". This teacher went on to say their team will "find a way to assess" within the content their students are interested in learning.

Half of the respondents implied assessment and formative feedback were aspects of the operation of the learning environment where a teacher built this skill by experience. Some teachers who were new to MLE, or new to teaching commented that they relied heavily on the more experienced team members for guidance in this area but that time did not always lend itself to the more experienced teachers being able to help. Teachers also commented that they were modifying pedagogy in regard to assessment and formative feedback acknowledging that students were more receptive to short conversations rather than a paragraph of writing in an exercise book which had been a common way to offer feedback in the past. A different teacher said of formative feedback that it "is important to make sure students know how to improve and what to improve and are given opportunities to improve". They went on to say, however, "those opportunities can be quite based on the timetable and what else is required within the classroom sometimes students don't get another opportunity".

Learning Principle Seven: Promote horizontal connectedness across learning activities and subjects, in and out-of-school (11/25). When considering this principle, some teachers' responses were often affirmative, but hesitant, for example, "I think to a certain degree", "Oh yeah, we are starting, but yeah", and "well, yeah". Others were more sure of their answers: "definitely, we are certainly trying that". This teacher, a

Social Studies teacher, said they were not even sure how they could teach their subject "without integrating maths and science" into it. An English teacher said of their subject:

> I actually think that English is quite pointless as a standalone subject. It is not supposed to be a standalone subject; there is no point in teaching reading and writing and speaking and all the things if the only time you use it is in an English class, that is a complete waste of time.

Four other teachers who responded to this principle also considered horizontal connectedness to be about the integration of curriculum subjects[19]. They were enthusiastic about making horizontal connections, excited to work with their colleagues from different subjects and share resources to teach students with an integrated curriculum. This idea was mentioned in comparison to a single-cell classroom. Teachers who saw value in horizontal connections questioned why there were still timetabled subjects at the schools.

Some teachers mentioned they understood horizontal connections to be part of a future-focused pedagogy, they could see value in it and also see it happening in other parts of the school, but not in their particular MLE. Other teachers made a point the students had to learn how to see horizontal connections because they had no previous experience with curriculum integration. Therefore teachers were not only trying to integrate the curriculum for students but also teaching students how to understand an integrated curriculum and make connections with lessons, between lessons and within each day.

Considering "out-of-school" connectedness, one teacher said they were confident horizontal connections were happening in the MLE but not out-of-school due to the expense of such activities. In relation to the transition into MLE, teachers commented about the lack of allowed time to plan together considering at their school horizontal connections across subjects were a desired part of the pedagogy by school leaders.

[19] Two teachers in the section on 21st-century skills and competencies considered the ability to integrate subjects in learning as a 21st-century skill or competency.

Section Summary

Sixteen out of twenty-three teacher participants were not aware of the 7 Principles of Learning. Six teacher participants were aware of but not familiar with the 7 Principles of Learning, and one teacher had been specifically made aware of them by the principal at the school who had shared the information only with heads of departments. Some participants mentioned that although they were unaware of these learning principles before their interview, they were already enacting some of the ideas in their practice, and it was affirming to know these ideas existed and that they were using them in their space.

There were some common factors across responses that seemed to influence teachers' perceptions of the 7 Principles of Learning. First was the varying student knowledge of subject content and varying understandings of other concepts such as what it means to learn which was raised in relation to learning principles One and Two. When responding to principles Three to Seven (inclusive) teachers commented on the *lack of time* available to spend developing the principles, reflect alone and with other teacher team members, or differentiate learning for students and learn about formative feedback from a more experienced colleague. When considering the 7 Principles of Learning as a concept overall and specifically principle four and six teachers commented on how these were basic ideas that were taught or should have been taught during ITE.

Chapter Summary

During data analysis the similarities in the responses to both sub-question B and sub-question C became apparent. When initially responding participants questioned where they should have learned about the 7 Principles of Learning, and how they should know what 21st-century skills and competencies to develop in learners. They spoke of not having enough time to be able to focus on teaching and learning while also reflecting on their practice, individually or as a team and how much work they felt they already had and therefore how little time they felt they had for anything outside what was necessary for the daily operation of the teaching and learning they were responsible for.

Teacher participants offered varying motivations for their understandings and perspectives. Some participants spoke in comparison of what they had experienced in their own education or had previously observed in education and what they were currently witnessing as adults, teachers and parents. Others illustrated the skills or competencies or their perceptions of the 7Principles of Learning by using their subject specialism to explain the motivation. There were no agreed upon lists of 21st-century skills or competencies at any of the participating schools and teacher participant perception of the 7 Principles of learning varied between participants even when they taught at the same school or in the same MLE.

Chapter Six Findings III: Increased Interactions, Teacher Teams and Enablers and Constraints

Introduction

Part of the reason for designing this research with a multisite approach was an understanding that a multisite approach would allow the findings to be explored concerning context and also general reporting of findings applicable across all participating sites (Audet & d'Amboise, 2001; Herriott & Firestone, 1983; Jenkins et al., 2018; Lewin & Stuart, 2002, 2003). Findings Chapter I offered context-specific information for the participating schools while also beginning to respond to research sub-question A. Findings Chapter II continued responding to the research questions by addressing sub-questions B and C. This final findings chapter references the aim of this research which was to explore the operation of the MLE in the participating schools from the perspective of those who operated within the MLE daily and reports general findings present in all participating schools.

In addition to responses to the research questions, three themes were developed during thematic analysis; *Increased Interactions*, *Teacher Teams*, and *Enablers and Constraints* to teaching and learning. All 48 participants spoke about increased interactions amongst students, teachers, and students and teachers. All teacher participants also spoke about their experiences of being part of a teacher team. Participants also spoke of affordances that either helped to enable or constrain teaching and learning depending on the perspective of the individual participant. These affordances (or lack thereof) including increased interaction and teacher teams were related to the physical space and/or the organisational structure of the pedagogical core within the space and are reported in this chapter.

Increased interaction

At each school, teachers were asked about the resources available in their MLEs. All teachers listed the other staff they occupied the space with as potential resources. One-quarter of teacher participants explicitly suggested the physical space of the learning environment as a resource for teaching and learning. Principals and teachers discussed the spatial turn towards modernising learning environments and the assumption that altering the space would modify pedagogy. At least two-thirds of all teacher participants indicated that, in their opinion, any change in pedagogy was possible because of the people, not the space. Many of those teachers asserted that they had already begun modifying pedagogy in their earlier pre-MLE classrooms by personal volition. They explained this was attempted by doing such things as removing themselves from the position of knowledge expert, focusing more on student collaboration and putting greater emphasis on personalised learning.

Considering the frequency of these unprompted statements, the comparisons to previous learning environments, and the fact that very few teachers listed the physical space of the MLE as a resource, I began to ask: *What, if anything, does the modern learning environment allow for that was not allowed for in the traditional single-cell classroom?*

The principals from Kākāriki College and Kahurangi College suggested their MLE(s) allowed for increased student interaction due to the larger-scale physical space of MLEs in comparison to the pre-MLE spaces at their schools. They mentioned that the smaller spaces of the previous streamed single-cell classrooms only allowed students assigned to the same class to mix during learning time. However, at Kākāriki College at the time of data collection, Year 9 and 10 students learned part of the time with their year group cohort and part of the time in composite with both year groups. The larger-scale physical space, increased number of students, and incidental interaction in the MLE were purposefully employed to build a sense of community amongst the students taught in the space. A Kākāriki College teacher reflected:

> How do you deal with people who annoy you? How do you deal with people when they are frustrating you? How do you celebrate with people? I mean in a place like

> this you also need those nice person skills, that actually you are thoughtful of other people, you are respectful, that sort of stuff we are trying to instil in them more.

When asked if they thought the physical space of their MLE helped with teaching and learning these "nice person skills", the teacher responded by saying, "It gives us the opportunity to set them up to practice those skills. I guess yeah, in a way that helps. If you didn't have the space you couldn't essentially do some of the things that we do do." Teachers reported that this purposeful pedagogy was supported by building the connection between older and younger students and students and teachers with the mentor/mentee tuakana-teina relationship. The tuakana-teina relationship is part of traditional Māori society where the older or more expert tuakana helps guide, the younger or less expert teina (Te Kiti Ipurangi, n.d-c). In the MLE at Kākāriki College, the expert position was not guaranteed by age, which meant that the role of educator (expert) was fluid; if a student was knowledgeable on a topic and wanted to share that knowledge, they would hold the position of expert.

At Kahurangi College, each MLE was the size of nine traditional classes and contained the equivalent number of students; multiple-year levels of learners, curriculum subjects, and teachers were simultaneously timetabled into the same MLE space. This organisation meant increased interactions between students who did not typically learn in the same space and increased visibility of the actions of others. Correspondingly, this meant that more students were present to observe negative or inappropriate behaviour, such as bullying, which

> the kids don't tolerate. There are way more kids to see it. You can't just have some person in a class of 20, all of a sudden they are picking on that one kid in the corner because actually there are 65 other kids looking at you while you are doing it.

Previous to the MLEs being developed at the school, the school charter addressed developing a school culture that valued honesty, integrity and caring for each other. The principal acknowledged that if the foundation of that school culture was not already in place, the increase in interaction might not have had the same effect. The increased interaction amongst students seemed to amplify this valued part of the school culture. The principal and

some teachers at the school mentioned that having the different year levels in the same physical learning area helped embed the tuakana-teina relationship within the school culture, which helped construct a more inclusive learning environment.

A Kahurangi College teacher spoke about increased visibility due to the open space of the MLE and the increased possibility to observe others' teaching and learning compared to their experiences in single-cell classrooms.

> In the individual classes, the onus is really on those teachers to fill in those gaps created by being in a class and not being able to see anything else. But if everything is open and very visible, it becomes a lot easier to fill in those gaps.

The teacher went on to explain that "you don't need to fill in those gaps, because [the students] can see it". The example the teacher offered to illustrate this point was when junior students would see senior students working on NCEA assignments. The students would ask questions, curious about what other students were doing. The teacher recognised that students who asked the questions were *seeing* what their future learning would look like and beginning to understand what would be required of them in higher year levels.

Students in the focus group discussion at Kahurangi College also acknowledged this increased visibility. Of the five students in the focus group, two junior and one senior student were new to the school, and the other two senior students had been learning at the school since they were in Year 7 (at least four years). Both senior students who had been at the school since they were in Year 7 commented about *seeing* senior students learning when they were junior students and then transitioning to being senior students themselves: "It was good, we knew what to expect", and "I had seen what they were doing, it wasn't scary anymore". Like their principal and teacher, these students referred to the increased visibility of other students' behaviour and learning. This incidental interaction because of the increased physical space and increased interactions let students know what to expect for their future learning, decreasing their anxiety about said learning.

At Kōwhai College, students commented on observing others and increased interactions regarding new students who joined the MLE partway through a term. The focus

group students said sometimes new students would behave inappropriately in class, such as using cell phones or interrupting discussions, behaviour deemed inappropriate either because it went against the classroom treaty or a specific teacher's rules. The students went on to explain they observed new students were taught appropriate behaviour by their peers, in a way they termed "reverse peer pressure"; because students were pressured to act appropriately as opposed to what the students understood of the term peer pressure, which was generally to act in some inappropriate way. The students commented that the inappropriate behaviour of new students seemed to be corrected relatively quickly compared to their experiences in single-cell classrooms. The focus group students credited the fact that the inappropriate behaviour was exposed to more students as the reason for the speed at which new students learned the rules in their MLE.

The students at Kōwhai College also commented on the increased number of teachers in their MLEs. They presented a situation when the focus group students were learning in the MLE with 120 other students and four teachers. Students commented that they might not particularly like the teacher to whom they were assigned by their timetable; however, if a teacher the students did like and respect was also teaching in the MLE at the same time, the students stated they were less likely to misbehave. The Kōwhai College students explained this was because they did not want to lose the positive regard of the teacher that they did like, who they knew because of the greater visibility of the space could see them and might observe their inappropriate behaviour. The students explained that when their education had been carried out previously in smaller traditional classrooms, it would not have mattered if that teacher they liked was teaching next door; they were not concerned that the teacher could *see* them. A teacher at Kōwhai College commented on observing how students react to other teachers. They said that sometimes they noticed this behaviour in students when there were multiple teachers in the space, that the students were "chatting and then another teacher will say 'be quiet' and it is good because they haven't been quiet for me".

Three of the eight teacher participants at Whero College commented on noticing how the increased interaction amongst students in the larger-scale physical space of the MLE

could aid students in the transition between primary school and secondary school. The increased visibility of the Whero College MLEs and occasional different organisation of students into different groups were observed to aid students to connect with other students and friends they already had but may not usually be timetabled to a class with. These friendships helped students feel less scared and frightened about being at a different school and helped teachers develop relationships with students, making learning easier.

As well as reporting increased interaction for students, participants also reported increased interaction for teachers within and outside of teacher teams. The principal of Kākāriki College commented that just as students had been isolated in streamed classes, teachers had also been isolated by the previous structure at their school, which left no real purpose for teachers to collaborate. "Why would they?" although that structure had created "an easy accountability line: this teacher has got this group of students at this time, and they are responsible for doing a good job with them" for a specific subject. Therefore, the principal had organised teacher teams so that they planned and taught collaboratively within the same space taking collective responsibility for the students in front of them. This was a way to help grow the teacher community and the student community. More than one teacher at the school commented about the potential of team teaching in an MLE to support teachers in a way that would effectively ease each other's teaching load.

Purposefully supporting teachers to collaborate was also an aspect of the organisational structure of the MLEs at Whero College. There, a buddy system had been developed where teachers would pair off to offer each other the opportunity to reflect and gain professional development during their teaching day.

At Kahurangi College, teachers commented on increased interactions with colleagues mentioning they had easy, more timely access to teachers in the same space when they needed support within the classroom. They also commented on observing their colleagues because of the increased visibility of their MLE. They said they noticed how a different teacher's pedagogy might impact learning, then commented: "You see it happening, I wouldn't mind trying a bit of that." The teacher explained that they would approach that

teacher for pointers, or in the instance of observing non-engaging teacher practice, may offer to reflect with that teacher on how the lesson went.

As mentioned, teachers listed the other staff they occupy the space with as resources at all schools. Three teachers from Kōwhai College commented on teacher collaboration afforded by the increased physical space. The first teacher who could be understood to comment on teacher collaboration said, "You can ask the other teachers who are different subject specialists." The second teacher suggested the increased physical space afforded a greater possibility of "collaboration between teachers, shared projects, project-based learning, inquiry-based learning. All those good things." This teacher quickly followed their comment up by saying, "Whether we do it or not is another question." This teacher's comment suggested that although a teacher may consider a greater possibility of collaboration to be afforded by the physical space of an MLE in comparison to a pre-MLE learning environment, the perceived affordance alone does not necessarily lead to collaboration happening.

The third teacher from Kōwhai College said the space allowed for "the ability to collaborate, not only for someone like me with another teacher but that class out there, my class". The same teacher went on to comment about their and also their students' practice: "There is a whole lot of learning tolerance and supporting other people and looking out for other people" that happens in their MLE. This comment was similar to the teacher at Kākāriki College mentioned at the beginning of this section, who spoke about employing the increased interactions and larger-scale physical space of the MLE to aid students in gaining "nice person skills".

Teacher Teams

The 25 teacher participants at the four participating schools represented 11 different MLE teams. Members of these teams held varying levels of collective and individual responsibility for the learning and pastoral care of the students assigned to that MLE. In each school, teachers were also assigned to schoolwide curriculum and or leadership teams

depending on their specific role in the school. Teacher assignment to and participation in the teams outside of the MLE were not focused on in interviews but were on the periphery and were mentioned by all teacher participants concerning the teachers' experiences of operating within their MLE. Depending on the size of the school and the organising factors, the size of the teams varied, but all teams were reported to require time and commitment from teachers beyond what was required of them as a member of their MLE team.

At all schools, unprompted, each teacher participant reported their varying experiences of being part of the teacher-team in their MLE. The two following comments encapsulate the diversity of their responses. A teacher from Whero College commented:

> A huge thing for us as professionals is that we are able to rely on each other like that. That is not always the case, though. I have been in teaching collaborative teams where you do not feel like that. I feel very lucky this year about who I am teaching with.

A teacher at Kōwhai College commented: "A team has to be a team working together to achieve a collective goal, but this is not a team. This is a group of people, a group of teachers." It was common for teachers to speak of their experience as part of their current team in comparison to their experience in another team or at another school or workplace. When they spoke of previous teams, they also spoke of levels of support they felt compared to the current team they were assigned.

Nine of the 11 MLE teams were based in MLE that catered for students in Year 7–8 or 9–10. Twenty-three out of the 25 teacher participants (total) taught in these nine teams. Eight of these 23 teachers had completed a primary ITE[20], 14 teachers were secondary trained, and it is not known which ITE program the remaining three teachers completed. The perceived differences between the content of primary school ITE and secondary school ITE were a topic on which many participants commented. More than one teacher explained the

[20] As mentioned in the Chapter Four Findings I, in New Zealand, a person who has completed an ITE programme to become a primary school teacher can teach up to Year 10, and those who have completed a secondary school ITE programme can teach from Year 7.

emphasis was on pastoral care and general curriculum in primary ITE compared with the emphasis on curriculum or subject focus during secondary ITE.

The leaders of nine of the 11 MLE teams represented in the participant schools had completed their teacher training through a primary ITE programme. Who held the leadership position in a team was significant because teacher participants reported that the team leader's perceptions, understandings, and teaching practices influenced the team's operation. As one Kōwhai College teacher put it, "Each leader seems to have their flavour, and then the team runs under that flavour."

The interactions between teachers with different types of training seemed to lead to a debate over where to put emphasis in the classroom, on pastoral care (primary) or subject-specific knowledge (secondary). Preference seemed to be related to the teachers' experience and personal opinions as opposed to the school culture or charter. To illustrate this, one team at Kōwhai College had begun having a team leader-imposed mandatory meeting every morning before lessons began to discuss students' pastoral issues. Each of the teacher team members offered the same example from their varying perspectives. The leader had completed a primary ITE programme. The rest of the teacher participants recognised that it was important to take care of pastoral issues and address students' emotions because their emotions could impact on their learning. However, some team teachers reported dedicating so much time to pastoral care and "wrapping the students in cotton wool" was not their preferred method; instead, some remarked on teaching the students to learn to care for themselves. When commenting on this example, teachers explained that their pedagogies did not always align, and the leader made a final decision on how the MLE would be run which created tension amongst team members as one member said: "And there goes the team, suddenly it becomes I will do what you say because you say it not because I believe in it". This example demonstrates how the ITE program a team leader undertook was seen by their teammates to "flavour" the leader. Interactions between teachers, and team leaders, with different types of training, were one example of where teachers would feel supported or unsupported within the team. The sense of support seemed to be related to how well

individual pedagogies aligned within teams.

A teacher at Kākāriki College stated, "I don't know how secondary teachers feel about primary teachers. It is hard to know. Having stepped into this space as a primary teacher, they probably are not going to tell me what they think entirely." This quote seemed to imply that the content of the type of training a teacher receives offers a particular sort of knowledge. However, the training itself becomes a facet of a teacher's identity related to how they perceive themselves. Additionally, how one teacher perceives the content of another's training becomes a facet of how that teacher perceives their colleague. What teachers and principals understood about the difference between primary and secondary ITE seemed significant to them. This was illustrated by teachers being expressly hired for leadership positions because of their specific training background such was explained by a teacher participant at Kākāriki College:

> Currently, we have got leading our teams two primary [trained teachers], which is different. At the moment it is what we need I think. They have got an overall understanding of how these kids have learned at primary school as well which is very helpful, but also an understanding of all curriculum areas where people like myself who have been trained in one area, we come in flexible, but strength is in one area.

In this example, the school had purposefully employed teachers whose ITE was as primary school teachers, as team leaders for the Year 9 and 10 cohorts because they were seen to have an overview of the whole curriculum which is what the leadership judged that cohort to need.

As reported in Chapter Four Findings I, teams in MLEs were created differently at different schools; for example, at Kowhai College, teams consisted of a specialist English, Maths, Science and Social Studies teacher. Some teachers explained that they requested to be assigned to an MLE. They wanted to challenge their teaching practice, see what it was like to work in such a space or use their specialist curriculum knowledge as a tool to help make learning more accessible to students in MLE where the curriculum was integrated. Others were assigned to a specific MLE because they had had a personality clash in a different MLE. Others still had requested to be assigned to a specific MLE because they had a good working

relationship with another teacher from a different curriculum area and felt they could deliver strong horizontal connections between the subjects if given the opportunity.

At all schools, a teacher leader or principal commented that teams could also be created based on the "available teachers". The idea of available teachers was related to the teacher shortage and the rural location of some of the schools. A teacher's availability to be part of a team was also affected by teacher commitments in other areas of the school and what the timetable allowed for considering those other commitments. At each school, teachers commented on teachers from other areas of the school being assigned to their MLE. The teacher may have requested this, it may have been to fill a hole in their timetable, or they may have been a relief teacher covering for a teacher who was not present. Teachers who regularly taught in the MLE commented that the interactions related to this organisation caused more work for those teachers who regularly worked in the MLE. They reported needing to spend more time interacting with these teachers, "catching other teachers up" with planning, supporting them and making sure they were aware of the current place in the learning sequence. This organisation of teachers within MLE also created more work for those teachers assigned to the MLE for a short period of time because it was expected they would support the other teachers in the space and spend time "catching up".

Some teacher and student participants saw the irregular inclusion of other teachers from the same school as valuable. The value was in students becoming familiar with and beginning to create relationships with the teachers who would teach them when they were in other curriculum areas or year levels. Additionally, having different teachers come into the learning environment was reported to offer different perspectives and skills to both teachers and students.

Across all MLEs in all schools, participant teachers noted that when teachers were purely filling a hole in their timetable, they often did not take time to "catch up" or learn the organisational structure and the specific rules within the specific MLE. This organisation created more work for teacher team members and tense situations. Interactions with additional teachers assigned to an MLE team through the organisational structure of the

school—as opposed to the teacher's volition—had a significant impact on educational experiences in the MLE.

Amongst the variety of answers given by teacher and principal participants on how teams were assigned, there was also recognition amongst some leadership that it was essential to consider teacher personalities when assigning teams. However, from talking to participants, it seemed not always possible to consider teacher personalities when assigning teams for the reasons listed above.

Enablers and Constraints

There were a series of aspects related to the physical space of MLE that participants spoke of either enabling or constraining teaching and learning within their specific environment; noise, increased visibility, the quality of materials and function of the design of the space. Findings related to noise were apparent in two-thirds of all interviews with teachers and commented on in all focus group discussions. Noise, as reported by participants refers to an increase in the volume of classroom noises: peoples' voices, noise from devices and the movement of people and furniture within the space. Participants indicated that the increased number of people in the larger-scale physical space of the MLE was responsible for any increase in noise which had the potential to enable and constrain teaching and learning in the spaces.

At Kākāriki College, some students considered the noise in an MLE a "working noise" and addressed it with respect to learning to manage themselves. At Whero College, students gave the impression of being upset at their peers for making noise or other teachers for not controlling the volume, which the students judged to be too high and deemed a barrier to their learning. Some teachers also judged noise to be an enabler of learning. One Kahurangi College teacher used noise as a way for students to practice communication:

> You use your old 'thumb-O-mometer' and "Hey guys, the Year 9 next door are a bit unappreciative of our noise". Or if the Year 9 are being so noisy, the kids will say in our debrief after: "They were just too noisy". Okay, we'll go over and talk to them

about it. It's unrealistic to expect that kids will work in silence in the MLE because it is actually not designed for that.

In contrast, just as with some students, some teachers considered noise to constrain teaching and learning and be an aspect of MLEs that could negatively affect a person's experience. At Kōwhai College, a teacher commented: "I don't know if I can deal with all of the noise and all of the chaos. This experience in education is not pleasurable to me. I am empty from the noise."

The more common perception was of noise as a teaching and learning opportunity for both teachers and students: for teachers to improve their classroom management skills and for students to improve their self-management skills. The central tension related to noise appeared to be a misalignment in perceptions of noise: if one person or group judged noise to be too high, but others in the space did not.

The most commented on affordance of MLEs to enable and constrain learning was the increased visibility afforded by the spatial change in the learning environment. This concept was touched on in the first section of this chapter. The first way to further report the increased visibility as both an enabler and a constraint concerns "visual transparency" (MoE, 2010) and teacher office spaces. The MLEs at Kahurangi College and Kākāriki College had dedicated communal office spaces for teachers. These offices had glass panels in the walls or doors or internal windows, meaning teachers on non-contact time working in the office could be seen by other staff and students, or teachers during their non-contact time could observe students.

At Kōwhai College, teachers had initially been allocated office space in the middle of the MLEs. This organisation had led to tension within the space as one teacher commented: "What they [architects and school designers] hadn't actually considered is where do we do our marking? Where do we do our planning? Where do we do this? Where is this happening? They are seeing it as we are out there all the time." In search of a solution to this perceived constraint, teachers in each MLE at this school had repurposed one of the two breakout rooms within each MLE as a communal office space. That way, the teachers were able to

close the door for sensitive discussions, make phone calls, and assess student work instead of doing these traditionally private activities surrounded by students. At Whero College, teachers each had a dedicated class space but no dedicated teacher desk or office. At this school, teachers worked in their dedicated space or came together in the common area for planning, all of which was possible only when students were not timetabled into the MLE.

Another tension for some teachers because of the visual transparency of teacher workspaces was that students could easily find teachers during teachers' non-contact time; this meant that sometimes teachers would not get any non-contact time during the school day. A teacher from Kōwhai College argued, "Sometimes you finish here after full classes and you are wrecked. I go home every day wrecked, physically, psychologically wrecked. It is because it is constant. There are students always coming and going." This teacher expressed having conversations about the same point with their colleagues. Five teacher participants from Kōwhai College and Whero College mentioned the constant interaction as an aspect of the space they perceived constrained teaching and learning in their MLE because it did not allow teachers a chance to re-energise or prepare before the next lesson.

Other teachers mentioned this same notion of constant interaction concerning MLEs as a "home base" for students – an area where students would feel ownership and an area students may be able to access before school and during interval and lunch. Although teachers recognise the benefits of giving students a home base and making it available to them during student non-contact time, they also expressed it took away from their private organisational time and added to the constant interaction in their MLE. One school had two-storey MLEs, large, open spaces that could not be individually closed. The teams of both MLEs had to decide together if they would allow students into the learning environment during student non-contact time.

Teachers also explained that because of the increased visibility, when students could see a teacher they needed to talk to, they would do so. They perceived this to constrain learning by interrupting the learning that teacher was timetabled to at that moment. Equally, some teachers perceived this interruption from students as positive and therefore an enabler

to teaching and learning. After we were interrupted by a student in an interview, one Kōwhai College teacher offered their perspective on why the interruption was positive, suggesting that if the student needed them enough to interrupt when they were clearly busy, then

> they really need me, because if they do not have that question answered they actually cannot go any further and they are going to listen to every word you say because suddenly what you say is so crucial to them because it is the teaching they need. It changes the whole thing from "I am going to teach you" to "Can you please teach me?"

Other teachers reconciled the increased visibility and what they seemed to consider to be the lack of privacy from students by taking their work in their non-contact time to the staff room, where students were usually not allowed. However, as one teacher from an MLE that remained open to students during interval and lunch commented, "I cannot leave at lunchtime because there are always kids there. I know it is terrible, but you cannot get away, and it is not healthy, and it is not sustainable for me." In this quote, the teacher was mindful that attaining private space during their non-contact time would be positive for their health and sustaining their teaching practice; however, the organisational structure meant this was impossible because teachers needed to stay to supervise students.

At every participating school, at least one teacher shared that the increased audibility and visibility of MLEs (in comparison to experienced and non-MLE spaces) was the reason at least one colleague gave for leaving their job in that MLE.

Further to this, most participants suggested that the environment may have looked pleasant, colourful and open, but in their opinions, it was not as functional as it could be. This perception of function was seen to either enable or constrain teaching and learning in the MLE. At times, dissatisfactions with the affordances of the physical space were related to the perceived quality of the grade of Ministry of Education approved fittings, the idea being that they were not fit for purpose or not adequately thought through by the planners. The Kahurangi College principal illustrated this point, saying: "A door like that, potentially could

have 450 kids going in and out of it at least three times, up to three but probably more like six times daily. 450 people six times a day. Of course, it's never going to last."

At Whero College, students described their MLEs as "very open", "snazzy", "high-tech", and "expensive". Then another student commented on the function: "No curtains. They spent like two million dollars. They need curtains because when you're sitting here in our space, it is like really hot. They bought eight massive TVs and forgot to get curtains." The five other students in the group reinforced their classmate's concern by listing other aspects of their MLE they perceived to be "flash" (such as carpet on the walls, and multiple seating options) and not as necessary as curtains, the lack of which they reported to impact the learning.

Teachers also expressed concern with the function of the design of the learning environment in general and how this enabled or constrained learning. At Kākāriki College, all four teachers interviewed indicated that they were struggling to understand how to "effectively use the space". One of these teachers commented in a way that summed up what their colleagues said: "there are so many layers to things that you try and navigate whilst keeping the kids at the centre and making sure you are not doing them an injustice while you are learning as you go." For teachers at this school, it seemed the design of the physical space, and the perceived initial lack of guidance on how to function within the space effectively added one more layer of constraint to what teachers needed to "navigate while keeping the kids at the centre" of teaching and learning.

All of the teachers at Kōwhai College commented that some aspect of the organisation in their MLEs constrained teaching and learning in some way. One such constraint was reported earlier with teacher office space. Regarding the physical space of the learning environment, a teacher said, "Why don't we have walls? I am teaching; everybody is teaching like we have walls." A science curriculum specialist asserted that the open design of the space meant that they were unable to leave equipment out in case someone else was to come in and use their space. They mentioned this in comparison to their experience in a single-cell classroom where they could set up for class and then lock the door. Another science

specialist mentioned that because of the open plan of the space, they had a single lockable area for science equipment and supplies, which was not in the teaching space. This meant that if they were not prepared adequately for learning or wanted to follow a teachable moment with a different experiment, there would be a delay while they retrieved the desired equipment—if they could interrupt another teacher to supervise their class while they retrieved the desired equipment. Again, this led to constraints in teaching and learning compared to their experience with a traditional science classroom where equipment was more accessible.

The final aspect of the space participants reported to enable or constrain teaching and learning was the use of, and access to, digital devices. Technology was commented on in this way at all schools. All teachers reported an increase in access to digital devices and the use of technology in comparison to the classrooms they occupied before their assigned MLE. Many communicated that this access was favourable, instead of requiring students to bring their own device from home or request, collect, and return digital devices to another area of the school. However, teacher and student participants at all schools reported not having enough digital devices available for every student and that the available digital devices were not always working. As well as this, not all students had access to a device, or Internet at home, to continue their learning or do their homework: this affected lesson and content planning.

Teachers in three of the schools reflected that they initially used technology at a higher frequency in the MLE compared to their previous learning environment. Nevertheless, they were beginning to return to pen and paper because of the lack of constant access (at school and home). When students were asked about this, they often said they enjoyed bookwork more than working on digital devices because there were fewer distractions with bookwork.

Summary

This chapter has presented the general findings developed by reflexive thematic

analysis applied to the transcripts from all four participating schools. These were broken into three sections *titled Increased Interactions, Teacher Teams,* and *Enablers and Constraints*. All 48 participants spoke about increased interactions and enablers and constraints, and all 25 teacher participants spoke about their experience of being part of a team within the MLE they were assigned. When participants spoke about these elements of their experience they commented how they created and/or eased tension or enabled and or constrained teaching and learning within their MLE. Participants' understandings of these elements varied depending on the perspective and experience of the specific element. As noted, teachers from the same school commented both positively and negatively on the same elements such as the increased visibility, and the organisation of the teacher teams. It is important to be aware of the variable understanding of single elements within MLEs when exploring the daily operation of an MLE from the perspective of those who operate within the space. Being aware of these varying understandings may make it easier to create shared understandings, decreased tension and support enablers as opposed to constraints for teaching and learning in such spaces.

Chapter Seven: Discussion

Introduction

The aim of the current research was to explore the operation of the MLEs in the participating schools from the perspectives of those who were involved with the operation of those spaces. This focus was guided by the overarching research question: *How are MLE being used in the participating New Zealand secondary schools to develop 21st-century skills and competencies in learners?* Sub-questions were created to gain a more detailed understanding of the overarching question and participant understandings of their learning environments' pedagogical core and organisational structure, their perceptions of 21st-century skills and competencies and the 7 Principles of Learning. In this chapter, the findings are discussed and explored further in relation to relevant literature under the following three headings *Perspectivism and Intersubjective Realities*, *The Increased Visibility of Practice,* and *Spatial Code*.

The section on *Perspectivism and Intersubjective Realities* addresses the nature of the findings, first by considering the contrasting perspectives and comparisons participants reported throughout the findings, then this information is used to link the findings and subsequent analysis to the stated conceptual framing of this thesis. Perspectivism was included in the conceptual framework to ensure a social constructionist lens was used to explore how individual participants' perspectives and experiences may have come together to construct the shared reality of the operation of an MLE. Exploring the nature of the findings helps to support the overall conclusion reported in the final chapter. The second section, *Increased Visibility of Practice,* addresses the increased visibility apparent in MLE; an affordance reported by all participants. Increased visibility leads to the opportunity for students and teachers to interact with those they may not normally have interacted with, observe others' practices within the learning environment and be observed by others. Increased visibility is discussed in conjunction with the organisational structure and pedagogical practices employed within the MLE in the participating schools, particularly

teacher-team collaboration and deprivatisation of teacher and student practice. The final section, *Spatial Code*, addresses the spatial practice of MLEs with reference to Lefebvre's (1991) concept of a "spatial code" and what can be seen of the current spatial code within the MLE where this research was undertaken. The overarching research question begins to be responded to in the final section and the sub-questions are referenced throughout the three sections.

Perspectivism and Intersubjective Realities

Throughout the findings varying perspectives of the same aspects of MLEs were reported. One prime example is the increased visibility that is the focus of the next section as it was reported to be experienced and understood in different ways by different principal, teacher and student participants. It was also reported to be experienced differently by teacher members of the same team. One teacher participant at Kōwhai College spoke about how they appreciated the increased visibility of their MLE because it meant if a student needed their guidance, the student would be able to find the teacher no matter where the teacher was. A member of the same team commented on how the increased visibility invaded their noncontact time and left them feeling exhausted at the end of the day. Further aspects of MLE where varying perspectives were reported including concerns over whether the focus should be on the curriculum or pastoral needs in the classroom, opinions on differences between primary and secondary school ITE, or how participants perceived the 7 Principles of Learning with regard to the MLE they were assigned to.

It is essential to remind the reader that the requirement to modify learning environments in the New Zealand context was related only to the physical space, with the presumption that pedagogy would change to match the change in space (Benade, 2017; Starkey & Wood, 2021). The findings of Starkey and Wood's (2021) research maintained that one reason to develop MLE was that traditional, cellular classrooms were assumed to inhibit innovative or flexible teaching and learning practices. Dovey and Fisher (2014) commented in a similar vein but also explained regarding architecturally designed learning environments

that "the irreversibility of the open plan can be construed as the use of architecture to coerce teachers into new pedagogies" (Dovey & Fisher, 2014, p. 58). The literature review in chapter two contained commentary on the environment as the Third Teacher (Pezzetti, 2020; Strong-Wilson & Ellis, 2007), built pedagogy (Monahan, 2002), and documents that directly addressed how the physical space of a learning environment has the potential to impact teaching and learning (Fisher, 2005; Nair & Fielding, 2005). However, without guidance on how to change pedagogical practices or how pedagogical practices can be changed to align with the physical space, what happens?

Like all qualitative research, this research began by accepting that there is not only one way to view the world. Qualitative research also acknowledges that the way a person interprets the phenomenon in question is never neutral but subjective (Byrman, 2016; Denzin & Lincoln, 2000). Both of these points are supported by the varying perspectives on single aspects of MLE reported in the findings. Varying perspectives were also demonstrated to extend beyond individuals' teaching and learning practice to include how the operation and organisational structure of an MLE may have been different to part or the rest of the school, and how these different types of operations and organisational structures may have affected teaching and learning in that area of the school. In Chapter Five Findings II, the same idea could be seen by teachers both advocating for and against the concept of "tech-savvy" as a 21st-century skill or competency or how one should define the concept of 21st-century skills and competencies in general. This idea of varying perspectives is worth consideration with relevance to the participants' responses reported in the findings and the social constructionist stance taken in this research to explore how the shared realities of MLEs are constructed.

As well as sharing their perspectives, participants also illustrated their experiences and understandings with comparisons. Comparisons were notably present in Findings Chapter II, where participants reported that their previous experiences with education shaped their understandings of 21st-century skills and competencies: their own time at secondary school, their experiences of teaching and ITE, and what they had observed as

parents. Teachers and principals used first-person pronouns to explain their understandings of these concepts, instead of referring to any team, schoolwide or Ministry of Education understanding of this concept. Participant understandings also included what participants had previously perceived 21st-century skills and competencies to mean, what they imagined the future to hold, what they observed of the students in front of them, and how they perceived their subject specialism might help in developing 21st-century skills and competencies. The examples were all comparisons between participants' initial or previous and current experiences and understandings of education.

The epistemological concept of perspectivism suggests that all knowledge is historically and culturally situated, which leads to a specific perspective (Berger & Luckmann, 1966, 2016; Burr, 2015, 2019; Fay, 1996). Therefore, it is interesting to view the participants' perspectives and comparisons through the lens of a person's concrete situation. As explained, concrete situation is an ontological concept which suggests that when existing in the world, a person is unable to free themselves from the initial meanings, understandings and experiences they associate with an entity (defined as anything outside themselves) (Heidegger, 1967; Wheeler, 2011; Wollan, 2003). This idea was raised in the methodology chapter and came from Heidegger's (1967) work, which aimed to explore the meaning of existing (Being). Heidegger proposed the concept of time as a starting place to begin to understand the concept of being. The concept of time is relevant to the participants' perspectives and experiences of Being concerning MLEs because when participants made comparisons, they contained a temporal element; they were either historical or projected to the future.

Social constructionist epistemology suggests that people construct knowledge in interactions with those around them instead of knowledge being "grounded in an observable and definable external reality" (Burr, 2019, p. 118). This knowledge, constructed by interactions between people, forms an intersubjective reality and guides the conduct in that reality (Burger & Luckmann, 1966, 2016). In the findings, when participants' perspectives and understandings were in line, or in opposition or disconnected with those of their peers

and colleagues, an intersubjective reality with a supportive or tense atmosphere was created. This can be seen regarding team teaching in the varying experiences reported, one teacher suggesting it could "lighten the load of everyone". In contrast, a different teacher suggested it could leave teachers feeling restricted or without a sense of being a team, as reported when a teacher commented, "A team has to be a team working together to achieve a collective goal, but this is not a team. This is a group of people, a group of teachers."

Participants used comparisons to illustrate and validate understandings. One example was the teacher mentioned earlier who saw value in the increased visibility in the MLE because students could find them when they needed to. They explained this affordance of their MLE compared to their previous experience of teaching in a pre-MLE learning environment. The teachers from Kākāriki College were another example; they focused on creating a community amongst the students and teaching "nice person skills" because they had noticed the positive effect of these actions on student behaviour. They compared these experiences to teaching in pre-MLE spaces by explaining that the affordances of the MLE allowed better implementation of this type of teaching and learning. The idea of teachers using experience as examples to validate understanding was a notion also present in the work of Bradbeer et al. (2019) regarding the effects of ILE on teacher mind frames. The authors reported that evidence in the systematic review they carried out showed positive experiences were one factor that led to teachers altering their mind frames regarding teaching and learning in MLEs. In the studied MLEs, when teachers did not have new positive experiences to alter teacher mind frames, they seemed to rely on previous experiences to guide their actions, as demonstrated by their use of comparisons. Noise was a good example to illustrate this point. Some teachers and students commented on positive experiences of learning to use noise as a tool to learn to manage themselves. Other teachers and students had negative experiences with the noise in the MLE and considered it a barrier to learning. Two teachers commented on how much they used to enjoy teaching, but the experience of noise in the MLE they were assigned to did not provide them positive experiences compared to the perceived quieter teaching environment of their pre-MLE

space. This negative experience reinforced their previous understanding of noise, and it, therefore, became a source of tension for them in their MLEs.

The idea of varying perspectives has been present throughout this thesis, for example, in the learning environment literature reviewed in chapter two regarding the effectiveness of MLEs or ILEs. The way the effectiveness was judged varied depending on the perspectives of those carrying out the research or those operating the MLE(s) in question. In the research commissioned by the OECD, Istance and Dumont (2010) suggested the "7 Principles of Learning should be present in a learning environment for it to be judged truly effective" (p. 326). Blackmore et al. (2011) judged the effectiveness of the ILEs in the 12 case studies in their research by how well their operation adhered to the purpose and rationale of the ILE in question. The effectiveness of ILEs was also one of the aspects of learning environments investigated in studies associated with the ILETC project, which explored the impact the learning environment may have on student learning (Byers et al., 2018; Imms et al., 2017) and teacher mind frames (Bradbeer et al., 2019.) as a way to evaluate the impact and by extension effectiveness of the learning environment. Cleveland (2018) suggested in their research that the effectiveness of such spaces "is primarily associated with how well particular pedagogy, curricula, assessment practices and social factors are supported by, or aligned with, particular environments" (p. 72). Regardless of the specific focus of these articles, effectiveness seemed to be judged by an alignment between some combination of the philosophy, aims, teaching and learning practices, and the physical space of the learning environment. In the findings of this thesis, the principals at both Kahurangi College and Whero College implied that the effectiveness of their learning environments could be judged by students' skills for future employability. At Kākāriki College, the same could be said for developing a sense of community amongst the students, which would then support the community outside of the school in the future.

In their article that explored the transition for schools from non or pre-ILE spaces to ILE or MLE, French et al. (2020) reported a common occurrence was "a misalignment between the pedagogical goals of the building and its subsequent use" (p. 1). The writers

compared a misalignment between the use of the space and the pedagogy used as trying to put a square peg into a round hole and note that this misalignment could adversely impact learning. The importance of alignment of the physical space and pedagogy was also addressed by other researchers (for example, Blackmore et al., 2011; Carvalho et al., 2020; ERO, 2018; Osborne 2016a) and defined as a type of spatial literacy by Charteris and Smardon (2018). They advised that these aspects of the learning environment aligned when teachers knew how to use and understand the affordances of their particular learning environment.

Teacher participants in the current research did not speak directly to the concept of effectiveness; however, it could be that the participants' varying perspectives and comparisons were related to a concern regarding the misalignment of the use of the space and the teaching and learning practices employed within the space. In some instances, this may also have been related to a teacher-team lacking shared or agreed-upon goals, as the teacher commented earlier about not being a team but just a group of teachers because they were not working towards a collective goal. Other research into learning environments commented that shared goals and understandings were essential (Bradbeer, 2016; Mahat & Imms, 2020a, 2020b, 2020c). One reason for this was that teachers may have reverted to previous practices if those goals were unclear or not successfully achieved (Bergsagel & Sauer, 2007; Carvalho et al., 2020; French et al., 2020). This would mean there were no new positive experiences to change teachers' perspectives, and they, therefore, held the same understandings of a learning environment that they did before operating in that MLE, as was the case with the teachers and their tensions regarding noise.

The findings indicate that the concrete situation of the participants forms their perspectives which lead to comparisons and influence the varying perspectives and understandings reported in the findings. It seems the initial lack of guidance on how to align pedagogy and space may have left the participants to look to their concrete situation for direction on how to align these variables. Participants' concrete situations then affect the social construction of the operation of the space by either creating or easing tension

depending on whether understandings and perspectives were in line, or in opposition, or disconnected with their peers' and colleagues' understandings. This appeared to be especially apparent in teacher teams where the team leaders' perspectives were said to "flavour" the rest of the team, while other members perceived a more collaborative approach should be applied. When the initial lack of guidance is considered with reference to the interpretation of the findings reported in this section, the importance of the participants' individual concrete situation is highlighted. This idea emphasises the necessity of guidance and clear agreed-upon goals and definitions within teaching teams, or tense intersubjective realities which lead to team members feeling unsupported can be created. If the intersubjective reality of a collaborative teacher team is tense, this may adversely affect students' teaching and learning experiences. This idea can be seen in direct contrast to literature (such as MoE, 2015) which suggests that collaborative teaching promoted by the physical space of an MLE may positively impact students' learning. Another way to align these elements of the pedagogical architecture of an MLE is with the concept of a spatial code which is the focus of the third section of this chapter, first though, I will address the increased visibility of practice reported by all participants.

Increased Visibility of Practice

One consequence of the change in the physical space and subsequent organisational structure of the elements of the pedagogical core of MLEs was increased visibility: the higher possibility to observe and be observed by others. The visual transparency of others' actions appeared to be an element of MLE that highlighted how physically different MLE (and elements of their organisational structure, for example, team-teaching) could be, compared to what participants previously knew of education.

The increased visibility within MLEs was reported throughout the findings at all schools. A teacher who was part of a team at Kōwhai College that did not plan lesson content together mentioned that because of the increased visibility, and therefore the possibility to observe their students not timetabled to them at that moment, they could see what

curriculum content students were learning in other curriculum subjects. When teaching those students in the future, the teacher would refer to the learning they observed and connect that to their subject. In this example, the increased visibility helped the teacher guide students to make horizontal connections between curriculum subjects, promoted by Learning Principle Seven (Istance & Dumont, 2010). At Kahurangi College, teachers and students commented on the possibility to observe other learning happening in the MLE. Students in the focus group discussion who had moved between the junior and senior areas of the school commented on how observing the senior students' learning decreased their anxiety about future learning. Teachers shared examples of being able to observe their colleagues' teaching practices because of the increased visibility. They could see what practices worked effectively in the classroom for their colleagues and then talk with those colleagues about that practice to improve their own.

In the article by Charteris et al. (2017), principals suggested that the increased visibility could lead to a sense of de-territorialisation for teachers, making them feel vulnerable and resistant to change. In other learning environment literature, the increased visibility was reported to make some participants feel judged by their colleagues or anxious that their practice would be observed, suggesting that increased visibility can act as a form of surveillance of staff over staff (Alterator & Deed, 2013; Campbell et al., 2013; Saltmash et al., 2015). This could have been the situation at Kahurangi College if the teachers who had been observed did not want to be observed or questioned about their practice by their colleagues. Alternatively, the increased visibility of practice has been noted in the literature to be particularly beneficial to early career teachers who can learn and practice pedagogy while surrounded by more experienced teachers who can offer timely guidance whilst in a lesson (Campbell et al., 2013; Saltmarsh et al., 2015). As one researcher noted: in an MLE, the "teacher is always on show" (Benade, 2019, p. 228).

The increased visibility of both teacher and student practice was reported throughout the findings to impact the experience of teaching and learning in an MLE. The impact was understood to be positive or negative depending on the perspective of the person I was

speaking to at the time. This affordance of teaching and learning in an MLE is discussed in the following two sub-sections. Increased visibility is first addressed regarding the concepts of collaboration and deprivatisation of practice. Following that, increased visibility is addressed as a potential affordance of MLE concerning students and learning apart from subject-specific curriculum content learning. The findings from this thesis indicate that teachers and students operating within learning spaces with increased visibility are more significantly impacted by the deprivatisation of their practice than learning environment literature currently explores.

The Deprivatisation of Practice

In general, all registered teachers in New Zealand are held accountable to the New Zealand code of professional responsibility and standards for the teaching profession. These standards encourage teacher collaboration regardless of the learning environment (Education Council, 2017). MLE specifically were developed with affordances presumed to encourage collaboration (see Table 1 for examples of this from the ILE Tool [MoE, 2010]). *Designing schools in New Zealand requirements and guidelines* (MoE, 2015), referenced in the literature review, sets out requirements and guidelines for New Zealand schools and advocates for the large flexible open spaces of MLEs. This is partly because of the presumed pedagogical potential of large, flexible spaces to make possible and encourage collaborative teaching, which may then improve student learning outcomes. This document further suggests that collaborative teacher practice "provides relevant and sustained job-embedded professional learning for teachers, leading to improved knowledge and practice" (p. 34). The document explicitly asks, "what does this mean for teacher practice?" and directly responds by saying, "this requires teacher practice to include open and collaborative teaching – not simply collaborative planning" (p. 34). This information is crucial because it explains what is expected of teachers in the New Zealand context and how the Ministry of Education (2015) presumed and intended teachers to work in MLE. Other reported benefits of teacher collaboration in non-traditional or open learning environments are increased informal

teacher interaction (Alterator & Deed, 2013; Prain et al., 2014), that teachers can model collaboration, negotiation (of space and resources) and conflict resolution with their colleagues for students, and that teachers can share teaching and administrative responsibilities (Campbell et al., 2013).

Teacher collaboration is one way teacher practice is made visible to teacher colleagues. One other significant way teacher practice is made visible to teacher colleagues in MLE (compared with pre-MLE spaces) is with the implementation of teacher teams. Teacher teams require a level of purposeful collaboration beyond collegial or incidental collaboration (Alterator & Deed, 2013, Bissett, 2014; Bradbeer, 2016, 2020; Campbell et al., 2013; Carvalho et al., 2020; Charteris & Smardon, 2018; Fletcher et al., 2017; Prain et al., 2014; MoE, 2015; Whyte, 2017). As noted, all teacher participants from this research were assigned to an MLE where they formed part of the team. Teachers in all MLEs planned for the pastoral care of students together to some degree. In some teams, teachers also planned lesson content together; in other teams, teachers planned lesson content and purposefully team-taught together (to be read as taking collective responsibility for the integrated curriculum, learning, achievement and pastoral care of the students assigned to their MLE). Therefore, it can be understood that some teacher practice in the participating schools did not align with the spatial and pedagogical practices of collaboration MLEs were presumed in literature to promote (see, for example, Bergsagel et al., 2007; Bergsagel & Sauer, 2007; Bolstad & Gilbert, 2012; Fisher, 2005; Nair & Fielding, 2005; MoE, 2010, 2011, 2015).

When introducing the OECD understanding of ILE in Chapter One, I explained the OECD (2012) uses the term ILE to distinguish between traditional or conventional pedagogy and a new way of learning that may include, but need not be guided by, a change in the physical space where learning takes place. Nevertheless, increased visibility within learning environments was addressed in *Innovative Learning Environments* (OECD, 2013), where it was referred to as "enhanced visibility"(p. 78). In the same publication, it was reported that some research participants referred to the increased visibility as a deprivatisation of their practice. In the literature review of this thesis, other writers also used the word

deprivatisation in conjunction with the increased visibility in modernised/open/non-traditional learning environments and teacher practice (Alterator & Deed, 2013; Bradbeer, 2016, 2020; Campbell et al., 2013; Charteris & Smardon, 2018; Fletcher et al., 2017; Fletcher et al., 2020; Prain et al., 2014; Saltmarsh et al., 2015; Wells, 2018).

One of the 25 teacher participants of this study made specific reference to the concept of deprivatisation of practice when explaining the justification some teachers had offered for no longer wanting to teach in their MLE. The teacher commented that their colleagues said that because of "the deprivatisation of the space, they felt it wasn't for them". They commented further that teachers could have an issue with deprivatisation regardless of their age or experience but that the beginner teachers in their MLE had no experience with "private" teaching. It was reported earlier that some learning environment research comments that the increased visibility of practice can be particularly beneficial for early career teachers (Campbell et al., 2013; Saltmarsh et al., 2015). Early career teachers may meet the increased visibility in modernised learning environments with less resistance than their more experienced colleagues because of the lack of experience with "private" teaching. When other participants of the current study spoke about the increased visibility in their assigned MLE, they spoke of literally seeing others' teaching and learning practices. The term deprivatisation is used in this section to view increased visibility regarding teaching and learning in the studied MLEs.

It is essential to make a distinction between teacher collaboration and deprivatisation. Collaboration is often reported with positive connotations as a tool used in the classroom to help teacher professional learning in-situ (Bradbeer, 2016, 2020; Campbell et al., 2013; Charteris & Smardon, 2018; Prain et al., 2014). In educational but non-learning environment research deprivitisation can also be reported with positive connotations as a tool used in the classroom to help teacher collaboration and therefore professional learning (Brix et al., 2014; Halverson, 2003; Lingard et al., 2000; Lomos et al., 2011; Owen, 2014). However, learning environment researchers whose work was at the nexus between the physical learning environment, teachers' experiences, and teacher collaboration, reported

both potential positive and potential negative connotations of deprivitisation of practice (Alterator & Deed, 2013; Bradbeer, 2016, 2020; Campbell et al., 2013; Charteris & Smardon, 2018; Fletcher et al., 2017; Fletcher et al., 2020; Prain et al., 2014; Saltmarsh et al., 2015; Wells, 2018).

Positive impacts of deprivitisation on practice were mentioned earlier mainly in connection with collaborative teaching practices (Alterator & Deed, 2013; Campbell et al., 2013; MoE, 2015; Prain et al., 2014). Negative impacts include that it may make teachers feel vulnerable, surveilled by colleagues, anxious and judged, and in some cases, resistant to change (Alterator & Deed, 2013; Bradbeer, 2016, 2020; Campbell et al., 2013; Charteris & Smardon, 2018; Fletcher et al., 2017; Saltmarsh et al., 2015; Wells, 2018). With specific reference to collaboration and teacher-teams often personality clashes are reported which can make it hard to work as a team (Alterator & Deed, 2013; Campbell et al., 2013; Saltmash et al., 2015). Consider the example from Kahurangi College again; unless all parties accepted the increased visibility as a form of constant professional development, it might have been detrimental to teachers' experiences in the classroom. This adverse reaction was identified at each of the four schools, where teachers offered increased visibility as the reason that at least one of their colleagues no longer taught in the MLE. As will be explained, the findings from this thesis indicate the impact of deprivitisation on teacher practice may be related to the understandings of the elements of the pedagogical core and organisational structure of those elements, including if deprivatisation is purposefully engaged with or simply seen as a consequence of the increased visibility of teaching and learning in an MLE.

Part of developing MLEs in New Zealand was to support 21st-century teaching and learning practices and raise student achievement with flexible, student-centred teaching and learning practices that some research reports that pre-MLE spaces are perceived to inhibit (Alterator & Deed, 2013; Bradbeer, 2020; Campbell et al., 2013; Dover & Fisher, 2014; Starkey & Wood, 2021). As mentioned in Chapter Three, part of the reason for including student voice in this research was the recognition that teaching and learning in an MLE would affect student experiences. Raising student achievement could potentially change

student lives. Bradbeer (2016, 2020) observed that if teaching and learning in an MLE could potentially change student lives, this could also potentially change teacher lives as they were part of the teaching and learning in an MLE.

The impact of teaching in an MLE on teachers' lives is an important point to consider. Research has found time and again that the teacher is the most effective tool for achievement in the classroom. If the increased visibility and deprivitisation in MLE negatively impact teachers' experiences of teaching and learning that may negatively impact students' achievement. However, there is relative silence in learning environment literature on the impact of teaching in MLE on teachers' lives. There are hints that there is more to be explored, some research references increased informal interactions between staff and staff and students in learning environments with increased visibility, or teacher participants reporting that collaboration could lead to gain in their personal lives as well as the classroom (Alterator & Deed, 2013; Campbell et al., 2013; Prain et al., 2014). Campbell et al. (2013) reference research that considers the teacher "as having a leadership role beyond the classroom, extending into the community" (p. 218). Furthermore, teachers have reported limited downtime because of the increased visibility of the space (Alterator & Deed, 2013; Bradbeer, 2020), just as was reported by some teachers in this study and teachers in the study by Parin et al. (2014) reported that the increased visibility negatively "inhibited their usual personas with students" (p. 201). These points are mentioned briefly in the literature but underexplored for their full ramifications. The findings from this research make apparent that pedagogical practices employed in MLE can deprivatise teacher practice beyond the classroom and therefore impact their life beyond their role as a teacher.

In the present research findings, some participants reported that collaboration was better allowed for in their MLEs than in their experiences with pre-MLE buildings. Sometimes, the collaboration was purposeful and supportive, such as when some MLE teams planned content and team-taught together. Purposeful collaboration was described at Whero College in the form of teacher buddy teams whose purpose was to reflect and be a sounding board for each other to improve their practice. There were also examples from teachers of

what appeared to be incidental interactions. *Incidental* is defined as unplanned, a byproduct of some other activity (Buntting et al., 2018). In the context of MLEs, incidental interactions may also be due to the affordances of the increased visibility or number of teachers and students simultaneously timetabled into the physical space of an MLE, such as the interaction/observation mentioned by the students and teachers at Kōwhai College and Kahurangi College earlier. Such reported interactions may have offered positive professional development to teachers; however, that seemed to depend upon the volition of the teacher to whom I was speaking at the time. When one Kōwhai College teacher made a point that they would help out a colleague if appropriate, this was explained as an action they carried out through their volition, not purposeful action passed down through a directive or organisational structure of the space. Research suggested that when the school culture encouraged and purposefully supported teachers supporting each other, teacher-teams in MLE were more successful (French et al., 2020; Prain et al., 2014). This idea was confirmed by all teacher participants from Whero College who reported feeling supported by the purposeful buddy system.

In the participating schools, part of the increased visibility reported was explicitly related to the pedagogy valued within the MLE. Individual teacher practices were reported as more visible to students in schools that put more of an emphasis on student-directed learning. As reported in the context of Kōwhai College, when sharing experiences of "picking something of passion" for individual projects, a student explained that they were guided to the appropriate page of the NZC by the teacher but were to figure out which learning objectives to apply to their particular topic themselves. The valued teaching and learning practices in this MLE meant that teachers' practices were intensified. Teachers from this college commented that previously to teaching in their MLE they would interpret the curriculum document and teach the students their interpretation, and now because of the valued pedagogy in the classroom, they needed to teach their interpretation and explain to the students how they came to their interpretation of the curriculum document. Therefore, teacher practice was not only deprivatised through professional and incidental interaction

with their colleagues but their personal teaching processes were made more visible (deprivatised) to their students.

The sequence by which lesson content was planned was a further aspect of working in a teacher team in an MLE reported to deprivatise teachers' practice. When teacher-teams planned units of learning and individual lessons together by sitting in the same place with their colleagues their practice was deprivatised as they negotiated content, approach and assessment. As in the previous example, the personal teaching processes were made more visible to the colleagues then teachers reported they had been in pre-MLE learning environments. Additionally, when teachers were in teams who planned lesson content together, teachers commented on being dependent on team members to do their part of planning before they could do their own. Participants reported that when they had to fulfil their part of a task in sequence with teammates, this could often happen outside of school hours, meaning they would need to take time away from their out of school (private) life. In some ways, this made visible (deprivatised) teachers' private lives and made it hard to keep the two parts of their lives separate if they wanted to because requirements from one impacted the other.

In sum, it is fair to state that the deprivatisation of teacher practice is noted as a tool to help develop collaborative teacher practice in learning environments designed with increased visibility where teachers are expected to work as teams. Regardless of collaborative teacher practice, deprivatisation of teacher practice is apparent in learning environments with increased visibility solely because of the increased visibility. In the participating schools of this research, participants reported incidental deprivatisation of their practice due to increased visibility within MLE, the organisational structure (particularly teacher-teams, classroom layout and the increased number of teachers and students simultaneously timetabled to the same space), and teaching and learning practices employed or valued within the space. Teacher collaboration is advocated for in MLEs to raise student achievement; this can effectively change student lives (Bradbeer, 2016) and most definitely affects teacher lives. These examples of aspects of teachers' practice and lives beyond

purposeful professional interaction reported by participants as being made visible to colleagues, students, and their families go beyond the bounded physical space of the classroom and the learning time of the school day. These findings reveal that the one-dimensional perspective of a teacher that only recognises the deprivatisation of practice through purposeful professional interaction may not be in line with the reality of what happens within MLEs from the perspective of those who operate within MLEs. Teacher (and consequently student) experiences in MLE may benefit from acknowledging the teacher not only bound by the physical space of the classroom and the time of the school day but multidimensional with a life outside of the classroom.

Learning Other Than Subject Knowledge

The increased visibility of practice in MLEs was also reported in the findings to have the potential to impact student learning other than curriculum subject knowledge. The idea of learning other than curriculum subject knowledge in New Zealand schools historically was acknowledged in Chapter One concerning the 1877 Education Act, where lessons were designed for students to "learn English, have Christian values instilled and be taught 'moral' habits" (Tearney, 2016, p. 16). As will be demonstrated, the findings from this thesis convey there may be a lot more learning happening in an MLE than purposeful learning for school achievement and life after school in the 21st century.

Literature suggests teaching and learning practices that will help prepare students for the 21st century, include a focus on developing skills to learn (in contrast to focusing on knowledge retention) and carrying out student-centred learning where student interests, knowledge, and abilities are to be guiding principles in the classroom (Bolstad & Gilbert, 2012; Dumont et al., 2010; Instance & Dumont, 2010; OECD, 2013, 2015; Osborne, 2016a). When this is the case, it is important that the learner know themselves, their interests and how they learn. The 7 Principles of Learning (Instance & Dumont, 2010) also asserted that it was beneficial for the educator to be aware of the learners' motivations and prior knowledge. Indeed, all teacher participants agreed that for learning to be effective, students' emotions

and prior knowledge need to be taken into consideration.

Researchers have argued that the individualisation and personalisation of learning increases the visibility of students' practice (Bojesen, 2017; Thompson, 2018). Both Bojesen (2017) and Thompson (2018) contemplated the potential of MLE from the educational philosopher's perspective instead of from the reality of the use of MLE in operation. Bojesen (2017) spoke from the presumption that a pre-MLE classroom contained a one-size-fits-all pedagogy where students sat in rows, worked towards the same goals, and only behaviour and achievement differentiated them from each other. He proposed that without explicitly teaching it, the individualisation of learning that may be carried out within an MLE may have helped teach students to know themselves, their emotions and motivations better than learning in a pre-MLE environment. Thompson (2018) advised the reader that because of the focus on individualised learning, learning in an MLE could become purely about students' personal interests, needs and values, and teaching in an MLE could become purely about facilitating this. Therefore, just as these spaces could be used flexibly, they could also be places where nothing beyond the pursuit of student personal interests happened.

The idea of learning other than to gain curriculum subject knowledge was reported in the findings considering the development of any specific 21st-century skills and competencies in students. This idea was also related to developing the key competencies of the NZC: thinking; using language, symbols and text; managing self; relating to others; and participating and contributing (MoE, 2007, pp. 12–13) in students. As reported, there were no officially agreed-upon lists or definitions of 21st-century skills and competencies identified at any of the four participating schools. This absence of defined lists of 21st-century skills and competencies concurred with Ananiadou and Claro (2009) and their work commissioned by the OECD regarding the definition, teaching, and assessment of 21st-century skills and competencies in OECD countries. The authors did not find many precise definitions of 21st-century skills and competencies at national or regional levels in any of the 17 countries (including New Zealand) that responded to their research. In their paper, Ananiadou and Claro expressly referred to the key competencies of the NZC, indicating that those who

responded to their research from New Zealand suggested there was specific training on the key competencies but no focus on any other specific 21st-century skills and competencies beyond that.

The focus on purposefully developing the key competencies and associated concepts (such as problem-solving skills, the ability to relate to others, and the ability to manage oneself) in students was reported by both principal and teacher participants, and there was also awareness in some students of these skills and competencies. Both principals at Whero College and Kahurangi College commented that future employers desired these associated abilities. In recognition of these competencies being valued by future employers, developing the key competencies in students could be seen through the lens of social investment. Social investment was commented on in Chapter One, it was described as employing resources today that mean less of the government's social investments would be needed in the future. More specifically, it is a process of human capital formation that generates both public and private benefits (Boston & Gill, 2017; Hawke, 2017). In the case of education, with reference to the key competencies, students' time at school was being used to develop citizens with specific skills and competencies to be productive citizens who should be able to read, write and think, as well as be able to participate and contribute to groups (family, social, work), and relate to others while at the same time have learnt how to manage themselves appropriately. Further to this, they were learning in environments that have the potential to be dynamic, fluid, and not always predictable, elements that are assumed to be part of the unpredictable future society faces (Bolstad & Gilbert, 2012; OECD, 2013, 2015). It could be argued that learning to manage oneself in such an environment would also be a desired quality an employer may look for.

It is interesting to consider the idea of social investment and learning in an MLE with regard to Monahan's (2002) original ideas of built pedagogy: how the physical space affects teaching and learning by allowing for and preventing different types of pedagogy. Monahan suggested that "built pedagogies operate along a continuum between discipline and autonomy" (p. 5). The valued flexibility in a space, such as an MLE, is related to the extreme

autonomy end of the scale. It could be reasoned that that flexibility has the potential to develop "holonomous individuals" (p. 7); students who work well independently and on interdependent tasks, adaptable students who work well in dynamic, fluid environments and are resilient to unpredictable situations. Having learned to learn and manage themselves in such an environment, students may aim only for temporary or "just in time" employment because they could be easily bored in a predictable situation and may not have learned about focusing on a task to completion or achieving a larger goal that is not based on their personal interests. This idea was implied by some teacher participants who commented on needing to re-teach students to spend time with a single curriculum subject (in comparison to an integrated curriculum) when they reached higher year levels at their college, which employed a different organisational structure and different teaching and learning practices to the MLEs the students occupied in the lower year levels.

Developing in students the ability to manage themselves in the MLE could also be a response by teachers to address the lower student-teacher ratios research suggested were needed in education (Bolstad & Gilbert, 2012; Starkey & Wood, 2021). Starkey and Wood (2021) noted that policy discourse promoted lower student-teacher ratios, but this was not allowed for in the requirements of the physical space of an MLE; therefore, one way to address student, space, teacher ratios was to create large learning areas where collaborative teaching was employed. Findings in this thesis suggest that once students can manage themselves, the student-teacher ratio can change as teachers can then work with smaller groups, but this is only effective if other students can continue to manage their learning when they are not working with a teacher.

Literature that discussed how the spatial qualities of an architecturally designed learning environment purposefully built to support 21st-century teaching and learning, contended the design of the environment should afford more flexible space, access to technology, and allow for varied pedagogical practices (peer tutoring, collaborative work, and independent work) then it was presumed pre-MLE spaces did (Bergsagel et al., 2007; Fisher, 2005; Nair & Fielding, 2005; Pezzetti, 2020). This literature, like the educational

literature that discussed the deprivatisation of practice only related to teacher professional practice with reference to their colleagues, and only comments on pedagogical practices that should be possible in the learning environment.

The findings of this research reveal however that learning other than subject knowledge was reported as both purposeful and incidental due to the physical space of an MLE and the affordances of increased visibility and increased interaction reported by participants. This was demonstrated when the teacher and principal participants commented on the potential for students to have increased autonomy and freedom in an MLE, leading to increased options of where they may sit, whom they may choose to sit with and by whom they may choose to be instructed. In focus group discussions, students offered other examples of incidental learning. One student explained that they might not like the teacher they were assigned to according to their timetable. However, because the student did not want to lose the positive regard of the teacher they did like who was also assigned to the learning environment and could see them, they made sure to self-monitor their behaviour and act appropriately. Other students reported using what they considered "positive peer pressure" to correct the behaviour of new students who may not yet be aware of the rules in that specific MLE. The Kahurangi College principal also commented that students observing other students' behaviour seemed to mean that behaviour changed because students would let other students know they thought the behaviour was inappropriate. Alternatively, the example of developing nice-person skills in students at Kākāriki College. These examples may be the types of learning it is presumed traditional learning environments inhibit but they were not necessarily planned types of learning.

Throughout this thesis, it has been asserted that MLE were developed to help support 21st-century teaching and learning and therefore raise student achievement. The findings from this thesis suggest that increased interactions and increased visibility afforded by learning in an MLE where the above-mentioned purposeful and incidental learning happen, because of the increased interaction and increased visibility, could potentially change student lives by preparing students better for their future in the 21st-century. These examples

may be evidence of MLE doing their job by echoing the flexibility, adaptability, increased visibility, and the necessity to be able to manage oneself apparent in contemporary society.

When thinking about the findings of this thesis, learning other than curriculum subject knowledge, the key competencies of the NZC and the 7 Principles of Learning, Burr's (2015, 2019) critique of social constructionism also needs to be reconsidered. Burr suggested that from the view of psychology, the concept of multiple realities associated with social constructionism can create a fractured self. Participants of this study recommended that the ability to manage themselves and relate to others needed to be employed for an MLE to function well. These ideas suggested that learning in an MLE may have the potential to help a person become more aware of their own self. Earlier it was reported that the sequencing of lesson planning could make it hard to keep school and private life separate for teachers when working as part of a teacher-team. Therefore, it is possible for some that teaching and learning in an MLE may begin to unify the fractured individual.

In contrast, however, Monahan (2002) suggested caution because "practices occurring within flexible spaces can also reinforce student disempowerment through the solicitation of their participation in self exploration" (p. 7). Some students (or teachers) may not be ready for the level of introspection required for the type of self-management and recognition of prior learning, emotions, and motivations advocated for in MLEs (Istance & Dumont, 2010; MoE, 2007; OECD, 2013, 2015). In the same way, some teachers may have wanted to keep their school life and private life separate, and when that was not possible because of the organisational structure of the MLE or teacher-team they were assigned to, it may have created tension.

It is clear that not all experiences of teaching and learning in MLE are positive or without tension, but the findings of this thesis support the idea of the principal at Kākāriki College, who was of the opinion that there were "unexplored benefits of running in a broader modern learning environment". These benefits, such as students teaching themselves to self-monitor their behaviour, more students being able to observe and "not stand for" inappropriate behaviour, such as was an example at Kahurangi College, or students exerting

their "positive peer pressure" on other students, were discoverable by being able to have reflective interview and focus group discussions. I propose there may be a lot more learning happening in an MLE than students and teachers are consciously aware of.

The example of student self-monitoring was reported early in the data collection process. Out of curiosity, I mentioned this idea (anonymously) to two teachers in different learning environments at different schools later in data collection. They both commented on finding it a very interesting idea but had not considered or noticed this behaviour in the MLE they were assigned. Many examples of experiences and understandings reported in the findings seemed to be visible only to people who were involved with or took the time to reflect on their experiences. The point is that although MLEs may have the affordances and potential spatial qualities to support incidental learning and learning other than subject content learning, in and of itself, the physical space of an MLE alone did not guarantee that this will occur or that it would be an observable benefit. However, purposefully engaging with the ideas reported in the findings and further reflection and exploration of the daily operation of MLEs by those who occupy those specific MLEs has the potential to reveal observable benefits of teaching and learning in that MLE. Being conscious of the idea of incidental learning alone is an idea to be aware of when developing teachers' spatial literacy in an MLE.

The ideas mentioned here bring up the tension between representational (conceptual or potential) and representations (lived or reality) of space raised in the literature review with Lefebvre's (1991) writing on the production of space. Lefebvre's (1991) ideas on the production of space are discussed in the next section of this chapter.

Spatial Code

Henri Lefebvre was a French philosopher (1901–1991) who spoke of "social space". His book *The Production of Space* was written in French in 1978 and translated to English in 1991 and was a search for a unifying theory of space (assembling its physical, mental and social dimensions). This work, particularly regarding representational and representations of

space, has been included in others' work regarding learning environments, as noted in the literature review (Benade, 2017b, 2019, 2021; Benade & Jackson, 2017; Benade et al., 2017; Bradbeer, 2016, 2020; Couch, 2018).

One aspect of Lefebvre's (1991) work that I believe could be particularly helpful when discussing the findings from this thesis is the concept of a spatial code. Lefebvre reminded his readers that just as history is written by the victors, popular or populated ideas become the hegemonic discourse that instructs society about what is normal, acceptable and proper. He contended that these ideas exist collectively to lead society in what was perceived as the right or desired direction. He noted that names that physical places have, such as market place, church or classroom, "correspond to a specific use of that space, and hence a spatial practice they express and constitute" (Lefebvre, 1991, P. 16), in a specific culture, time and place. This coalition of ideas, guided by hegemonic discourse, apropos the physical space, are elements of the "spatial code", which inform realities (depending on interpretation) of how specific spaces should be operated.

To continue with the concept of a spatial code, it may be advantageous to explain what a spatial code is not. Lefebvre maintained that a spatial code "is not simply a means of reading or interpreting space: rather it is a means of living in that space, of understanding, and of producing it" (1991, pp. 47–48). It is also important that a spatial code not "be mistaken for a practice" (p. 64). A spatial code should not be confused with the concept of spatial literacy. As understood in this thesis, the spatial code reflects the official, bureaucratic and normative understandings of how the space (classrooms/MLE/school) should function. Spatial literacy could be understood as more individual (teacher/teacher team/school contexts) and immediate, related to the operational function and organisational structure of the space. In this instance, a spatial code, as well as the aforementioned spatial literacy (or lack thereof), are all elements of interpretations of larger abstract ideas and ideological notions of what education could or should be.

When considering Heidegger (1967) and the concrete situation of the participants, it was noted that the thing that is being (participant) is "situated in a particular place and a

particular time, with many other relations and attitudes to many other things" (Wollen, 2003, p. 33). Acknowledging the participants' historical comparisons and contrasting perspectives, part of the web the participants were situated within could be understood as the spatial code of education in function when and where the participants initially and previously interacted with education and MLEs. As Lefebvre notes about spatial practice, "the past leaves traces; time has its own script" (1991, p. 37).

In the case of MLE, the spatial code education contained is no longer what it was in the New Zealand context. A short history of schooling in New Zealand was offered in Chapter One; in the ideas reported there, it is possible to see how the spatial code of education has differed through time. These changes were reported related to the curriculums that have been focused on, different ways school facilities have been managed, and different pedagogical practices that have been valued at different times; for example, initially, knowledge retention was valued, but the value now is focused on skills to create knowledge.

Within MLEs, other aspects are also quite different to what many New Zealanders might ordinarily consider the spatial practice of education to include, for example, substantial numbers of students, multiple teachers and multiple subjects being timetabled into one large space simultaneously. As noted in the previous section on deprivatisation, teacher practice can appear quite different from teachers' non or pre-MLE teaching experiences. The spatial code of MLEs may also appear different from what has historically been witnessed in print media, television series and movies that include learning environments.

Perhaps the most obvious or remarkable aspect of the spatial code that has changed is the physical appearance of school facilities which is especially noticeable when one compares an MLE to a pre-MLE classroom. Some teacher and principal participants reported interactions related to opinions on the physical space of MLEs, which led to slow acceptance of MLEs in some communities. Principal, teacher and student participants who carried out their daily teaching and learning within the space also questioned aspects of the space. The principal at Kahurangi College commented on the quality of the Ministry of

Education approved door handles for the increased number of times a door would be opened and closed considering the increased number of people simultaneously timetabled into the single space because of its increased size. Teachers at Kōwhai College commented on the open office space within the classroom where it was assumed they could carry out traditionally private teacher actions, such as marking assessments or having confidential phone conversations with parents. Students also commented on aspects of the design of learning environments, such as not having curtains in the classroom when the walls are made of glass and the sun creates heat and glare. Some teachers also questioned the effective use of the space considering the practices employed in the classroom: "Why don't we have walls? I am teaching, everybody is teaching like we have walls." These are all examples and comparisons of ways to observe the spatial code as different from what was known of education and how the manifestation of the spaces differed from what participants thought they should be.

Lefebvre (1991) said spatial codes "follow a process: formation, establishment, decline and dissolution" (p. 48). Following this line of thought, I suggest that we are witnessing the dissolution of the previous code and the formation of a new code. Other learning environment researchers, borrowing from other theorists, have used similar imagery when exploring MLE from their various perspectives. Earlier in this chapter, work by Charteris et al. (2017) was mentioned, where it was suggested that the increased visibility of MLEs can lead to a sense of de-territorialisation for teachers. In their research, Charteris et al. considered an MLE as an assemblage, as did Carvalho et al. (2020) and Dovey and Fisher (2014). Dovey and Fisher specifically commented on learning environments with reference to the concept of de-territorialisation and an assemblage explaining "de-territorialisation as the movement by which territories are eroded as new assemblages are formed" (2014, p. 8). It seems both ways to consider MLEs recognise the "formation" of something new, often accompanied by a decline or dissolution of what was. Indeed, French et al. (2020), who explored successful transitions from traditional learning environments to ILE and MLE, identified four broad themes which appeared to have aided schools in

successful transitions, all of which contained an element of purposeful action in embracing the change to create new agreed-upon pedagogical practices and organisational structure. They noted that "teachers who align their pedagogy to the intended design of the ILE appeared to transition successfully, avoiding the reversion to traditional practices" (p. 188). This idea could be seen in contrast to attempting to change pedagogical practice because the physical space had changed, but teachers not being ready to fully commit to a change that would not revert to traditional practices. All examples listed in this paragraph reference the incidental, necessary or purposeful creation or formation of what could be understood as elements of spatial code when operating within modified learning environments.

In light of this discussion, in the participating schools at the time of data collection, the new code did not seem to be fully established, which may have caused any tension, hesitancy and resistance reported in the findings. In contrast to resistance and tension, some of the findings suggested that learning in an MLE may have helped negate any loneliness when students were separated from their friends in pre-MLE learning environments. Also, some of the organisations and increased visibility were reported to help decrease anxiety around future learning, and some teachers reported benefiting from the immediately available interactions with their colleagues to improve their teaching practices.

Part of the reason the code may not have been fully established at the time could have been because of the short amount of time between the establishment of many of the MLEs and data collection (one–seven years). It also may have been because of the flexible, adaptable, fluid approach to teaching and learning that the spatial qualities of MLEs are assumed to promote and that are currently valued when developing citizens for the 21st century (Bolstad & Gilbert, 2012; Istance & Dumont, 2010; OECD, 2013, 2015). As the teacher at Kākāriki College commented: "It is tricky; there is no blueprint."

The OECD (2015) offered "more rapid economic and social change than ever before" (p. 3) as a reason for the need for an educational paradigm shift. Other literature reviewed in this thesis also contained a general notion that education needed or needs to be reshaped for the 21st century (see, for example, Bolstad & Gilbert, 2012; Dumont et al., 2010; Nair &

Fielding, 2005; OECD, 2013). But because of the current rapid pace of social change, is it possible for a fully established contemporary spatial code of education to be constructed? For example, large open, flexible learning environments are still advocated for (MoE, 2020), but the ILE Tool (MoE, 2010), which was very influential regarding the physical design of learning environments no longer holds any authority. Does this mean what has been constructed of the spatial code in the schools that adopted environments built in line with the ILE Tool will now decline and dissolve as a new code is formed? The same question could be asked regarding the schools' journeys to MLEs in Chapter Four Findings I. The idea of journey, formation or establishment suggests a fixed point or an achievable thing. Lefebvre (1991) did not offer a fixed time on how long it may take to establish the spatial code.

Pertaining to the nature of the findings of this thesis, the epistemological stance of social constructionism and relativist ontology, the discussion in the first section of this chapter established how the varying perspectives of the participants can be seen to create their intersubjective commonsense realities. Berger and Luckmann (1969, 2016) commented that the third step (internalisation) in constructing an intersubjective commonsense reality appeared in the following generation. The speed at which policies change, such as those that affect the spatial code of MLEs may be part—or is even proof—of the rapid change society faces. Although the overarching research question for this thesis asks *How are MLE in the participating school being used to develop 21st-century skills and competencies in learners?* the ideas discussed here suggest that not only might teaching and learning in an MLE have the potential to develop learners as citizens for the 21st century; it may also develop the abilities of teachers to function effectively in the 21st century, creating even more flexible, adaptable citizens.

In MLEs, participants could be seen to exist within a spatial code while at the same time producing spatial practice with their actions. When there was a lack of guidance and perspectives were not in line with their colleagues, a tense intersubjective reality was created. Without agreed and shared visions and goals, tense intersubjective realities may be perpetuated until the process for the next spatial code comes into action. This may lead to

further resistance to change from teachers, reverting to previous practices and more teachers leaving their positions in MLE, if not teaching in general because of dissatisfaction with the experience of teaching. Teachers' dissatisfaction, in turn, will disadvantage students. It is also possible that the processes of formation, establishment, decline and dissolution may begin to happen more rapidly because of the rapidly changing nature of contemporary society. How will we support our educators and learners if this is the case?

A New Spatial Code

More than once throughout this thesis, I have commented on the initial lack of guidance on how to align pedagogical practice with the modification of the physical spaces of MLE; however, there are underpinning concepts and documents available to support building a new spatial code for secondary school MLEs in the New Zealand context. Each of these elements contains information that can be pieced together to envision this code, but as Lefebvre (1991) contended, a spatial code cannot be read; instead through interpretation, it acts as a guide. These elements were available to all the participating schools, and yet at all the participating schools, the physical spaces appeared different and had a different organisational structure. Participants' understanding, interpretations, perspectives, and experiences, even when participants were from the same school, or MLE, differed. The varying context of the schools account for some of the differences, but this demonstrates the spatial code as an abstract guide open to the interpretation of the interpreter.

Two of these elements are *Our code our standards: Code of professional responsibility and standards for the teaching profession* by the Education Council (2017) and *Designing schools in New Zealand: Requirements and guidelines* by the Ministry of Education (2015). The first provides information on the official requirements and expected standards of teachers from the educational authority of New Zealand that all teachers are governed. The second set out requirements and guidelines when designing schools in New Zealand, including how those spaces should be used and is to be deferred to when there is any "ambiguity or contradiction" (p. 6) between this document and any Project Brief created

in renovating or establishing a school.

As noted in the literature review, some researchers have begun writing detailed single case studies of aspects and related aspects of MLEs that could be used as guidance or reflection for those transitioning to, and implementing, such learning environments. These documents contain examples of interpretations of the spatial code in practice. See Wright (2018), who reported the emerging story of a newly established secondary school, and McPhail (2018), who investigated how curriculum integration could be understood and approached by teachers in one secondary school. A further document that could be used for guidance is the 2018 ERO document *Leading innovative learning in New Zealand schools*, which explored learning practices in 12 different schools in different contexts. There is also facilitator guidance that lead researchers of the ILETC project have developed as a result of what was observed as best practice through their research (Mahat & Imms, 2020a, 2020b, 2020c, 2020e, 2020f). Further research that explores aspects of 21st-century teaching and learning that could be used as guidance because of how they demonstrate these aspects in action in their particular contexts are; Benade (2017b), who explored being a teacher in the 21st century at primary and secondary schools, Trask (2019) focused on teaching senior secondary school science curriculum in MLE and Bradbeer (2020) who addressed teacher collaboration in modified learning environments at primary school.

Two other elements of a new spatial code are; *21st-Century Skills and Competencies* and the OECD's *7 Principles of Learning* which were originally understood in this thesis as underpinning concepts of MLEs. Participants' awareness and comprehension of these concepts were explored in Chapter Five Findings II. Responses indicated that participants were not overly familiar with these underpinning concepts, and they were not being engaged with in the MLEs in the participating schools as intended. However, participants commented that once they were made aware of the 7 Principles of Learning during their interview, they could see them functioning in their MLEs and commented that they could appreciate their function regarding education in general. These underpinning concepts are examples of how to align pedagogy and practice and therefore achieve closer to the theoretical potential of

MLEs.

Other underpinning concepts were not always overtly understood by those who used MLEs. When explaining my personal interest in this topic at the beginning of this thesis, I mentioned that when I began my journey, the teacher colleagues I taught with in an MLE asked me to find out why the learning environment had changed because they were unfamiliar with the underpinning reason for transitioning education into MLE. When the students in some focus group discussions were asked if they had learned in an MLE before, they seemed hesitant in their understanding or definition of what an MLE was. When participants did offer their voices regarding what I understood to be underpinning concepts, these understandings could be seen as open to interpretation. Varying interpretations regarding 21st-century skills and competencies were demonstrated by including transcript excerpts in Table 6.

When teacher participants were asked if they knew about the 7 Principles of Learning, they asked how they should know about or when they should have learned about this concept. I first became aware of this concept when beginning the literature review and trying to understand the origin of the movement to MLE in New Zealand. If a person knew the term "7 Principles of Learning", a Google search offered the OECD's original document. The same search also returned results related to the Ministry of Education and learning environments, information on resources and curriculum materials, and an ERO document regarding pedagogy for modern learners. From this, we can conclude that information on the 7 Principles of Learning is available when one is aware of the concept, but I am not sure exactly where teachers should have learned about this idea, only that it is a concept readily available in relation to the Ministry of Education and learning environments.

When participants were asked about both of these underlying concepts, they referred to ideas such as "getting through", "surviving", and sacrificing one part of teaching or learning for another. Other participants mentioned that there was not enough time in the day or that they did not have the opportunity to reflect with their colleagues and sit back and consider "how should this look?". There seemed to be a lack of opportunity for conversations

between team members to reflect and form common understandings, definitions and goals. This was true even at Whero College, where the principal had purposefully organised the timetable so that the teachers in the MLEs had opportunities to plan together during school hours.

Regarding social constructionism, it is essential to note about the second step in this sequence, "institutionalisation", that an individual cannot grasp an external reality by introspection (Berger & Luckmann, 1966, 2016). Berger and Luckmann commented that the person must "go out" and learn about external realities just as they must learn about nature by interacting with it. Therefore, it cannot be expected that a person without interaction with others would simply know about external realities or that a teacher in an MLE may simply know how to operate effectively with their colleagues. In this sense, a person must be allowed time for reflection and the meaningful reciprocity language provides to properly comprehend external realities such as the intersubjective reality of the operation of an MLE.

Findings from this thesis indicate that without the opportunity to reflect (alone and together) or other guidance (for example, from the school about how an MLE team should function), the participants' unique spatial code, based on their concrete situation, becomes what they rely on to guide their practice. Without the opportunity to reflect as a team and discuss and explore their perceptions and understandings, how can they create the shared meanings that seem necessary for the team-teaching environment? Furthermore, if the underpinning concepts are not being engaged with in the classroom, what is the point of the time put into forming those underpinning concepts and developing MLEs in the New Zealand education system in general? This gap is a key finding; a better way to define it may be as a gap between the potential and the reality of the use of MLEs. This gap is made visible or observable by the findings of this thesis.

This key finding is a way to begin to respond directly to the overarching research question of this thesis: *How are MLE being used in the participating New Zealand secondary schools to develop 21st-century skills and competencies in learners?* The MLEs in the participating schools were being operated in a way that made visible the gap between the

spatial code of MLE as defined by literature (including the potential of the spatial qualities that literature presumes MLEs may contain) and the realities of the daily operations of these learning environments. This gap was visible, for example, when considering how the underpinning concepts of 21st-century skills and competencies and the 7 Principles of Learning were not being engaged with in the MLEs in the participating schools as underpinning concepts as the literature suggests they were designed to be. The gap was also visible concerning the increased visibility of practice participants reported. This gap was evident regarding the deprivatisation of teacher practice; literature suggested this should be employed as a form of constant professional development (Bradbeer, 2016; Charteris & Smardon 2018; Education Council, 2017; MoE, 2015), while in the reality of the operation of MLEs, the deprivatisation of practice was a reason given in each MLE for a team member to have stopped teaching in that MLE.

Additionally, the gap can be seen between the potential of the use of the spatial qualities that literature presumes MLEs may contain and the reality of the use of the spatial qualities concerning the organisation of the physical space of the learning environment. Some MLEs were organised so that class lots of students were taught in separate corners of the classroom and did not purposefully engage with other students, curriculum subjects, or teachers who were simultaneously timetabled into the same space. This led to adverse experiences and a focus on noise as a barrier to learning. In other MLEs, purposeful engagement with the other students, teachers, and curriculum subjects simultaneously timetabled into the space was reported to lead to positive experiences. For example, by observing others' learning, students reported decreased anxiety about future learning, and teachers reported positively engaging with their colleagues by their own volition to improve their teaching practice.

Viewing MLEs through the lens of a spatial code (Lefebvre, 1991) with reference to participant responses, the physical space becomes an organising connector in the operation of the environment. By this, I mean that the physical space of an MLE is not just a place where teaching and learning happen. It is a space occupied by humans who have concrete

situations, contrasting perspectives on single aspects of MLEs, and previous experiences of education to make comparisons to; they occupy the space together and are often required to collaborate, if not interact in general, because of the organisation and affordances of the space. Recognising the physical space of an MLE as an organising connector may be another foundational element to acknowledge if wanting to form an enduring spatial code for MLEs in the New Zealand secondary school system.

Research demonstrates that the most effective element to affect student learning in the classroom, no matter the type of learning environment, is a teacher's ability and understanding (Blackmore et al., 2011; Bradbeer et al., 2017; Bradbeer et al., 2019; Byers et al., 2018; Carvalho et al., 2020; ERO, 2018; Fletcher et al., 2020; Imms et al., 2017; Instance & Dumont, 2010; MoE, 2015; Wall, 2016a, 2016b; Young et al., 2020). When working in the team-teaching environment of an MLE, the findings of this thesis indicate that a teacher's ability to collaborate with their team members by acknowledging and productively communicating their perspectives is important, as is their understanding of spatial literacy regarding the learning environment they teach within. These elements may impact the effectiveness of an MLE, and they are definitely elements that influence the intersubjective reality of teaching and learning in MLEs.

Summary

To begin this chapter perspectivism and the idea of the participants' concrete situation were used to explore contrasting perspectives and comparisons reported throughout the findings. This section suggested that without guidance, a person's individual perspective becomes the guiding light on how an MLE should function effectively. This part of the discussion included recognising that all participants made comparisons to previous educational experiences when making sense of their experiences. These ideas were then used to consider, with reference to social constructionism, how these contrasting perspectives and comparisons may create the shared intersubjective reality of the operation of the MLEs

Following this increased visibility due to the increased physical space of MLEs reported by the participants was addressed. The concept of increased visibility led to a discussion on the deprivatisation of teacher and student practice. Writing on the deprivatisation of teacher practice often promotes this as a job-embedded form of constant professional development, viewing the teacher as a one-dimensional aspect in a learning environment; one-dimensional in the sense that this writing only seemed to refer to deprivatising teacher practice to teacher colleagues, during the school day. However, throughout the findings, it was possible to observe that teacher professional interaction was not only deprivatised in MLEs to colleagues but also to students and not only during the hours of the school day. Increased visibility of practice was also discussed with reference to learning other than curriculum subject knowledge. This section considered how the physical space of an MLE may aid in developing the key competencies of the NZC and what pedagogical potential MLEs have to offer regarding learning other than curriculum subject knowledge learning.

Finally, in this chapter, Lefebvre's (1991) ideas around a spatial code and ideas around elements to help form a new spatial code were considered. This discussion was proposed pertaining to a general spatial code for MLEs and how an individual's spatial code may be developed based upon their concrete perspective and previous comparisons to education. One main point from each of these sections was that there seemed to be a lack of time for participants to create agreed-upon definitions and goals or reflect on what they may each consider a spatial code to collectively create the operation of their MLE. By exploring individual understandings and experiences throughout the findings and then exploring what seemed to be common aspects across the participating schools, this study has been able to offer insight into the observable gap between the potential and the reality of the use of MLEs.

Chapter Eight: Conclusion

Introduction

This chapter concludes this thesis by providing a research summary and responding to the research questions. Key findings are outlined along with recommendations relevant to these findings and for future research. The limitations of the study and a redefined definition of pedagogical architecture are also presented in this chapter.

Research Summary

In the introduction of the thesis, the term modern learning environment was proposed as the name for learning environments that were established between 2010 and 2020 in New Zealand state-owned schools in line with *The New Zealand School Property Strategy 2011-2021* (MoE, 2011). MLEs were required to be developed as new schools were built and when property funding became available in existing schools. These changes from traditional cellular classrooms to large modern learning spaces were required at state-owned schools regardless of whether the school community and local community were prepared for or understood the reasons behind these changes. MLEs were to be developed to improve schooling property infrastructure, and it was assumed the affordances of the learning environments would support 21st-century teaching and learning to help attain the Ministry of Education's focus "on having a world-leading education system that equips all New Zealanders with the knowledge, skills and values to be successful citizens in the 21st-century" (MoE, 2011, p. 2).

The idea of 21st-century teaching and learning was promoted as a way to prepare learners for an unpredictable future by valuing knowledge-building skills as opposed to knowledge retention skills, as had become the norm in schools (Bolstad & Gilbert, 2012; Dumont et al., 2010; OECD, 2013, 2015). The idea of modern teaching and learning practices were referred to in literature regarding the need to develop MLE, but often in comparison to the idea of traditional teaching spaces and practices, which were generally presumed to be

inhibitive to adequately prepare learners for life in contemporary society (Starkey & Wood, 2021). However, neither concept (21st-century teaching and learning or modern teaching) was initially practically defined in a way that offered specific guidance for the daily operation of MLE in the New Zealand context. For example, Part B of a guiding document by the Ministry of Education (2015) cryptically stated that it "forms a critical link between the National Curriculum and the design of environments that will support the learning outcomes to which it aspires" (p. 5). Although this document suggested this may be achieved in part by teacher collaboration, there was no explanation of how teacher collaboration could or should be achieved. Therefore, when MLEs were initially introduced to the New Zealand schooling context, little guidance was offered on how to align teaching and learning practices with the affordances of the modified physical space to make effective use of MLEs to develop skilled, successful citizens for the 21st century.

The experience of teaching in an MLE inspired this qualitative project. The research undertaken for this thesis set out to explore the daily operation of MLE in four New Zealand secondary schools that had followed the directive to renovate and build MLE(s) as property funding became available (including when new schools were built). This non-random sampling (Onwuegbuzie & Collins, 2007) for the inclusion of the participating schools in this study was because this research was designed to gain insight into the phenomenon of MLE and how they were being understood and operated in the reality of their daily use. This aim can be seen in contrast to literature which explored any assumed potential the spatial qualities a building such as an MLE may afford teaching and learning for the 21st century (for example, Bradbeer, 2016; Dovey & Fisher, 2014; Fisher, 2005; Monahan, 2002; Nair & Fielding, 2005). It can also be seen in contrast to research that came from the educational philosophers' perspective (such as Bojesen, 2017; Thompson, 2018) but was not grounded in the experience of those who operated within MLE.

A multisite study was undertaken to explore the understandings and operations of MLEs in different contexts (schools). This approach allowed information and participant responses to be explored with reference to their specific contexts and an exploration of

general aspects of MLEs reported at the four participating schools (Audet & d'Amboise, 2001; Herriott & Firestone, 1983; Jenkins et al., 2018; Lewin & Stuart, 2002, 2003). Contextual information was gathered by a document review and during interviews with school principals.

The perspectives and understandings of 48 participants (total) involved with teaching and learning in MLEs were gathered from the four participating schools. The perspectives of teachers and principals were collected by individual semi-structured interviews and the perspectives of students were gathered by a focus group discussion at each school (Fontana & Frey, 2000). There were two main foci during data collection: (1) to investigate the organisational structure of the elements of the learning environments, and (2) to explore what those in MLEs considered 21st-century skills and competencies to be and how these were being developed in learners. This approach to exploring MLEs can be seen in contrast to learning environment research that focused on specific aspects instead of the general operation of MLEs (see, for example, Bradbeer, 2016, 2020; French et al., 2020; Trask, 2019; Young et al., 2020). This approach can also be seen in contrast to learning environment research that considered single perspectives of learning environments such as school principals or leaders (such as Bissett, 2014; Charteris et al.,2017; Imms et al., 2017).

Participant responses were analysed by domain summary and reflexive thematic analysis (Braun & Clark, 2006, 2019; Braun et al., 2019). The prevalence of participant responses coded into inductive (based on the primacy offered to participant responses) and deductive (based on research questions) themes were used as a guide throughout data analysis. The findings were then interpreted and discussed with reference to the ontological concept of relativism (Denzin & Lincoln, 2000; Fay, 1996) and the epistemological concepts of perspectivism (Fay, 1996; Heidegger, 1976; Wollen, 2003), and social constructionism (Berger & Luckmann, 1966, 2016; Burr, 2015, 2019). The findings were also interpreted against relevant literature explored throughout this thesis.

This research identified that without guidance, the operation of individual MLEs in the participating schools became dependent upon individual principal and teacher

perspectives and understandings. Individuals' perspectives and understandings then influenced the operation of the MLE(s) in the participating schools, where all teacher participants were assigned to teams and were required to collaborate.[21] The findings from this research also indicate that the participants' individual understandings and perspectives were historically situated based on previous experiences with education. When individuals' perspectives were in line, or in opposition, or disconnected from their peers and colleagues, a supportive or unsupportive intersubjective reality was created (Berger & Luckman, 1966, 2016; Burr, 2015, 2019). This was true in all nine MLEs represented in the four participating schools.

A Response to the Research Questions

The overarching research question of this thesis will be addressed shortly. First, the three research sub-questions developed to help gain insight and detail for answering the overarching question will be responded to as they lay a foundation for the overarching question.

Research sub-question A: *What do the MLEs in the participating schools look like at their pedagogical core, and what is the organisational structure of these learning environments?* began to be responded to in Chapter Four Findings I: The pedagogical Core and Organisational Structure of the Participating Schools. There was evidence in the findings that the contexts of the participating schools affected the operation of the corresponding MLE(s). All of the participating schools contained each of the elements of the pedagogical core: educators, learners, content and resources (OECD, 2013), but they were organised, understood and explained differently at each school. In all schools, educators were referred to as teachers and only qualified teachers were given this title. In all schools, teachers reported students learning from other students but they were not considered educators.

[21] The reported collaboration functioned along a continuum from collaborating for student pastoral care to taking collective responsibility for the integrated learning and assessment of the students assigned to the MLE.

Learners were referred to as students at all schools. Regarding content, students were taught some combination of English, Mathematics and Social Studies in the MLEs. When asked about the resources in the MLE all teacher participants considered the other staff as resources, but they did not initially necessarily consider the modified space to be a resource. The organisation of the elements of the pedagogical core varied within the different MLE, for example, some students were taught in class groups, others were taught as full-year cohorts, while others were taught in composite within class or cohort groups. Another example of the varying organisation was learning time.

This sub-question was further responded to in detail throughout the findings when exploring participant responses and how they related to the organisational structure of their specific MLE. Some teachers reported that the organisational structure of the MLE to which they were assigned, made possible because of the physical space, allowed a focus on different skills and competencies the spatial qualities of pre-MLE learning environments had not allowed for. One example was the focus on developing "nice person skills" and a student community at Kākāriki College. Teachers reported that because of the increased number of students and teachers timetabled into a learning environment, it became essential to help students relate to others. In this instance, others referred to students they may not have been timetabled with in a pre-MLE learning space, or may not come from the same socio-economic background, or have had similar life or teaching and learning experiences. This example demonstrates that in some MLEs in the participating schools, the organisational structure of the MLE(s) and the affordances of the physical space were purposefully engaged with to develop specific skills and competencies in learners. However, the organisational structure and affordances of the physical space were also reported by some participants to lead to incidental learning, learning that was unplanned, a by-product of some other activity (Buntting et al., 2018).

Findings related to research sub-question B*: What do educators and learners in the MLEs in the participating schools consider 21st-century skills and competencies to be?* indicated that there were no agreed-upon lists or definitions of 21st-century skills and

competencies at any of the participating schools. There was, however, some focus on developing the key competencies of the NZC: thinking; using language, symbols and text; managing self; relating to others; and participating and contributing (MoE, 2007, pp. 12–13) in learners as 21st-century skills and competencies. This was the case in all participating schools and reported by principal, teacher and student participants. Both of these findings concurred with Anaiadou and Claro, whose 2009 research explored what 21st-century skills and competencies OECD countries were focusing on developing in schools.

Teachers were aware of purposefully developing skills and competencies in the students for their future once they leave college, but only one teacher participant asserted the concept of 21st-century skills and competencies was an underpinning idea that guided their personal pedagogy. With no agreed-upon lists or definitions—as with the first key finding—what participants considered 21st-century skills and competencies were based on personal experiences and understandings and what they saw as important for their specific students in their specific contexts. Varying perspectives on what 21st-century skills and competencies could be was one example of how a supportive or unsupportive intersubjective reality was created.

Other specific skills and competencies offered (apart from the key competencies, see Table 5) were not new or different skills and competencies, the development of which was unsupported by pre-MLE learning environments. What was significant and interesting about the responses to this sub-question was that teacher participants were insistent that they were developing the skills and competencies in students before teaching in MLE spaces. The Ministry of Education originally intended MLEs to support 21st-century teaching and learning, but the idea of skills and competencies for a specific century was not an underpinning concept in the MLEs. Rather the skills and competencies principals and teachers saw as beneficial to their particular students were the focus. However, data collection happened during the 21st century, so it could be argued that any teaching and learning reported was 21st-century teaching and learning. This aspect of MLEs may have been clearer if the original guidance from the Ministry of Education had been clearer as

opposed to asserting the spaces would help support 21st-century teaching and learning and raise student achievement and not defining how (Benade, 2017, 2021; Hopkins, 2018; Starkey & Wood, 2021).

The final research sub-question, C: *In the MLEs at the participating schools what are the educators' perspectives of the OECD's 7 Principles of Learning?* revealed that 88% of teacher participants were unfamiliar with and not purposefully employing these principles in their teaching practice (see Table 2 for a list of these principles). The significance of this finding was related to the original developers of the 7 Principles of Learning (Istance & Dumont, 2010), advising that the principles need to be in action for a learning environment to be effective. It is important to note that this question explored the teachers' awareness of the 7 Principles of Learning, not the effectiveness of the MLEs.

What was more significant and interesting regarding this question was that OECD learning environment research, specifically the 7 Principles of Learning, was promoted as guidance when implementing MLEs in New Zealand (Carvalho, 2020; Couch, 2018; ERO, 2018; MoE, n.d., 2017), but teachers in MLEs, some of whom had been teaching in them for eight years, were not aware of, familiar with, or had not implemented these principles. The findings related to this question raise the issue of where and how teachers could and do find information that may help guide their practice. Is it possible that because of the lack of initial guidance from the Ministry of Education, teachers have turned to their personal experiences of teaching and learning to guide practice instead of returning to the Ministry of Education for guidance that is now available? Alternatively, maybe they are too busy with the daily operation of teaching and learning that they do not perceive free time to reflect on such information.

To respond to the overarching question: *How are MLE being used in the participating New Zealand secondary schools to develop 21st-century skills and competencies in learners?* it is essential to first return to the view of MLEs as physical buildings built to specific standards adopted as was required when property funding became available. Any skills and competencies that participants offered as 21st-century skills and

competencies were explained to be developed in students to prepare them for the future once they leave college. During interviews, it became apparent that the key competencies, especially the ability to manage self, were also being developed in students to enable teaching and learning in the increased physical space of MLEs where multiple subjects, multiple class lots of students, and multiple teachers were often simultaneously timetabled into the single space. This action may have been a response to student-teacher ratios (Starkey & Wood, 2021). This observation begins to answer the "how" part of the overarching research question. In some MLEs, the physical space of the learning environment, affordances reported by participants (increased interactions and increased visibility) and organisational structure were purposefully engaged with to develop skills and competencies (such as managing self) in students.

Deeper consideration of the overarching research question in conjunction with the approach to exploring the operation of the MLEs taken in this research revealed the following key finding: the MLE(s) in the participating schools were being operated in a way that made visible the gap between the Ministry of Education rhetoric regarding the purpose and use of modified learning environments, the potential of the spatial qualities that literature presumes MLE may contain and the reality of the daily operation of these learning environments. This key finding was expanded on in the final section of the discussion chapter and demonstrated with reference to 21st-century skills and competencies, the 7 Principles of Learning, deprivatisation of practice (teacher and student), and the organisational structure of the participating MLEs.

A further key finding was that the increased visibility in MLE made teacher and student practice observable in a way which meant they no longer carried out their roles within the bounded time of a lesson or the four walls of a classroom. Their practice was observable in this way due to the architectural design of the physical space and increased visibility in an MLE compared to a pre-MLE learning environment. The increased visibility was also due to pedagogical practices, which literature promotes to support 21st-century teaching and learning in MLEs by focusing on student-centred, personalised learning

(Bojesen, 2017; Dumont et al., 2010; OECD, 2013, 2015; Thompson, 2018). The visibility is also related to teachers being required to work in teacher teams in MLEs.

Limitations

Time is the key limitation to comment on under this heading as it was an influencing factor that helped shape this thesis. Time refers to the time available to visit schools to create a clear picture of the operation of their MLEs, the time principals and teachers had to contribute to interviews, the time available for students to participate in the focus group discussions, and the time between when MLE were first introduced and when this thesis will be published. This last point is a particular limitation because, as reported in the literature review in the most recent school property strategy (MoE, 2020a), MLEs (as defined in this thesis) are no longer required; instead, learning environments are to be built to Quality Learning Environments Standards. Although this strategy still refers to guidance documents that advocate for large, flexible learning spaces (MoE, 2015, 2020b), the directive to design spaces per the ILE Tool is no longer in action and *The New Zealand School Property Strategy 2011-2021* (MoE, 2011) has been replaced. This may mean there may be some confusion about terminology in this thesis in the future. To negate confusion, clear definitions have been given to terms throughout this thesis.

Although the primacy offered to participants is considered a strength of this thesis with reference to the aim of exploring the operation of MLE from the perspectives of those involved in the daily reality of the spaces, it could also be perceived as a limitation. The limitation is related to the generalisability the primacy offered. Primacy was offered to participants' responses to gain insight from their perspectives, but as the findings demonstrate, participant perspectives were historically and culturally situated based on the participants' previous experiences with education. The interpretivist aspect of the theoretical framework this research is positioned within adds to this limitation. During interviews, there was not always time or forethought to ask participants for clarification of their perspectives, and it was not until conducting data analysis that it became clear that participants'

perspectives and understandings were not always clear. This made some things hard to analyse and generalise across datasets, for example, when considering responses to participants' perceptions of 21st-century skills and competencies. This limitation may have been negated by having a more clear and precise overarching research question or designing the research with a second round of interviews after data analysis had begun during which time I could have clarified participants' understandings in relation to the other data I had analysed.

Contribution

Theory

The findings from this thesis contribute to theory by exploring Lefebvre's (1991) idea of a spatial code in the context of learning environments. This theory is then extended to recognise the importance of the interpretation of that code by those involved in the daily operation of those spaces. Within his work Lefebvre explored the reason for and defined the process of the formation of a spatial code, my work takes these understandings and explores them in practice in multiple comparable spaces. By using Lefebvre's idea of a spatial code in this thesis it is possible to clarify that there is no single interpretive truth regarding the organisational structure of an MLE rather that interpretation is based on the understandings of those involved in the operation of that space and the social, contextual, and cultural ideas that are believed to be relevant to that specific MLE.

Practice

As demonstrated in the findings, without guidance, the participants' individual perspectives and understandings were shaped by their previous experiences with education, and when those understandings and perspectives were not in line with their colleagues and peers, tense intersubjective realities were created. With consideration of Berger and Luckman's (1966, 2016) social constructionist ideas around the habitualisation,

institutionalisation, and internalisation of knowledge and reality, it is clear that without the purposeful time to reflect both individually and with teacher-team members, it is not possible to create any agreed-upon intersubjective reality. Instead, the team leaders' perspective "flavours" the operation of an MLE regardless of whether all team members are in agreement; this spatial code (Lefevbre, 1991) then stays in action until the next spatial code is formed.

Policy

Twenty-first-century skills and competencies and the 7 Principles of Learning were two concepts referred to throughout this thesis as important when exploring the operation of MLE. The importance of these concepts was related to the Ministry of Education rhetoric in action at the commencement of this thesis. Upon investigation, many participants were not as familiar as they could be, aware of or engaging with these concepts in their learning environment. This finding made visible the gap between Ministry of Education rhetoric and the reality of the daily use of MLE in the participating New Zealand secondary schools and contributes to an understanding of how Ministry of education guidance and policy has been put into action in modified learning environments.

Recommendations

For Policy

The observable gap commented on in the previous paragraph begs the question of what other information presumed to be important in the classroom from the perspective of literature is not being engaged with in the classroom. It also makes me wonder what information is being engaged with in the classroom that is not apparent in literature that could be explored to help with the operation of learning environments. Therefore I recommend an investigation into what practitioners in MLE consider to be important information and influential ideas regarding the operation of learning environments. Of

higher importance is understanding how teachers gain access to any information they consider to be underpinning or helpful related to MLE. The exploration into underpinning/helpful concepts and access to that information from the perspective of those who are involved with the daily operation of teaching and learning would offer insight into how to effectively disseminate information to schools directly to the people who would use it, as opposed to information being available but practitioners being unaware of it. Understanding how and where teachers access the information they find beneficial would also be incredibly helpful when future educational policies and changes are implemented, as this would be a way to share that information directly with those who need it.

For the Operation of MLEs

The first recommendation regarding practice is for a deep consideration and purposeful reflection by individual leaders, teachers and teacher-teams to create agreed-upon definitions and goals, including how the teacher teams should function and the roles of the different members. Purposeful reflection is recommended in learning environment research, which has identified the purposeful action and acceptance of a culture of change as a positive step in aligning the physical space with teaching and learning practices (see Blackmore et al., 2011, French et al., 2020). Findings of this thesis indicate that agreed upon definitions and goals are especially crucial when teachers are assigned to teams, and teacher collaboration is advocated for by guiding documents as is the case in the New Zealand context (Education Council, 2017; MoE, 2015).

The second recommendation is that principals, teachers and students further develop their understanding of the physical space of an MLE as an organising connector as opposed to simply a physical space where teaching and learning take place (classroom). This recommendation is offered to teachers who find themselves teaching in an MLE because it is the space they are assigned due to their timetable or the fact that it is the space available in the school where they teach. This recommendation is also critical for the organisation of MLEs, where multiple subjects and/or multiple year levels are taught simultaneously by

individual teachers or teacher-teams. This recommendation is fundamental for MLE where the MLE was the result of available property funding in comparison to any desire to change pedagogical practices: spaces where the physical environment was modified regardless of whether the school and local community were prepared for or understood the reasons for the change in the physical space of the learning environment.

Recognition of the space as an organising connector and its impact on teaching and learning may make visible perceptions of the positive and negative aspects of the physical space. Some interactions reported in the findings aided in decreasing student loneliness and built a purposeful and continual community of professional development for teachers and leaders. By identifying aspects and understandings of those aspects, they could be scaffolded to impact teaching and learning experiences in MLEs more positively. There may be many more ways than those reported in this thesis of how the physical space can impact teaching and learning from the perspective of the reality of those involved in the daily operation of MLEs. That impact would vary depending on students, teachers and the context of the school. Like with the first recommendation, time to reflect individually with teacher team members and with students is necessary to understand multiple ways the space is an organising connector and therefore how it can impact teaching and learning in the MLEs, which is why students' opinions should be included in these reflections.

Future research

Aligned with the limitations of the research undertaken for this thesis, a more focused or specific approach is recommended for future research. Three areas for future research identified through this current research are a deeper exploration of teacher-teams, further investigation into the deprivatisation of both teacher and student practice from the perspective of those who operate within MLE and an examination of what, how and where teachers gain information that influences their practice in the classroom.

An exploration of teachers' perceptions of team-teaching in spaces where this is implemented simply because it is advocated for in the space—instead of by the volition of

teachers—is recommended for future research. What, if any, professional development are teachers offered regarding how to collaborate and teach in teams? What professional development would teachers themselves find beneficial or presume they would find beneficial regarding collaborating and carrying out the practice as part of the team? What is the organisational structure of teacher-teams, and does this change at different times? What time allowances are allocated for teacher teams? To what extent are they expected to, and to what extent, do they collaborate? What are student perceptions of teacher-team collaboration, and how/do students perceive teacher collaboration to affect their educational experiences?

As noted when discussing the increased visibility of MLE in Chapter Seven there is a distinction between collaboration and deprivatisation and the increased visibility and deprivatisation of practice for both teachers and students may have a more far-reaching impact than literature currently explores. Findings from this thesis revealed that it is necessary to consider teachers, students and leaders as more than one-dimensional participants in MLE whose sole function is to carry out their social role in the classroom as a bounded space within the school day. An investigation into this aspect of MLE may offer insight into how to relieve tensions created by this organisational structure and reveal the true extent and impact of this phenomenon.

Final words

Pedagogical architecture was defined in the introduction as multidimensional, including the physical property and social and pedagogical dimensions of learning environments. The findings and discussion of this research revealed that it is necessary to view teachers, students and leaders as more than one-dimensional participants in MLEs whose sole function is to carry out their social role in the classroom as a bounded space. Therefore, pedagogical architecture is redefined as a multidimensional concept acknowledging the context-specific, physical, social, mental (perspectives, emotions and understandings, including spatial literacy), and pedagogical aspects of the learning

environment. This definition is submitted in combination with recognition of the necessity of purposeful reflection and planning in the construction of the operation of MLEs to ensure effective use of the space for teaching and learning.

Here, in the concluding chapter, it can be asserted that the approach to research undertaken in this thesis revealed an observable gap between the known and assumed potential of MLEs presented in literature and the reality of their use in daily operation. Because of the reported incidental learning, discoverable by reflection in interview and focus group discussions, it seems this gap may also include the unknown potential of MLEs. There is potential that the findings of this thesis may only be completely discoverable in reflection with those involved in the daily operation of the space. This gap is not the same throughout the different schools but varies depending on the teachers, students and contexts of the learning environment.

The understanding of QLE in the current school property strategy (MoE, 2020a) begins to address this potential from the perspective of how MLEs can better align with the teaching and learning practices at each school with the school vision and charter. However, the multidimensional view of both teachers and students observed in this thesis suggests a comprehension of MLE beyond solely being a learning environment developed as infrastructure to support 21st-century teaching and learning; instead, MLEs need to be understood as places where life is also carried out. It is this researcher's impression that a purposeful focus on the pedagogical architecture of the learning environment (including the existing spatial code) and purposeful time for reflection to clarify understandings and create shared definitions and goals would ease tensions in these learning environments. This may also allow a more effective focus to develop 21st-century skills and competencies in learners and prepare them to be successful 21st-century citizens, an original goal from when MLEs were first introduced to the New Zealand context.

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Appendix A

Information for School Principal

Project title: The pedagogical architecture of modern learning environments: Case study research in four New Zealand secondary schools.

Name of researcher: Julie Hest
Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate, I thank you. If you decide not to take part, there will be no disadvantage to you of any kind and I thank you for considering my request. If you have any questions about the project which you would like answered before you decide whether to participate, these questions can be directed to myself, Julie Hest, or my chief supervisor Roger Moltzen. Our contact details are at the end of this document.

Aim of the project:
This project is being undertaken as part of the requirements for my PhD in Education. The main research question I am investigating is how secondary schools in New Zealand with modern learning environments are employing these spaces to develop 21st-century skills and competencies in their learners. The purpose of the interviews I would like to undertake is to gain an understanding of the way teachers in MLEs interpret the core concepts of MLEs: pedagogical core, organisational structure and 21st-century skills and competencies. The purpose of the focus group discussion with some of the learners in the MLEs is to understand their experience of learning in the MLE.

The information from teachers, along with demographic information about the school, and the responses of the learners will be synthesised to create an overall picture in the form of a case study of the MLE in your school. This same process will be repeated at three other schools and then the information from the four case studies will be synthesised into the discussion of my thesis. The overall aim of this research is to enlarge the discourse on MLEs by understanding how MLEs are being interpreted in secondary schools in practice.

What information would I like to collect and how?
Should you agree for your school to take part in this project, you will be asked to engage in an audio recorded individual interview of approximately 60 minutes in duration. This interview will take place at a time and location which is convenient to you within the month of (XXXX). I will ask you about your school's journey to MLEs and also about your interpretation of the key concepts I will discuss with the educators in the MLE.

The interviews will be carried out by myself, and I will record the interviews digitally and also make notes. I will transcribe these recordings at which time I will make them available to you if you wish to read over them to make sure the points you have made are clear and what you wanted to say. I anticipate reading over the interviews should only take about 15 minutes more of your time. Only you, myself and my supervisors will have access to the transcripts.

I will also collect “demographic information” about your school via a document review. This should not require anything from you. I hope to find the information from places such as your school website and prospectus. The intention is that by gathering this information I will begin to build a comprehensive picture of your school in an attempt to see how the MLE is understood within the school as a whole.

Teachers who agree to take part in this project, will also be asked to engage in a recorded individual interview of approximately 60 minutes in duration. This interview will take place at a time and location which is convenient for them within the month of (XXX). The interview questions will be about the pedagogical core, organisational structure and 21st-century skills and competencies in MLEs.

I would also like to invite six learners from the MLE (three girls and three boys) to participate in a focus group discussion. The aim of this focus group is to collect student voice and gain a deeper understanding of their experience of the MLE. It would be ideal to carry out this focus group discussion during class time. I do not anticipate it lasting more than 45 minutes and will negotiate with the teaching team when might be the best time for this to occur so that it is least disruptive to students' learning. Before carrying out the focus group discussion, I need to obtain parental consent for the students who will participate. I will send home an information letter and consent form with students who express an interest in participating and add a date that I will need the form back by.

As well as this, I would like to take some photos of your MLE when it is empty. This will be a visual aid to help in understanding the way your school uses the space as a resource.

What will happen to the information participants share?
The information participants share will be confidential. Every attempt will be made to preserve the anonymity of all participants and the school. Pseudonyms will be used in the place of names. Any identifying data about the school will be disguised in publications or presentations arising from this study.

As required by the University of Waikato's research policy, the data collected, including the consent form, will be securely stored for five years upon completion of the project, after which time it will be destroyed. Any physical copies will be kept in a locked filing cabinet and any digital copies or communication will be stored in a password protected file on my personal computer.

What if participants have any questions?
If you have any questions about this project, either now or in the future, please feel free to contact either:

Julie Hest
University of Waikato
Faculty of Education
Tauranga
Phone number
Email

Roger Moltzen
University of Waikato
Faculty of Education
Hamilton
Phone number
Email

I hope that you consider this study to be worthwhile and that you agree to be a part of it.

Kind regards
Julie Hest

The pedagogical architecture of modern learning environments: Case study research in four New Zealand secondary schools

Principal Consent Form

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I understand

- The participation of my school in this project is entirely voluntary.
- I am free to withdraw the school from the project at any time without disadvantage to the school.
- I have the right to withdraw data from my interview up until the point of analysis.
- All data will remain confidential; it will be stored securely for five years and then it will be destroyed.
- The school and all participants will remain anonymous and pseudonyms will be used in place of real names; however, complete anonymity cannot be guaranteed as the thesis will be a published document.
- The main use of information gained through this project is for Julie Hest's PhD thesis, but information may also be used for other publications or presentations.

I consent to the involvement of my staff and learners in this study.

…… ……

(Name of school) (Date)

……

(Full name of participant)

……

(Signature of participant)

The pedagogical architecture of modern learning environments: Case study research in four New Zealand secondary schools

Information sheet for principal participants

Thank you for showing an interest in this project. The purpose of this Information Sheet is to assist you in making an informed decision about whether or not to participate. If you have any questions about the project which you would like answered before you decide whether to participate, these questions can be directed to myself, Julie Hest, or my chief supervisor Professor Roger Moltzen. Our contact details are at the end of this document.

Aim of the project:
This project is being undertaken as part of the requirements for my PhD in Education. The main research question I am investigating is: How are modern learning environments (MLE) being used in New Zealand secondary schools to develop 21st-century skills and competencies in their learners?

The purpose of the interview I would like to undertake with you (the principal) is to gain an understanding of your school's ongoing journey to MLEs in the way you, as the principal, interpret the elements of the pedagogical core of the MLE: the learners, educators, content and resources, as well as what you consider to be 21st-century skills and competencies. The information from yourself, along with the understanding gained from interviews with teachers who teach in the MLE at your school, demographic information about the school, and the responses from some of the learners who learn in the MLE will be synthesised to create an overall picture in the form of a case study of the MLE in your school. This same process will be repeated at three other schools and then the information from the four case studies will be reported in the findings of my thesis and then synthesised into the discussion chapter. The overall aim of this research is to enlarge the discourse on MLEs by understanding how MLEs are being interpreted and operated in a small group of New Zealand secondary schools.

What will you be asked to do?
Should you agree to take part in this project, you will be asked to engage in an audio recorded individual interview of approximately 60 minutes in duration. This interview will take place at a time and location which is convenient to you by the date we have specified. You do not have to answer any questions you do not want to and you may withdraw from participation in the project at any time. You may withdraw your transcripts from the project up until analysis.

The interview will be carried out by myself. I will record the interviews digitally and also make notes. I will transcribe the recording and then make this available to you if you wish to read over it to make sure the points you have made are clear and what you wanted to say. I anticipate reading over the interviews should only take about 15 minutes of your time. Only you, myself and my supervisors will have access to the transcripts.

What will happen to the information you share?
The information you share will be confidential. Every attempt will be made to preserve the anonymity of all participants and the school, and pseudonyms will be used in the place of names. However, complete anonymity cannot be guaranteed as the thesis will be a published document. The main use of the interview data will be for my thesis but may also be used for other publications and presentations. By consenting to participate in this project you are also consenting to your interview data being used for these purposes.

As required by the University of Waikato's research policy, the data collected, including the consent form, will be securely stored for five years upon completion of the project after which time it will be destroyed. Any physical copies will be kept in a locked filing cabinet and any digital copies or communication will be stored in a password protected file on my personal computer.

What if you have any questions?
If you have any questions about this project, either now or in the future, please feel free to contact either:

Julie Hest
University of Waikato
Faculty of Education
Tauranga
Phone number
Email

Roger Moltzen
University of Waikato
Faculty of Education
Hamilton
Phone number
Email

I hope that you consider this study to be worthwhile and that you agree to be a part of it.

Kind regards
Julie Hest

The pedagogical architecture of modern learning environments: Case study research in four New Zealand secondary schools

Principal interview consent form

I understand

- What this project is about. I have read the information sheet and all my questions have been answered to my satisfaction.
- I am free to request further information at any stage.
- My participation in the project is entirely voluntary.
- I am free to withdraw from the project at any time.
- I have the right to withdraw data up until the point of analysis.
- All data will remain confidential. It will be stored securely for five years and then it will be destroyed.
- All participants and the school will remain anonymous throughout the study; however, complete anonymity cannot be guaranteed as the thesis will be a published document.
- The main use of information gained through this project is for Julie Hest's thesis, but information may also be used for other publications or presentations.

I consent to be a part of this study.

.....
(Name of school)

.....
(Full name of participant)

.....
(Signature of participant)

.....
(Date)

Concepts for discussion with principal

- How did the school's journey to MLEs begin?
- How has the community reacted to the change?
- How were the learners and educators prepared for the transition?
- What professional development was/is available?
- How are the educators selected?

Appendix B

Information for Teacher Participants

Project title: The pedagogical architecture of modern learning environments: Case study research in four New Zealand secondary schools.

Name of researcher: Julie Hest
Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate, I thank you. If you decide not to take part, there will be no disadvantage to you of any kind and I thank you for considering my request. If you have any questions about the project which you would like answered before you decide whether to participate, these questions can be directed to myself, Julie Hest, or my chief supervisor Roger Moltzen. Our contact details are at the end of this document.

Aim of the project:
This project is being undertaken as part of the requirements for my PhD in Education. The main research question I am investigating is how secondary schools in New Zealand with modern learning environments are employing these spaces to develop 21st-century skills and competencies in their learners. The purpose of the interviews I would like to undertake is to gain an understanding of the way teachers in MLEs interpret the core concepts of MLEs: pedagogical core, organisational structure and 21st-century skills and competencies.

The information from teachers, along with demographic information about the school, and the responses of some of the learners will be synthesised to create an overall picture in the form of a case study of the MLE in your school. This same process will be repeated at three other schools and then the information from the four case studies will be synthesised into the discussion of my thesis. The overall aim of this research is to enlarge the discourse on MLEs by understanding how MLEs are being interpreted in secondary schools in practice.

What will you be asked to do?
Should you agree to take part in this project, you will be asked to engage in an audio recorded individual interview of approximately 60 minutes in duration. This interview will take place at a time and location which is convenient to you within the month of (XXXX). You do not have to answer any questions you do not want to and you may withdraw from participation in the project at any time without any disadvantage to yourself of any kind. You may withdraw your transcripts from the project up until analysis.

The interviews will be carried out by myself, and I will record the interviews digitally and also make notes. I will transcribe these recordings at which time I will make them available to you if you wish to read over them to make sure the points they have made are clear and what you wanted to say. I anticipate reading over the interviews should only take about 15 minutes more of your time. Only you, myself and my supervisors will have access to the transcripts.

What will happen to the information you share?
The information you share will be confidential. Every attempt will be made to preserve the anonymity of all participants and the school, and pseudonyms will be used in the place of names. However, complete anonymity cannot be guaranteed as the thesis will be a published document. The main use of the interview data will be for my thesis but may also be used for other publications and presentations. By consenting to participate in this project you are also consenting to your interview data being used for these purposes.

As required by the University of Waikato's research policy, the data collected, including the consent form, will be securely stored for five years upon completion of the project, after which time it will be destroyed. Any physical copies will be kept in a locked filing cabinet and any digital copies or communication will be stored in a password protected file on my personal computer.

What if you have any questions?
If you have any questions about this project, either now or in the future, please feel free to contact either:

Julie Hest
University of Waikato
Faculty of Education
Tauranga
Phone number
Email

Roger Moltzen
University of Waikato
Faculty of Education
Hamilton
Phone number
Email

I hope that you consider this study to be worthwhile and that you agree to be a part of it.

Kind regards
Julie Hest

The pedagogical architecture of modern learning environments: Case study research in four New Zealand secondary schools

Teacher consent form

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I understand

- My participation in the project is entirely voluntary.
- I am free to withdraw from the project at any time without any disadvantage.
- I have the right to withdraw data up until the point of analysis.
- All data will remain confidential. It will be stored securely for five years and then it will be destroyed.
- All participants and the school will remain anonymous throughout the study; however, complete anonymity cannot be guaranteed as the thesis will be a published document.
- The main use of information gained through this project is for Julie Hest's thesis, but information may also be used for other publications or presentations.

I consent to be a part of this study.

.....
(Name of school)

.....
(Full name of participant)

.....
(Signature of participant)

.....
(Date)

Core concepts and the elements to be discussed in interviews with teachers

- Pedagogical Core – This is to give an overview of the core elements of your MLE.
    - Learners, e.g. Who gets taught in your MLE? For example, is it one year group or more? Does everyone learn together or are specific learners working on different programmes?
    - Educators, e.g. Who teaches in your MLE? For example, do you have beginner teachers, or fully registered teachers, or do parents or other students teach in the space?
    - Resources, e.g. What resources do you use in your MLE. For example, how do you use technology, or the space within the MLE? Do you use the community as a resource?
    - Content, e.g. What specific content is used in your MLE? For example, what subjects are taught in your MLE? How are they taught and how do you decide on the specific content?

- Organisational Structure – This is to help understand how your MLE is organised.
    - Re-grouping of learners, e.g. Are your learners organised any differently in the MLE than they would be in a conventional classroom?
    - Re-grouping of educators, e.g. Can you please explain how the educators in your MLE are organised? Is it different at all to how they would be organised in a conventional classroom?
    - Learning time, e.g. Can you please explain the timetable to me and why it is organised the way it is?
    - Pedagogy and assessment, e.g. How is learning approached in your MLE? For example, is it project or inquiry or relationship based? Can you explain how assessment and feedback work in your MLE?

- 21st Century skills and competencies. What sort of skills and competencies do you focus on with your students in the MLE? Are there particular skills and competencies you think the MLE helps develop in students?

- What is your perception of the OECD's '7 principles of learning' in relation to the MLE you teach in?

Appendix C

Information for Students and Their Caregivers

Date XXXX
Dear XXXX

My name is Julie Hest and I am a PhD student at the University of Waikato.

I am interested in modern learning environments in secondary schools, and I am carrying out research in four different schools that have these environments. I hope to be able to record the different ways schools, teachers and students understand and use these spaces.

I would like to talk with your child in a group with five of their other classmates who also learn in the [use the name the school gives the MLE]. These students have all expressed an interest in participating in this project and talking together with me about their experience of learning in the MLE. This focus group discussion will occur during school time, at a time agreed to by their teachers so that it is not disruptive to their learning. This discussion will be digitally recorded and I think it should not take more than 45 minutes.

During the discussion I will ask the following questions:

- Have you learned in an MLE before?
- How does learning in the MLE compare to other learning you have done (within the school and in previous schools)?
- What is good about learning in an MLE?
- What is not good about learning in an MLE?
- What would you change about the MLE?

Anything said in the focus group discussion that is used in the thesis or shared with others will not be attributed to individuals. The information will be combined with what the teachers tell me and what I learn about the school to help paint a picture of what people understand and how they use the [name the MLE] in your child's school. I will do this same project at three other schools and then talk about them all in my thesis. The main use of this research will be for my thesis, but it may also be used for other publications and presentations. I will use pseudonyms instead of real name for all participants. I will ask the students involved in the focus groups to keep the discussion confidential, but complete anonymity cannot be guaranteed, particularly because your child will be involved in a focus group discussion and others in their class will know who they are.

The information I will gather in the interviews will be kept in a safe place and destroyed five years later as per the regulations at the University of Waikato. Your child's participation in this project is entirely voluntary and they may withdraw at any time without any repercussions. You will not, however, be able to withdraw your child's contribution to the focus group discussion because this will be a collective conversation where your child's contribution will be woven in with the other participants' contributions.

If you have any questions, please do not hesitate to contact me, or my supervisor with the details included below. If your child would like to participate and this is okay with you, please sign and return the form on the next page to the student centre. Please return the signed form by [DATE].

Thank you for taking the time to read and consider this information.

Kind regards
Julie Hest

Julie Hest
University of Waikato
Faculty of Education
Tauranga
Phone number
Email

Roger Moltzen
University of Waikato
Faculty of Education
Hamilton
Phone number
Email

The pedagogical architecture of modern learning environments: Case study research in four New Zealand secondary schools

Learner Consent form

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

Consent form for parents/caregivers	
School Name:	
Student's Full Name:	
I have read and understood the information in this letter dated ……. I consent to the involvement of my child in the research project.	
I understand that complete anonymity cannot be guaranteed as my child will be participating in a focus group with other students, and that my child should treat this as a confidential discussion.	
I understand that at any time I can withdraw my child from the research project or my child can decide to withdraw from the research project, but I cannot withdraw my child's contribution to the group discussion as this is a collective conversation.	
Consent from parent/caregiver	
Full Name:	
Signature:	Date:
Consent from student	
Signature of student:	Date:

Focus group discussion questions to be discussed with the six learners (three male and three female) in each school:

- Have you learned in an MLE before?
- How does learning in the MLE compare to other learning you have done (within the school and in previous schools)?
- What is good about learning in an MLE?
- What is not good about learning in an MLE?
- What would you change about the MLE?