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Lived experiences of Secondary School
Technology leaders with flexible
learning environments

2018

School of Education

A dissertation submitted in partial fulfilment of the requirements for the degree of Master of
Educational Leadership at Auckland University of Technology

Abstract

Flexible Learning Environments (FLEs) are a highly topical aspect of New Zealand education due to the work of the OECD (2015) and the prioritisation of the flexible spaces by the New Zealand Ministry of Education. Much of the literature focuses generically on the characteristics of and potential for space. In addition, much of the literature is centred on primary contexts due to the integrated nature of the curriculum within these types of school. It is only in very recent times that any sort of post occupancy evaluation has occurred and it was the intention of this study to contribute towards that through the lived experiences of secondary school Technology leaders.

The study describes the impact of the introduction of Technology in the New Zealand Curriculum (Ministry of Education, 1995). This is portrayed against a backdrop of curriculum design theory whereby socially constructed learning is posited against the concept of powerful knowledge as portrayed by Young and Muller (2014). The third element of the space and educational futures triangle is that of pedagogy and its relationship to space. This is addressed initially from the perspective of the failed open plan movement of the 1970s, before reframing the environment as an enabler of particular pedagogical types.

The research centred on the premise that within Technology, space has been used flexibly for some time. This was due to the natural alignment between the subject and the 7+3 Framework (OECD, 2015). This allowed for the subject area to be better placed in engaging with FLEs effectively. In understanding the effects of this leadership behaviours, actions and support mechanisms afforded to and provided by Technology leaders in these spaces was explored.

This phenomenological study focussed on the lived realities of four Technology leaders and through semi-structured interviews, provided their experience of the flexible use of space within their context. Attention was paid to the way in which external influences impacted on practise and also the ways in which Technology Leaders had acted on these influences.

Whilst Technology leaders use space in flexible ways this tends to be through the use of multiple fixed space rather than single agile spaces. This occurred due to the shift from a finite skills approach to a practical problem solving one centred on an authentic problem which is often student defined. This spatial use resulted in cultural shifts whereby teachers entered into the physical and social space of others, thus creating a deprivatised environment whereby staff also interacted with students not formally designated to them. This freedom of approach for students, afforded by teacher agency in working with and being accountable for all students

created opportunities and challenges with success being determined by staff 'buy in' and the framing of these conditions by the leader.

Recommendations derived from the research centred on the interplay of space and the actors within it. Simply using space to drive pedagogical change is ineffective and learns nothing from the failed open plan movement. Likewise, inherently linking pedagogy to curriculum type is limiting and has contributed to the negative rhetoric towards FLEs centred on an open plan typology when the potential is much more than that. The challenge now is to understand how the agility of space can be fostered within Technology alongside the learnings for other subject areas from the experiences within Technology.

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Attestation of authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements). Nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Matthew Bennett

Acknowledgements

In completing this manuscript I would like to thank my lovely wife, Lana for her continued support providing me with the time to study throughout this Master's Degree. I could not have completed this process without her unwavering support, encouragement and dedication allowing me to focus on undertaking and completing this research project. She has been a rock and without this support I would have certainly fallen by the wayside. The patience and understanding of my two children, Jack and Charlotte has also been amazing and the return to 'family time' at the conclusion of this project is something I am very much looking forward to.

It is vitally important to acknowledge the four technology leaders who participated in this research project. Their openness in sharing experiences, frustrations and successes was greatly appreciated. Without this willingness to candidly share these stories there would not have been the opportunity to complete this work. Their generosity in freely giving their time and talents is very much appreciated.

This experience of completing postgraduate study in educational leadership has been a hugely rewarding one for me both professionally and personally. I would like to thank all those who have contributed towards my opportunity to study at AUT through the provision of teacher scholarships and the continued support for teachers in similar positions to my own.

I would finally like to thank Howard Youngs, my supervisor for this dissertation. It has been an absolute pleasure to have worked with him over the past three and a half years in completing this Master's Degree. He has opened my eyes to seeing the world differently and his calmness, positivity, encouragement and patience has been very warmly and gratefully received. I feel absolutely privileged to have had Howard as a mentor and teacher during this experience. Thank you.

Ethics approval

This work has been conducted in accordance with the Auckland University of Technology Ethics Committee (AUTEC) policy and procedures. This dissertation was granted ethics approval by AUTEC on 13th February 2018. The ethics approval number is 18/40 and the notification of approval is contained in Appendix A.

Chapter One | Introduction

The impact of space on teaching and learning has been a topic of much debate and focus in recent years. This has led to research centred around the physical attributes of space including how spatial characteristics such as lighting, ventilation, heating and acoustics impact upon student outcomes (Barrett, Zhang, Davies, & Barrett, 2015; Wall, 2016); the sociomaterial nature of space (Mulcahy & Morrison, 2017); and how space impacts upon pedagogy and practice (Blackmore, Bateman, Loughlin, O'Mara, & Aranda, 2011; Neill & Etheridge, 2008) amongst others. What is only just beginning to be considered however, is what happens post occupancy, and how these new spaces can be evaluated (Imms, Cleveland, & Fisher, 2016), alongside how this affects practice and the leadership required to facilitate the necessary change required for the effective use of these types of environment. Technology as a subject area is a domain that I have worked within in numerous roles and in numerous contexts, as a teacher, Head of Department and Head of Faculty for the past twenty years, both in New Zealand and the United Kingdom. This experience within the subject area has shaped the researcher's values system in terms of why and how the subject is taught, alongside how spaces could and should be utilised to maximise students' educational outcomes.

Within New Zealand, the discussion around the impact of space is particularly poignant, with the Ministry of Education (2016) mandating Flexible Learning Spaces (FLS) are embedded in the planning or renovation of any new building development within schools. A further aspect that is not currently addressed is the suitability of specific subject areas to be better placed in effectively engaging with flexible space than others. Given the diversity of approach and inherent characteristics of subjects such as Physical Education and Technology, it could be argued that flexible learning spaces already exist within education. The drivers towards adopting this kind of structural and pedagogical approach have occurred both externally, from the OECD and the New Zealand Ministry of Education (MOE), and internally through the nature of the Technology curriculum (Ministry of Education, 1995). A strong argument could posit the nature of the Technology curriculum as an external force for change given it was introduced by the MOE however, the interpretation of this document and the decision to change structure and practice is very much internally driven. It is these influences or catalysts driving Technology leaders to engage with the use of space flexibly that will shape the remainder of chapter one.

The terminology surrounding such spaces is complex, with the literature in many countries referring to the same types of space by different names. Globally the descriptor used is Innovative Learning Environment (ILE) as this is the terminology used by the OECD. The New

Zealand Ministry of Education initially referred to such spaces by the term Modern Learning Environment (MLE) however, has now aligned itself with the OECD by using the term ILE within the literature. The focus of this study is centred upon the flexibility of space and going forward I will be referring to these types of spaces as Flexible Learning Environments (FLEs). Within the literature review the terminology described above may be used interchangeably, however, due to the context and perspective of the specific literature being referred to. This complexity of terminology is further addressed in the chapter two on page 9.

The emergence of Technology as a learning area

In understanding the emergence of Technology as a learning area within New Zealand education it is first important to understand the structuring of New Zealand secondary schools and the New Zealand Curriculum. Secondary schools within a New Zealand context educate students in years 9 to 13 (ages 13-18) with the first eight years of education occurring in primary (Year 1-6) and intermediate schools (Years 7-8). Whilst in junior schooling students may engage with an integrated curriculum centred on the New Zealand Curriculum (NZC) (Ministry of Education, 2007). This is in contrast to secondary school contexts where the majority of New Zealand schools teach the curriculum through discrete subject areas dictated by and mandated through the New Zealand Curriculum document. Alongside the eight essential learning areas the document promotes values and key competencies for all students which are delivered across and through all subject areas. The NZC (Ministry of Education, 2007) identifies the following values “excellence; innovation, inquiry and curiosity; diversity; equity; community and participation; ecological sustainability; integrity; respect” (p. 7) and the key competencies as “thinking; using language symbols and texts; managing self; relating to others; participating and contributing” (p. 7) as essential to its vision of education. Whilst the NZC defines achievement objectives for each subject area it is non-prescriptive regarding content and as such each educational institution or school is to develop a context specific curriculum centred on the NZC. With eight essential areas for learning being included in the NZC, inclusion provides a means for validation of the importance of the subject area, affording status and meaning.

Technology as one of the eight essential learning areas of the NZC is a relatively new subject area. In the foreword written in the first Technology curriculum document (Ministry of Education, 1995), the Education Secretary of the time identified the subject area as “an exciting new development for New Zealand schooling. It is the first national curriculum statement to be developed for the learning area of technology” (p. 5). In defining the aim of Technology education, the curriculum document states,

Learning in technology implies becoming confident in using a variety of means to address needs and opportunities and solve practical problems within society. It focuses on know-how as well as knowledge itself, gathering information from diverse sources. It encourages risk taking, lateral and divergent thinking, the development of multiple solutions to problems, trial and error, teamwork, and the management of resources effectively and efficiently. (Ministry of Education, 1995, p. 8)

Through the unpacking of this statement an understanding is gathered as to the diversity of approach and therefore the demands placed upon the teachers, school structures and environments. Prior to the curriculum document the subject was centred on the acquisition of skills in a particular material area be that wood, metal, plastic, textiles or food. This 'new' approach encouraged diversity and required changes in the accommodation used to teach the subject. As such many schools redeveloped their facilities to teach this 'modern' subject. Indeed three of the four contexts involved in this study redeveloped their technology facilities between 2000 and 2003 shortly after the implementation of the Technology curriculum.

In defining diverse information sources the NZC identified explicit links with other subject areas to include; language and languages, mathematics, science, social sciences, the arts, and health and physical wellbeing. This application of relevant conceptual knowledge from other subject areas was a major leap for Technology teachers at the time. Nationally, at the time the National Certificate of Educational Achievement (NCEA¹) was introduced in 2002, technology departments were divided between embracing the new curriculum area at senior levels or retaining skills based or vocationally driven programmes. This somewhat split the subject area. In further defining the subject area the Ministry of Education (1995) identified the curriculum as being "organised in three inter-related strands" (p. 10). These were identified as technological knowledge and understanding, technological capability and technology and society. Students undertaking practice within these strands were provided a means to developing technological literacy. Indeed these three strands have been retained in subsequent curriculum reviews. This meant that the previous skills focused subject area had been synthesised into the strand of technological capability, significantly shifting the focus of the subject. Of particular interest was one of the characteristics of learning stating that "Technological activities often require students to work co-operatively and collaboratively—with each other, their teachers, and other adults" (Ministry of Education, 1995, p. 16). Explicitly defining teamwork as an aim of technology

¹ NCEA is the national secondary education qualification undertaken in New Zealand secondary schools. NCEA is structured in three levels and follows a standards based assessment model where students undertake Achievement Standards to attain credits which contribute towards attaining a holistic certificate at the respective level.

education, alongside the co-operative and collaborative aim of the subject was a significant change. Coupled with an emphasis on divergent and lateral thinking a picture is painted of important aspects of what is now termed 21st century Learning (Bolstad & Gilbert, 2008).

In discussing curriculum design in the knowledge age, or 21st century, Bolstad and Gilbert (2008) posit that “Instead of tasks and activities designed to reproduce existing knowledge, students need activities designed to allow them to work with knowledge to create new knowledge” (p. 38). This statement echoes the aim of technology education in “solving practical problems within society” (Ministry of Education, 1995, p. 8) for which there may be no existing solution, therefore potentially constructing new knowledge. In doing this in collaborative ways, learning directly relates to the 7+3 framework (OECD, 2015) described below. This is important as one part of the driver behind Innovative Learning Environments (ILEs) as described by the OECD (2015) is the ability to engage in collaborative or socially constructed learning. This concept is one that is not unique to Technology but crosses subject boundaries.

The emergence of a curriculum for and the inclusion of Technology as an essential learning area was an important step in the validation of the subject area. Its impact was felt nationwide across both the primary and secondary educational sectors. Importantly, the impact of the Technology curriculum on schools has been, in some contexts, to facilitate a cross-curricula approach and as such break down some of the traditional subject area silos through applying conceptual knowledge from the knowledge bases of other subject areas both within and outside of Technology.

The influence of the OECD

Contrary to much of the literature, which is facility or architecturally focused, the OECD (2015) discuss ILEs in far broader conceptual terms. Their focus is on viewing the environment holistically, as opposed to physically, and is based around a framework referred to as 7+3. This framework positions the learning environment as a set of seven learning principles and three innovation dimensions. This framework is defined below.

The research-based learning principles state that, in order to be most effective, schools and other learning environments should attend to all of the following design principles:

- **Learning Principle One:** Make learning central, encourage engagement, and be where learners come to understand themselves as learners.
- **Learning Principle Two:** Ensure that learning is social and often collaborative.

- **Learning Principle Three:** Be highly attuned to learners' motivations and the importance of emotions.
- **Learning Principle Four:** Be acutely sensitive to individual differences including prior knowledge.
- **Learning Principle Five:** Be demanding for each learner but without excessive overload.
- **Learning Principle Six:** Use assessments consistent with these aims, with strong emphasis on formative feedback.
- **Learning Principle Seven:** Promote horizontal connectedness across learning activities and subjects, in- and out-of-school. (OECD, 2015, p. 24)

Alongside these learning principles are three dimensions which the OECD (2015) describe as “powerful learning environments”. These dimensions include “Innovate their pedagogical core, become “formative organisations” with strong learning leadership and open up to partnership” (p. 19). Of particular relevance to this study is the holistic nature of the OECD’s approach to ILEs alongside the collaborative nature of principle two, and the innovative pedagogical focus of dimension one. It is this innovative approach relating to pedagogy and the opportunity that the flexible use of space opens up that is often overlooked by detractors to ILEs by the singular focus on the physical nature of the space.

Spatial implications within New Zealand Education

In publishing their *The New Zealand school property strategy 2011 - 2021*, Ministry of Education (2011) identified the need for Modern Learning Environments (MLEs) which were fit for purpose, citing that “a teacher-centred system that revolved around structured classroom lessons” (p. 13) was no longer fit for purpose. The MOE later revised the term MLE to align with the ILE terminology used by the OECD. Coupled with the 7+3 framework presented by the OECD (2015) much has been done to stimulate the conversation around the appropriateness of existing learning environments. This has led authors to ask questions of the impact of space and environment on student outcomes. For instance “Does the learning space make a difference to learning?” and “Does contemporary learning require renewed space?” (Mulcahy & Morrison, 2017, p. 3). Other authors have attempted to identify this impact. When evaluating space, Wall (2016) summarises research findings, concluding that “...any area that adversely affects students will tend to have a similar effect on teachers” (p. 15). It could be presumed that the inverse of this will also be true. As explored in the section ‘Buildings alone will not change pedagogy’ of chapter two, these changes are about more than just redefining and changing the physical space. One criticism of made of ILEs is that traditional teacher centred pedagogies re-emerge in a new

environment not designed to support them (Charteris, Smardon, & Nelson, 2017) hence the importance of the holistic approach, to include pedagogy and practice, as evident in the 7+3 framework (OECD, 2015). It is this feature of the leadership requirements of change, both in physical space, structures and pedagogical change that is the focus of this dissertation. This study hopes to address this by investigating the flexible use of space through FLEs within the Technology curriculum area.

Rationale

The rationale behind this research project was to explore the ways in which space is already used in flexible ways within Technology education. Given the prevalence of discussion around how environments impact upon teaching and learning, I felt it important to explore the impact that the aims of the original Technology Curriculum, published twenty three years ago, has had on the use of space in determining the potential future learnings for other subjects adopting a similar approach. The leap in 1995 from a finite skills training approach centred on a single material focus, or workshop technology, to the promotion of thinking skills and abstract knowledge application had profound implications for the way in which space is used in Technology as a subject area. The pedagogy and strategies used to work efficiently and effectively have also shifted within such space. The reaction to how this space has been used and the development of spaces over the past twenty years to engage in this way of working made Technology a natural choice for study.

According to the NZC (Ministry of Education, 1995) learning in technology, and therefore the driver of practice and pedagogy within the subject, included such things as:

- Building on “students’ existing knowledge and skills, values and interests”
- Understanding that there is “no single “right answer” – lateral thinking and willingness to test divergent options
- The “sharing (of) ideas, presenting concepts, and evaluating of possible solutions” and the requirement for students to work co-operatively and collaboratively - with each other, their teachers and other adults (p. 16)

The co-construction of learning in the final point above is an important one as this social-constructivist approach is one of the key tenets of 21st century learning. This espoused pedagogy from the Technology curriculum document meant that the subject could no longer be taught in a silo of material and skill. It also meant that the ‘traditional’ forward facing, teacher centric environment would be limiting and constraining in delivering such a curriculum. Indeed, due to

the specialist nature of tasks linked to space there was a requirement for teachers to work flexibly with one another to provide resource access to students as and when required. How this is managed is an area of significant interest as it echo's some of the generic FLE discussion of current times.

Given the requirements of the Technology Curriculum (Ministry of Education, 1995) written sixteen years prior to the *Ten Year Building Plan* (Ministry of Education, 2011), it is the premise of this study that FLEs are not so new after all and that the seeds of what we understand as FLEs were perhaps, sown significantly earlier. In transitioning to alternate spaces there is a leadership imperative to manage this change. A key aspect of this is in allowing teachers to adjust and adapt to space and the pedagogies required to operate effectively within that space. It is this feature of the leadership requirements of change both in physical space, structures and pedagogical change that is the focus of this dissertation. This study hopes to address this by exploring the implications of the FLEs within the Technology domain.

Research questions

In addressing this opportunity for research the following research question will be answered.

How do Secondary School Technology leaders account for their experiences of change associated with utilising flexible learning environments?

In further understanding this area, subsequent questions, and areas of direction for this research will include understanding:

- I. What was the catalyst that drove the change process towards a more flexible learning environment within the technology department?
- II. What structures and support mechanisms did Heads' of Technology provide to their teaching staff in enabling flexible use of space and resources?
- III. What external factors (from outside of the Technology Department) provided support or barriers for change towards Flexible Learning Environments?

Research design

As the research focuses on the experiences of four participants who have worked within FLEs across a number of contexts the following epistemological and ontological assumptions were made. Epistemologically the stance of this study accepts that the discussion and recording of lived experience pertains to knowledge. Whilst ontologically, the study accepts reality as being the lived reality of each of the participants. Each of the four participants were interviewed,

either in person or via Skype, to understand their experience of working within and implementing practice within such environments. The audio from each interview was digitally recorded and transcribed by the researcher. Participant selection was based on the diversity of context and video conferencing provided an opportunity to broaden the geographic boundaries for participation.

Dissertation organisation

Following this, chapter two comprises of a literature review. This review highlights and brings to the fore issues pertaining to a focus on more than just buildings when considering the use of space, the characteristics of FLEs, a variety of collaborative effects from the environments, the requirement for more than just infrastructure to make pedagogical change, as well as leadership issues related to such change. These topics are situated under the umbrella concept of student centred learning.

Chapter three describes the methodology and approach taken in conducting this research. The initial focus is on the methodological assumptions made and progresses to justify the use of the tools and methods selected. This includes issues of data collection and data analysis alongside the ethical considerations related to such research.

In chapter four the results and findings of the research are presented. The findings from each participant have been presented individually to account for understanding the lived experience of each participant, rather than a thematic presentation. The data has been organised under two meta-themes of 'impacting on' and 'acting on', and the five themes derived from the data analysis and coding process.

Chapter five provides discussion around the findings from the research. This discussion interprets these in relation to the literature review in answering the research question and sub-questions.

Conclusions of the study are drawn in chapter six. This chapter proceeds to identify the limitations of the study and concludes by making recommendations for future and subsequent research.

Chapter Two | Literature review

Introduction

FLEs within all aspects of education are highly topical, with many educators expressing opinions, both for and against. The term FLE encompasses a wide variety of very different environments. The discussion around learning environments has also produced a variety of differing terms for essentially the same concept of space, albeit with differing foci. These spaces have been termed Modern Learning Environments (MLEs) (Ministry of Education, 2011, p. 13), New Generation Learning Environments' (NGLEs) (Cleveland & Imms, 2015, p. 4), Flexible Learning Environments (FLEs) (Benade, 2015, p. 9) and Innovative Learning Environments (ILEs) (Ministry of Education, 2016; OECD, 2013, p. 22). These terms tend to be regionalised and specific to authors. The New Zealand Ministry of Education has settled on ILE as the universal descriptor within the New Zealand context. Osborne (2016) has attempted to disentangle the terms of ILE and FLE, positioning an ILE as an environment that is capable of evolving and an FLE as an environment comprising of different sized spaces to enable a variety of pedagogy and activity to occur. It is the term FLE and the flexibility of space that holds the focus of this study as innovative, new generation and modern are associated with time and place. This literature review is structured around the characteristics and design features of FLEs as situated under the umbrella of student centred learning. It progresses to focus upon the collaborative effects of space and culminates by looking at the leadership of change related to such spaces. It should be noted that throughout this literature review, the terminology used to refer to space as described above retains that used by the respective author.

Student centred learning

In considering the need to address the entire concept of education in the 21st century, Kedian and West-Burnham (2017) address concerns with the existing educational model in Western societies when they state:

The current western schooling model is arguably predicated on an anticipation that the future will be similar to the past. However, the social context in which schools are located have changed substantially – values, technologies, international perspectives, changes in the nature and extent of future employment opportunities. (p. 7)

This apparent disconnection between society and education has been the source of a variety of initiatives, one of which has been the conceptualisation of ILEs, to address this gap between modern day society and an education system whose classrooms' current form has been in place

for one hundred and fifty years. This has led to the term 'industrial education' being used to describe a traditional teacher centred, didactic education. When critiquing 'industrial education' and the use of ILEs as a lever to enact environmental change, Benade and Jackson (2017) question whether the basic purpose of education has changed dramatically in the 21st century.

Bolstad and Gilbert (2008), when considering a shift to 21st century learning, identify the educational change as being an epistemological shift in how we value knowledge. Knowledge is no longer something that is produced by experts but is something that happens socially through collaboration. This change, Bolstad and Gilbert (2008) argue, is the shift from the industrial age of the 20th century to that of the knowledge age of the 21st century. If knowledge is formed collaboratively then the logical progression is that the environment in which the knowledge or understanding is created needs to be conducive to collaboration. Traditional classrooms described as 'single cell' (Charteris et al., 2017; Osborne, 2017) or "industrial age egg crates" (Hattie, 2003, p. 13 as cited in Charteris et al. (2017)) imply a negative rhetoric towards these types of classrooms thus promoting a shift towards FLEs. The danger in this thinking is that the rationale for the shift in environment is lost. The imperative for diverse pedagogy associated with effective teaching and learning is that the space is the enabler and not the outcome. This is important as it could be argued that collaborative learning can occur in single-cell environments. However, given the constraints of space in these environments this is not ideal. This is due to a much more limited amount of space per student, coupled with a reduction in the potential agility in transforming space for diverse approaches towards teaching and learning in a single cell environment.

In discussing the strengths of a traditional classroom the literature identifies that they are best suited to teacher centric styles (Wall, 2016), lecture based pedagogy and a singular focus on the instructor (Neill & Etheridge, 2008). Mulcahy and Morrison (2017) when discussing ILEs as relational environments identify that "the majority of teachers (in one of the studied schools) "really want to do teacher-led stuff"" (p. 6), indicating that there is a disconnection between environment and pedagogy or perhaps a lack of awareness of the opportunity of space. This is a claim reinforced by Woolner, McCarter, Wall, and Higgins (2012) who identify that "didactic classrooms develop didactic teachers" (p. 47) and the concept of teachers' "spatial literacy" (Imms, 2017, p. 7) is generally poor. Given the prevalence of traditional classrooms and an associated lack of spatial literacy of teachers, it is unsurprising that there is resistance to move towards more flexible approaches to space. In discussing the challenges going forward pertaining to FLEs, Imms and Byers (2017) identify the need to isolate the effect of specific pedagogy as it is the environment which enables the pedagogy and the pedagogy that increases

student engagement. The argument for a shift towards more flexible spaces come from a need to develop a more learner centric approach and shift away from teacher centric territories.

Gislason (2010) argues that administrators prefer a “traditional classroom paradigm” (p. 130) whereby there is one teacher in charge of a standard sized class. Bradbeer (2015) identifies that these environments “privilege ‘invisibility’, ‘privacy’, ‘autonomy’ and ‘territory’, not qualities conducive to collaboration.” (p. 14). Given the argument of a shift towards a more student centric pedagogy in the form of 21st century learning it is logical to determine that these spaces and indeed academic structure of organising subjects into areas and then teaching blocks in a timetable may not be fit for purpose.

In adding an alternate view to this discussion, the traditional subject or discipline based approach to education and the 21st century learning binary has been challenged by McPhail and Rata (2016) in their critique of 21st century learning as a concept. They propose that a further concept described as ‘Powerful Knowledge’ presented by Young and Muller (2014) is an alternative educational future. Both concepts stem from a social justice stance that contend that learners should not be precluded from information or knowledge, but McPhail and Rata (2016) posit that the differences lie in “what is meant by knowledge, how this knowledge is to be organised and how it is to be made available in school (pedagogy)” (p. 54). By way of contrast, 21st century learning positions the knowledge with the knower, making it a socially constructed phenomenon thus removing it from the traditional disciplines or subject areas as currently experienced within most schools. This blurs the boundary between knowledge and pedagogy. Powerful knowledge, by way of contrast, values specialised knowledge which is not acquired socially or informally (Young & Muller, 2014). This lens through which knowledge is viewed values abstract concepts and relationships between concepts, and McPhail and Rata (2016) state that the challenge is to determine “how best to sequence concepts” (p. 55) allowing progression from lower to higher-order understanding, and then determining the most appropriate pedagogy to deliver this to the student. The purpose of this digression is to acknowledge that alongside the development of FLEs there is not necessarily a compulsion to abandon an objective discipline based curriculum in favour of a more subjective social constructivist approach. It is a question of pedagogy for which the agility of FLEs is best placed for both epistemological stances as both reject didactic teacher led pedagogies. Indeed McPhail and Rata (2016) identify that teaching academic subjects in a rote-learning or teacher centric style was a “pedagogical fault, not a function of the subjects themselves” (p. 62). For some this distinction between knowledge and pedagogy becomes blurred and knowledge defaults to didactic teaching.

The change towards FLEs driven in New Zealand through the Ministry of Education's building programme and internationally through the *Schooling Redesigned* document (OECD, 2015) is a radical one as it presents a significantly different environment for teachers to work within. This is especially confronting due to the huge financial investment in building infrastructure required to enact this change. Kennedy (2017) identifies the current situation as a paradigm shift which moves the focus of education from the teacher to the student. Tse, Learoyd-Smith, Stables, and Daniels (2015), from their experience in the United Kingdom, acknowledge that the change made in the UK's *Building Schools for the Future* programme was an extreme one where "it was impossible to go back to square one." (p. 72). Kedian and West-Burnham (2017) identify one of the strongest barriers to change as being the assumption that in Western society we "know what it means to learn at school and what a school is" (p. 16). This social understanding perhaps blinkers us to change, especially change which is radical, polarising, and irreversible. In the New Zealand context, the current investment in FLEs requires teachers to have a deeper understanding of space and pedagogy (Barry & Rafferty, 2017). The critique by Tse et al. (2015), on the *Building Schools for the Future* programme in the UK, is that a shift away from a traditional approach to teaching and learning is enforced through policy by changing the physical environment to one that makes a single teacher to single class approach more challenging. The potential result of changes centred solely on the physical environment is that teachers continue to work in traditional ways in a sub-optimal environment for this kind of teaching.

A focus on more than just buildings

Much of the research conducted into learning environments prior to 2015 focussed on the physical characteristics of the environment. According to Wall (2016) this included; lighting, heating, ventilation, acoustics, fixtures and fittings and what the author termed "advanced features" (p. 8). It is these features and their specific link to pedagogy that is of particular interest in developing the flexibility and agility of a learning space, as well as the ability of the space to enable differing pedagogies. The association with pedagogy is important as this provides a direct link to student learning outcomes.

One of the counter arguments against the shift towards more flexible and agile space has stemmed from the meta-analysis work of Hattie (2009). He concluded that for student learning outcomes, space had only a negligible effect. It should be noted that the focus of space in the context of this work was much more on open vs traditional spaces and the meta analysis isolated space in order to measure its effect on student outcomes. Hattie (2009, p. 88) also reflects that "open education had its heyday in the 1970s and 1980s". Imms and Byers (2017) when addressing this, identify that the measure used by Hattie (2009) "did not account for the

teaching practices that such spaces could afford; simply changing the space was not enough.” (p. 141). This concept of changing the space to drive change in education will be explored later in this literature review.

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Figure 1. Typology of Essential Teaching Approaches (Bradbeer et al., 2017, p. 25)

If the consideration of space in isolation and away from pedagogy misses the point, then in addition to the consideration of space there also needs to be a consideration of pedagogy. Bradbeer et al. (2017), when considering progress in New Zealand regarding a shift towards FLEs, presents a typology of essential teaching approaches illustrated in Figure 1 above. This typology provides a graphical reference as to how teaching approaches can be constrained or enabled through space. It also goes some way to illustrate the role of the teacher in each approach and typology three identifies the possibility of a second teacher in a team or collaborative teaching environment. With the exception of typology one, five and six every other approach requires

the ability of the environment to be large enough to contain groups of students along with the flexibility to move furniture if enacted in the same space. This concept is referred to in the literature as the 'agility of space' (Dovey & Fisher, 2014; Perkins, 2009). Perkins (2009) elaborates on the term agility by emphasising the need for change to be enacted by the student without the reliance of the teacher or support staff having to action this prior to the lesson.

Neill and Etheridge (2008) discuss the term "room efficacy" (p. 49) and the effects of spatial flexibility to increase student engagement, facilitate collaboration, allow for a variety of uses and enhance the teaching and learning style of participants. These terms of engagement and collaboration indicate a more social side to education whereby students work together to foster understanding. Whilst these social traits of education can be evident in a single cell environment, an important outcome of FLEs is that these types of spaces facilitate a social approach through flexible spatial arrangements. Wall (2016) discusses the greater opportunities afforded by flexible spaces to individual and group based learning which is student centred and provides opportunities for "collaborative teaching practices" (p. 5). This interaction between staff is challenging in a single cell environment as these spaces have been deliberately designed to contain a typical class of around thirty students and a single teacher.

Some authors suggest that it is the act of modifying the room or choosing a space which increases engagement as it involves students actively engaging in their own learning (Benade, 2017a; Neill & Etheridge, 2008). This empowerment or learner agency (Osborne, 2016), brought about by space but also by the prevalence of technology within these spaces has increased engagement. A further factor to which Osborne (2016) attributed increased engagement or rather a reduction in off-task behaviour was that of density of space and matching that to the activity. Where a space is less dense and there is opportunity to circulate, as is the case with open environments, behavioural problems decreased. This conclusion was based on a study by Gifford (2002) relating to environmental psychology and importantly identified that teacher pedagogy needed to match the task. Benade (2017a) identifies that "it is not the physical space making the sole difference, but rather the complex web of social relationships that can (or cannot) occur within a given spatial context" (pp. 127-128). Essentially the space acts as an enabler or indeed a disabler of particular pedagogy, reinforcing the links between the two. Space and practice are not approached in isolation or as two separate entities. Mulcahy and Morrison (2017) take this a stage further when they reject the simplified concept of a pedagogy and space binary but moreover promote a relational approach to considering learning environments. This relational approach reinforces the complex web proposed by Benade (2017a). In describing this phenomenon, Mulcahy and Morrison (2017) consider FLEs to be a "sociomaterial assemblage"

(p. 8) that affects and is affected by what goes on within it. This stance challenges the view of environments being physical entities which support learning and embraces the social potential of environments and the effect that people have on and within spaces. Within a traditional, didactic, teacher centric model of educational practice this view of the environment and pedagogy affecting learning potential could be quite confronting.

Buildings alone will not change pedagogy

Within the literature it has been noted that much of the shift towards these innovative modern or flexible spaces has not been the result of creative thinking in the education sector but more the push by governments to influence educational outcomes (Benade & Jackson, 2017; Tse et al., 2015). Cleveland (2015) notes the term “built pedagogy” (p. 59) used by Torin Monahan, a Professor of Communication at the University of North Carolina, with reference to aligning teacher practice and educational architecture. This attempt to promote a more collaborative culture in schools through removing the single cell environment is reinforced by the mandating of ILE features in all new building design by the New Zealand Ministry of Education (Charteris et al., 2017) under the *Ten Year Building Plan* for all property projects in New Zealand state schools. Charteris et al. (2017) also observe that property is a key enabler in the MOE’s strategy to move towards 21st century learning practices indicating the overarching ideal towards expenditure on these environments. Dovey and Fisher (2014) identify the open plan style of environment that typifies the mental picture conjured up when considering ILEs to be not particularly agile. They also note “irreversibility of the open plan” environment and the use of architecture to “coerce teachers into new pedagogies.” (p. 58). This is of particular significance within New Zealand, given the Ministry of Education’s imperative to incorporate features of ILEs into every new build as part of its *New Zealand school property strategy 2011-2021* (Ministry of Education, 2011).

In reaction to the concept of built pedagogy, numerous authors acknowledge the problems caused by using a development of infrastructure to drive educational change. Mackey, O’Reilly, Fletcher, and Jansen (2017) identify the “significant risk for students, staff and whanau when buildings or technology drive change process” (p. 106). It should be noted that in this context technology is referring to information technology and is not to be confused with the subject area discussed in this study.

Characteristics of FLEs

There are numerous characteristics of FLEs. The most focussed upon or dominant characteristic relates to the potential open plan nature of these spaces. Deed and Lesko (2015) describe this as “unwalling the classroom” (p. 218). This aspect of these environments is particularly

polarising amongst teachers as what was once an activity involving one class with one teacher is potentially an activity involving a much larger group of learners with numerous teachers. For some this presents tremendous opportunity, yet for others this is quite threatening. Blackmore et al. (2011) discuss the development of FLEs as being more than just a one size fits all approach and identify a lack of consideration for context in the literature relating to spatial design as being a significant gap. Whilst a generalism, the opening up of space is considered a positive due to the effect of it deprivatising practice (Benade, 2017a; Charteris et al., 2017). In addition it also provides freedom for both teacher and learner in approaches to teaching and learning (Neill & Etheridge, 2008). This is quite different from more traditional environments which potentially promote or encourage more teacher directed or didactic pedagogy. Neill and Etheridge (2008) acknowledge this when they state “the traditional classroom, with its fixed seating arrangement and singular focus on the instructor, is best suited for lecture” (p. 50). Alongside the claimed positive concept of collaboration, characteristics of FLEs include the possible positive impact of space as an enabler of innovative pedagogy (Benade, 2017a; Imms & Byers, 2017), engaging learners through the social nature of FLEs (Mulcahy & Morrison, 2017) and operating with a student centric focus (Neill & Etheridge, 2008; OECD, 2015) as well as the promotion of learner agency (Osborne, 2016) through choice in space.

Many of the perspectives of FLEs have particular views of what these spaces are or look like. Some have the intent of open plan, warehouse type environments whilst others focus on the furnishings and draw attention to furniture such as bean bags and other alternatives to chairs and tables. Stereotyping all FLEs as open plan is a limiting perspective as these environments can include a wide variety of spatial types. In Table 1 below, Dovey and Fisher (2014) present a typology of learning spaces. This shows the naming of spatial types alongside the physical characteristics of these learning spaces including the potential size and use. Importantly the traditional ‘closed’ learning space or classroom is the first entry in this table. Also of note is the functionality attached to some of these spaces and the identification of fixed function spaces.

Table 1
Typology of Learning Spaces (Dovey & Fisher, 2014, p. 48)

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Imms et al. (2016) have taken the written typology above and developed it graphically to illustrate the potential relationships between these spaces. This is presented in Figure 2 over the page. Alongside the graphical representation another feature of these plans is the placing of these spaces on a continuum from traditional environments on the left (labelled 'A'), through to open-plan learning spaces on the right (labelled 'E').

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Figure 2. Learning Space Typologies (Imms et al., 2016, p. 4)

Due to the radical change of space from a traditional single cell classroom, it is overly simplistic to consider this typology in terms of the right side being the most preferable and the layout on the left the least. This reflects the almost evangelical stance of some towards these kinds of spaces and related pedagogy (Imms, 2017). Imms et al. (2016) note that the difference in the continuum is the degree of openness of the environment and to experienced educators, spaces C and D offer the greatest flexibility. This indicates that the concept of flexibility in space is not a blinkered one size fits all solution that can be applied to all settings. Flexibility will come from the multi-purpose nature of the space, the characteristics of the furniture placed within it and the breadth of potential educational activities. It is not a diagram placing desirability towards a preferred extreme to the right and an undesirable extreme on the left. Typology E provides the opportunity for large open plan rooms populated by large groups and multiple teachers. At the other end of the scale, the traditional classroom model is effective in a setting where teaching and learning occurs that is teacher and not student-centric (Benade, 2017a; Neill & Etheridge, 2008; Wall, 2016). The major concern is that in space A the opportunity to utilise other pedagogies is limited due to constrained space. Benade (2017a) also notes that these single cell spaces provide “fewer spatial opportunities to redirect students who have become disengaged” (p. 120) which touches upon engagement and behavioural management possibilities in an alternate environment.

This radical change in extremes of educational space was experienced by educators during the open plan movement occurring in the United Kingdom, United States and Australia in the 1970s and early 1980s (Rodwell, 1998). When looking at this era Rodwell (1998) identifies spaces as “the ‘barn type’, with only permanent walls being the exterior ones” or “the most popular internal design.... The ‘nook and cranny type’” (p. 110). These descriptions conjure up ideas of the typologies D and E proposed by Imms et al. (2016) in Figure 2 above, some forty years later. When considering the rationale behind revisiting a movement which was moved away from over thirty years ago Sigurðardóttir and Hjartarson (2016), when critiquing open plan design in Iceland this century, suggest a shift towards constructivist views of education and the impact of new technologies to be the drivers in considering these types of environments once more. In critiquing the open plan movement Rodwell (1998) notes the “comparative low cost” (p. 112) of these environments as a change driver. In the 21st century this stance has shifted with an acknowledgement of the importance and technological development of acoustics, lighting, ventilation and heating within these environments (Blackmore et al., 2011; Wall, 2016) perhaps providing justification in using the word ‘innovative’ in a 21st century ILE.

The collaborative effect of FLEs

Collaboration is an activity that is regularly championed in education as a powerful force in educational change (Bradbeer, 2015; Woolner et al., 2012). The form that this takes and the focus placed upon it varies considerably within the literature. However, for some, the emphasis is on the importance of student collaboration for engagement purposes (Fisher, 2017). For others, it is about the importance of team teaching or co-teaching (Gislason, 2010; Mackey et al., 2017). Whilst in its broadest form, collaboration occurs outside of the institution’s physical confines through links with other institutions, such as within New Zealand in Communities of Learning (Whyte, 2017).

Collaboration has long been considered a fundamental aspect of educational practice and was cited by Whyte (2017) as a driver for the open plan movement of the 1970s. These environments were portrayed as “... a learner-centred environment, within which teams of teachers could collaboratively integrate the curriculum, while individualising teaching practices to meet the learning needs of students” (p. 85). This is an ideal echoed in much of the literature promoting 21st century ILEs and perhaps indicates that these environments are not so innovative but are replicating or refining former educational initiatives within a different historical context. The open plan movement failed due to a resistance of teachers and parents (Rodwell, 1998). One of the ways this resistance manifested itself was in teachers continuing to use the new spaces with little change to pedagogy (Sigurðardóttir & Hjartarson, 2016). The same authors also state

teacher concerns over noise issues and behavioural issues within predominantly open plan spaces as reasons for their failure. Mackey et al. (2017) identified that policy makers of the time overlooked the complexity of teaching and learning by relying on teachers to transition to these new spaces simply because it was there. This led to schools partitioning these open spaces with interior walls, thus returning to individual single cell classrooms. Rodwell (1998) highlights this by observing that not a single Tasmanian school that was a part of the open plan movement had retained these spaces by 1995.

When considering the failed open plan movement, Whyte (2017) continues to describe that the “belief in the rightfulness of their practice meant that New Zealand teachers continued to teach in the new open spaces as they had always taught in cellular classroom(s)” (p. 85). One conclusion to draw from this is that there was a misalignment between pedagogy and space. Without acknowledging this inherent link, future and current shifts in space may result in a similar outcome eventuating. Mulcahy and Morrison (2017) identify the current agenda surrounding FLEs as “detaching the teaching staff from what the Principal calls ‘their little box at the front’ and attaching them to the FLE in which it is anticipated they will collaborate and innovate and not teach ‘in the same way’” (p. 5). It is this assumption that the ILE will shape educational practice that was addressed above in the sub-section ‘Buildings alone will not change pedagogy’.

One of the challenges behind the design of facilities that promote collaborative teaching is the deprivatisation of practice (Benade, 2017a; Charteris et al., 2017; Whyte, 2017) as this blurs the traditional single space to single class territory, controlled by a single teacher into a spatial context that potentially brings multiple groups and teachers into the same space at the same time. As Fletcher, Mackey, and Fickel (2017) identify, co-teaching in ILEs is a paradigm shift for teachers, students and parents. This shift in thinking is also challenged by teachers who are spatially illiterate (Whyte, 2017) and therefore currently lack the tools or lenses required to utilise different spaces in effective ways. When considering co-teaching as a concept, Mackey et al. (2017) identify a double edged scenario which creates opportunities for “teacher collaboration and professional growth, and less favourably, the potential for misunderstanding, conflict and challenge” (p. 98). Kedian and West-Burnham (2017, p. 16) suggest that the implications of and the conditions created for collaboration in many schools appear ill defined. This suggests that the expectations again fall back to these collaborative practices occurring, seemingly by osmosis, without clear and explicit structures being put in place and lacking conscious decisions being made around collaboration. This is a dangerous stance to take as

collaboration creates complexity (Mackey et al., 2017) and this complexity needs to be acknowledged by those leading and working within the space.

Co-teaching also tests professional relationships and requires quite different skills to a more traditional, single teacher – single class approach. In considering a Post Occupancy Evaluation conducted by the Ministry of Education in 2012, when students had access to more than one teacher, the students gained an advantage as their individual characteristics could be better catered for (Benade, 2017a). Potential strategies for co-teaching are outlined by Mackey et al. (2017) in considering the forms that this could take. They include “alternate teaching; station teaching; parallel teaching; one teach, one observe; one teach, one assist; team teaching; complementary and supportive co-teaching” (p. 98) as potential strategies which could be employed. Fundamentally, this involves a high degree of trust between teachers (Benade, 2017a; Bradbeer, 2015) and the question that must be answered is how is this trust developed?

The OECD (2015) considers aspects of trust building when they note the importance and relevance of culture change, capacity creation and change agents as an important features of ILE strategies. The dilemma that this creates however, is the acknowledgement that to build trust amongst colleagues takes time (Mackey et al., 2017) and often teachers are time poor resulting in a lack of opportunity for this to occur. This lack of time compounds with the imperative to make the new space work and the challenge to generate these conditions in traditional single cell spaces. One vital aspect of building trust and working as a team would be that of shared values and beliefs. This sets up shared understandings or beliefs, which constructs an organisational culture to which everybody subscribes. An important part of this would be a joint or shared accountability of student outcomes (Mackey et al., 2017) and not camouflaging co-teaching or teacher collaboration as a surveillance tool (Benade, 2017a). Bradbeer (2015) identifies that where teachers undertake collaboration there is less disagreement about philosophical opinions. It is important to note that sharing beliefs and values does not ensure that everybody will get along. This emphasises the importance of recruitment decisions and the selection of compatible team members as vital in setting up collaborative environments to succeed and not succumb to micro-politics and conflict. Understanding why collaboration is important and not jumping forwards to the what and how is important in the first instance. This is reinforced by Mackey et al. (2017) who caution against “co-teaching becoming the rationale for change as opposed to a strategy to support a student centred environment grounded in effective pedagogy” (p. 106).

In aligning space to student engagement, Fisher (2017) identifies collaboration, active involvement and physical movement as three of twelve related factors. Flexible spaces have the effect of opening up possibilities for students by allowing them have greater mobility and freedom of movement (Gislason, 2010) over that of a more traditional classroom. A large part of this flexibility is centred on the furniture situated in the environment and how this can be used to enable or indeed, disable particular pedagogies. Benade (2017b) notes that for collaborative learning to occur there is a requirement for “flexible furniture that can be easily moved to match the activity” which can also “be used in multiple ways” (p. 802). Numerous authors identify an important difference between the terms flexibility and agility when referring to space and in engaging learners. This is particularly important as Perkins (2009) posits flexibility as the ability for a space to change function in a time consuming but planned way, but agility as the characteristic of a space changing quickly and is importantly completed by the learners. Dovey and Fisher (2014) describe agility and fluidity as one in the same and an important part of the adaptability of a space. It is this agility that will contribute to the abilities of the environment to support a variety of pedagogies. Interestingly they note that open plan environments lacks agility “because they constrain choice” (Dovey & Fisher, 2014, p. 58) in an equal and opposite way to the constraining nature of the single cell classroom. It is this ability to change an environment in a time efficient manner supporting a diverse range of pedagogies and allowing for student directed collaboration with their peers which makes these spaces exciting, not their difference to the norm. Collaboration is reliant on the interpersonal relationships of the actors with the context and the middle leader has the opportunity to shape this. It is this value of space as being socially produced to which Mulcahy and Morrison (2017) term a “social ILE” (p. 8) therefore shifting thinking away from an environment as only a physical entity to support learning to one where the meaning of the space is generated from the social interactions within it.

Leading the change to FLEs

In identifying successful middle leaders, Gurr and Drysdale (2013) identify a common purpose, collaboration, influencing planning and organisation as well as strategic resource allocation as being key leadership skills. These leadership practices are particularly suited to the strengths and characteristics of FLEs due to the emphasis on collaborative practice. Given the focus on a more collaborative approach and greater flexibility for both the student and teacher within FLEs alongside the associated changes to classroom practice, it is reasonable to consider that the fulcrum for successful change is the middle leader within that particular context. This leadership

role provides the interface between teaching staff and Senior Leaders ². It may be the drive and vision of the middle leader who leads and manages change in the classroom. Gurr and Drysdale (2013) contend that the role of the middle leader is crucial due to their proximity to teaching and learning, however too often there is a lack of support from senior leaders. One manifestation of this limited support could be in a lack of time to enact sustainable change. Due to the middle leaders' proximity to teaching and learning and Senior Leadership, to be effective they must hold credibility and authority with their staff and also serve as a "buffer and bridge" (Bennett, Woods, Wise, & Newton, 2007, p. 462). This shelters staff from the frustration of barriers imposed on a school wide level through providing a voice for the subject area. Bennett et al. (2007) illustrates the challenges on the middle leader when they identify the dilemma of serving the interests of the whole school balanced against advocating for and showing a loyalty towards their department or subject area.

When facilitating change, Garvey Berger and Johnston (2015) describe "safe-to-fail" experiments (p. 94) as an important way of enacting change. These experiments create an environment of controlled and considered risk and when combined with collaboration could present middle leaders with interesting new pedagogical possibilities in FLEs enabling flexibility in use. Working collaboratively in this way provides an additional benefit of providing ownership to the entire team not just the enactor of change. Cardno (2012) discusses the intertwined nature of change and collaboration. She identifies the three important traits of collaboration or shared decision making as being; utilising expertise, gaining a commitment to change and providing voice or operating democratically. It is these traits that will create a buy in or form the spine of a collegial approach to a subject area. Coupled with the findings of Jarvis (2012) in-so-much-as the acknowledgement of subject leaders within his study holding "little or no 'essential power'" (p. 485) a collegial or collaborative approach is a necessity for the successful implementation of any change.

Collegiality and collaboration are frequently used interchangeably and this has been the case to date in this study. In citing Hargreaves (1994), Datnow (2011) identifies however, an important difference. According to Datnow (2011) collaborative cultures are "spontaneous, voluntary, development-oriented, pervasive across time and space, and unpredictable" (p. 148). When enacting change in the form of a building development, which due to its very nature might require pedagogical and systemic change, collaboration on this level might be impossible. What

² Senior leaders are appointed to school-wide leadership roles. In larger secondary schools there may be a hierarchical senior leadership structure with an Associate Principal working under the Principal and overseeing a team of Deputy Principals. In other contexts this team may be composed of a team of Deputy Principals who work under the Principal.

would likely occur would be predicated on being “regulated, compulsory, implementation-orientated, fixed in time and space, and predictable” (Datnow, 2011, p. 148). Collaborative work on these terms, Datnow (2011) argues, is not collaboration but contrived collegiality and “does not lead to meaningful or sustainable change” (p. 148). Situated within the context of change towards FLEs and the associated expenditure and impact, it is possible that contrived collegiality and not collaboration would be the likely norm. When considering effective collaboration, Hargreaves (1992) as cited in Head (2003, p. 48) identifies a further concept entitled “bounded collaboration”. This he describes is prescriptive collaboration, devoid of adequate time to question, discuss or develop materials. Given the time poor nature of teachers and the wider school characteristics of any building development it is clear that these concepts of contrived collegiality and bounded collaboration give some perspective to the role that the teachers who will work out of such a development can have in its success and failure. It also draws into question the success of such dramatic change developments and perhaps provides an interesting and important return to the failure of the open plan education movement discussed above regarding the sustainability of change. Deep collaboration and therefore sustainable change could prove challenging in an environment whereby not all actors feel that they have been heard or where they have been involved in a process based, from their perspective, upon compulsion and a potential pre-determined outcome.

In discussing educational change, Albright, Clement, and Holmes (2012) identify issues of presentism³ whereby change is considered to be bureaucratically imposed and having little impact on classrooms. The current day shift towards FLEs has come from mandated change from the Ministry of Education through its *New Zealand school property strategy 2011-2021* and as such it could be considered that this enforced change could be set up to fail. Fundamental to any educational change is the perceived benefit to the learner (Albright et al., 2012, p. 80). Through the implementation of student centred learning, discussed above, and how this is front and centre in the rationale behind the development of FLEs, the rationale for change is a strong one. The current day issue centres around change on whose terms and by mandating this, as the Ministry of Education have done in its property strategic plan, there is a certain boundedness to the change. Hargreaves (2004) adds to this by identifying internally driven change as being perceived to be more beneficial than externally or mandated change. How this is framed by both senior and middle leaders could significantly affect the success of the change initiative, in this

³ Presentism is a leadership behaviour whereby thinking or acting has a short term focus and is damaging to sustainable change (Albright et al., 2012).

case the implementation and/or utilisation of FLEs and the subsequent potential changes in pedagogy required.

Summary | Literature review

Within the literature review, discussion focussed on the characteristics of FLEs and a typology of learning spaces proposed by Imms et al. (2016) and the opportunities afforded by these spaces. Attention was paid to the collaborative effects of these types of spaces both in terms of student collaboration as a tool for engagement (Fisher, 2017), the potential for collaboration between teachers through deprivatising practice (Benade, 2017a; Charteris et al., 2017; Whyte, 2017) along with co-teaching (Fletcher et al., 2017; Gislason, 2010; Mackey et al., 2017). The discussion around collaboration progressed to discuss the leadership imperative to manage such change to ensure that this is sustainable, authentic and uncontrived. The literature review identified the shift in focus towards FLEs to consider more than just the development of buildings and infrastructure because, as was seen through the experiences of the failed open plan movement, this is not necessarily a recipe for success (Rodwell, 1998). Emphasis was placed on the relationship between pedagogy and learning environment alongside the social effects illustrated by Mulcahy and Morrison (2017) who describe the learning environment as a sociomaterial assemblage. From a holistic perspective emphasis was placed on the importance of the learner being at the centre of all educational decisions and practices. The literature review culminated in discussion around the leadership of change, the benefits of collaborative cultures (Datnow, 2011), and the potential reality of bounded collaboration (Head, 2003) and contrived collegiality (Datnow, 2011). Chapter three which follows, focuses on the methods and methodology adopted in undertaking this study.

Chapter Three | Research design - methods and methodology

Introduction

In this section of the dissertation I intend to outline the methods and methodology used within the study. This chapter focuses on the justification of this selection alongside supporting literature and progresses to identify the data collection tools used which are shown in Appendix B. This discussion of research design and data collection is split into two sections. Firstly, the decisions made around the structure of the interviews are discussed followed by the interview protocol which served to guide the way in which the interviews were conducted. Secondly, a discussion around the data analysis process used is conducted. An explanation as to the ethical considerations made in the research design is then presented, followed by documentation of the data analysis.

When conducting the study I was interested in exploring the idea that space and learning environments have been used in a flexible way within the technology education domain for some time and certainly prior to the drive towards building flexible learning spaces as portrayed by (Ministry of Education, 2011) in the *The New Zealand school property strategy 2011-2021*. More specifically I wanted to understand the lived experiences of educators who have worked within these types spaces or who have adapted their practice within single cell spaces with flexible intent. The final aspect of interest in the study was how various forms of leadership impacted upon and influenced the use and change towards working in this way.

Research methodology

As the focus of the study was experiential in nature, a qualitative paradigm was the natural choice. This interpretivist worldview provides the opportunity to portray multiple realities and the unique experiences of the participants of the study. It is the unique experiences of these individuals which is of interest to me as well as the unifying feature of working within the same subject domain as a binding or common feature in providing direction to the study. Creswell and Poth (2018) identify that “seeking an understanding of the world is different from generating solutions to real-world problems” (p. 32) and indeed the intent of this research is to understand the experiences of those involved, despite the solutions enacted by each being different and potentially not transferable outside of that particular context.

Through an interpretivist world view the epistemological assumption that the researcher makes is that knowledge is known through the experiences of the participants. Each of the participants has a variety of experience due to working within differing contexts with potentially very

different educational values and agendas. These realities are also shaped through the prior experience of working within other contexts as well as the length of time each participant has been in their respective role or school. Bryman (2004) identifies the “understanding of human behaviour” or interpretivism as being inherently different to the “explanation of human behaviour” (p. 13) or positivism. My interest FLEs stems from understanding how space has been used in a flexible or non-traditional way alongside associated leadership issues, rather than explaining how and why space was used in a particular way.

When acknowledging world views, Creswell and Poth (2018) discuss the importance of axiology alongside epistemology. This assumption is a characteristic of qualitative research whereby the researcher positions themselves “within the context and setting of the research” (p. 21). Therefore my role as an experienced Head of a Technology Department is important. Equally important within the research design and analysis is that during the act of conducting the interviews and subsequent analysis I listened carefully to what was said by participants, ensuring it was their voice being portrayed and was not distorted by my own assumptions and experiences. It is essential to acknowledge this background as the interpretation of the data set may differ from that of a researcher with little or no experience in Technology education or with experiences within a different subject area. Whilst this is useful, it is important that this does not interfere with the data as it is important that the preconceived notions that I may bring to the research process do not influence the story of the participant (Shudak, 2018). My position as a practitioner with a strong familiarity of the subject area and strategy needs to be in many ways distanced to ensure that as a researcher I am not subject to familiarity bias and interpret what is said to be that which I want to or expect to hear.

The study focuses on the accounts of the lived experiences of formal and informal leaders within Technology Departments. Of specific interest are the participant experiences of implementing or working within a non-traditional, flexible way of utilising teaching and learning spaces. Due to the experiential emphasis, the study prioritises “people’s subjective understandings” (Leavy, 2017, p. 129). More specifically, a phenomenological perspective provides the opportunity to understand the lived realities of the actors within each context during the transition to greater flexibility in the use of space. Phenomenologists focus upon the commonality of the experiences of participants (Creswell & Poth, 2018). This particular stance suited this study as it emphasises the understanding of real world experiences and not the development of generic solutions to problems (Creswell & Poth, 2018). This has important implications for the results of the study as the findings will be context specific and will not be able to be generalised or blindly applied to other contexts. Mutch (2006) illustrates this point more broadly when discussing the aim of

qualitative research as being “to illuminate the experience or understanding for others but not to generalise” (p. 43). These findings however may well resonate with others working in similar contexts both within and outside of the domain of Technology education.

Research design and data collection

Given the phenomenological nature of the study a natural assumption in the acquiring of data was through conducting semi-structured interviews. Shudak (2018) describes “the use of interview to mine experience and provide data” (p. 1248) as being an important feature of phenomenological research. In approaching interviewing there are three potential interview structures which could have been used utilised, ranging from unstructured through to highly structured (Leavy, 2017; Mutch, 2006). The semi-structured middle ground provided enough direction to participants and also ensured that the interviews followed a broad set of themes. This also afforded the opportunity and freedom of each participant to reveal the narrative of their own experiences situated within their own particular context. The flexible and fluid nature of semi-structured interviews coupled with the potential for the emergence of unexpected themes (Mason, 2011) made this tool a highly appropriate choice. In order to gain a variety of experiences, four participants were chosen for the study and were selected from my own professional network alongside responses to an advert placed on the New Zealand Graphics and Technology Teachers Association (NZGTTA) digital forum. Each of the participants worked within a New Zealand secondary school. Two of the participants were Head of Technology Departments, one was an Assistant Head of a Technology Faculty and the final participant was an experienced Technology teacher. Whilst this final participant would have a knowledge of leadership actions, this would be blinkered in-so-much as the understanding of leadership actions, whilst experienced, were not necessarily understood within the context of the actual decision making.

The intention at the start of the study was to conduct each of these interviews in person within the respective departments or teaching area. This was to provide me with a visual picture of the environment being spoken about, thus allowing greater clarity in the mental picture of the experience being created. The geographical location of a number of the participants however, meant that this was not feasible and as such two of the four interviews were conducted via a Skype video conference. The limitation that this method of data collection imposed meant that my picture of the environment was very much a mental one, developed throughout the interview, and not one that was personally experienced as it was in the other two interviews. The semi-structured interview format provided the opportunity to discuss the nature and

physical layout of the facility with each of the participants as part of the data collection process. This subsequently helped to situate each participant's experience.

In conducting each of the interviews the interview protocol in Appendix B was developed and actioned. This ensured that there was consistency in approach between each of the interviews. This would have been even more valuable had there have been more than one interviewer however in this study this was not the case. Alongside the interview protocol the interview questions contained in Appendix B were asked and the responses digitally recorded. The questions were developed to explore the catalyst for change and to determine the nature of this. It was of particular importance to understand whether the change was an internally or externally driven one. The questions developed provided the opportunity to understand how the Technology leader acted upon this change. This involved exploring the structures and mechanisms enacted in facilitating change but also the two-way relationship between the middle leader and their teaching staff as both of these stakeholders will impact on the implementation and success of any change initiative. It was therefore important to understand the needs and requirements of both groups from the Technology leaders' lived experience. Through probing the influence of Senior Leaders the interview returned to the impacts on change from outside of the subject area. This was firstly to understand the barriers or enablers in place within the context but also to ascertain the impact that Senior Leaders had on the change initiative. The interview progressed to direct the participant to discuss challenges surrounding the topic. These may have been discussed earlier but this question provided an explicit prompt to address this aspect. The interview concluded by focusing on the relationship between the use of space and its impact upon student outcomes, thus returning to the reason for change, that of positively impacting upon the learner. This structure would allow the participant to discuss the impacts on as well as acting on the change initiative.

Whilst conducting interviews Leavy (2017) identifies that participants often "drop markers" (p. 141). These markers are interesting threads that crop up during the interview and are worth exploring further. An important aspect of the interview protocol was to note these threads down 'in the moment' to prevent the participant from being interrupted mid-response. These markers or potential digressions could then be explored further without compromising the value of the earlier response.

Data analysis

To allow for emergent themes to manifest from the four different narratives, a thematic analysis was conducted on the data. One advantage of thematic analysis as stated by Braun and Clarke

(2006) is that it is not tied to an epistemological position but can be applied “across a range of theoretical and epistemological approaches” (p. 78) in determining patterns or themes within the data. More specifically an inductive approach to thematic analysis was used as the coding process could be conducted without attempting to align with a pre-determined coding theme (Braun & Clarke, 2006). This is in contrast to a theoretical approach to thematic analysis which is driven by the analyst and fits within the researchers’ interest in the study area (Braun & Clarke, 2006). This predetermined approach to coding would be in direct contrast to the phenomenological stance of the study which was driven by the lived realities of the participants. In this instance imposing my own personal agenda on the data through predetermined themes would be wholly inappropriate.

In conducting the data analysis, the first step was an immersive one. The initial intention was to hire a transcriber to convert the digital recordings into a written form which could then be coded. This approach would remove an opportunity to listen and re-listen to the interviews, however, the decision to conduct the transcription process myself was made to allow for a process of familiarisation of the data. This position is reiterated by Kvale (2007) who argues that by investing time in this stage a more thorough understanding of the data is gained by the researcher. The transcription process began by recording the data in written format and then checking the transcription for accuracy both in terms of the wording and the use of punctuation to convey the original intent and meaning of the comment. The transcripts were distributed to each participant whereby opportunity was provided to listen to and check the final transcription for accuracy. The opportunity for feedback was provided prior to the data being used.

The first step in analysing the data involved further listening of each recording whilst simultaneously mapping the content of the interview onto an A1 sheet. Each interview was mapped to a separate sheet, thus providing further opportunity for immersion into the themes and discussion. This also provided an accessible summary of each interview allowing for themes to be identified and developed more easily. An example of this mapping is shown below in Figure 3. By spreading these sheets out this approach also provided accessibility in determining similarity of themes across participants as well as identifying the discussion points which were unique to individuals and their specific context. These sheets were then used in deriving the coding used.

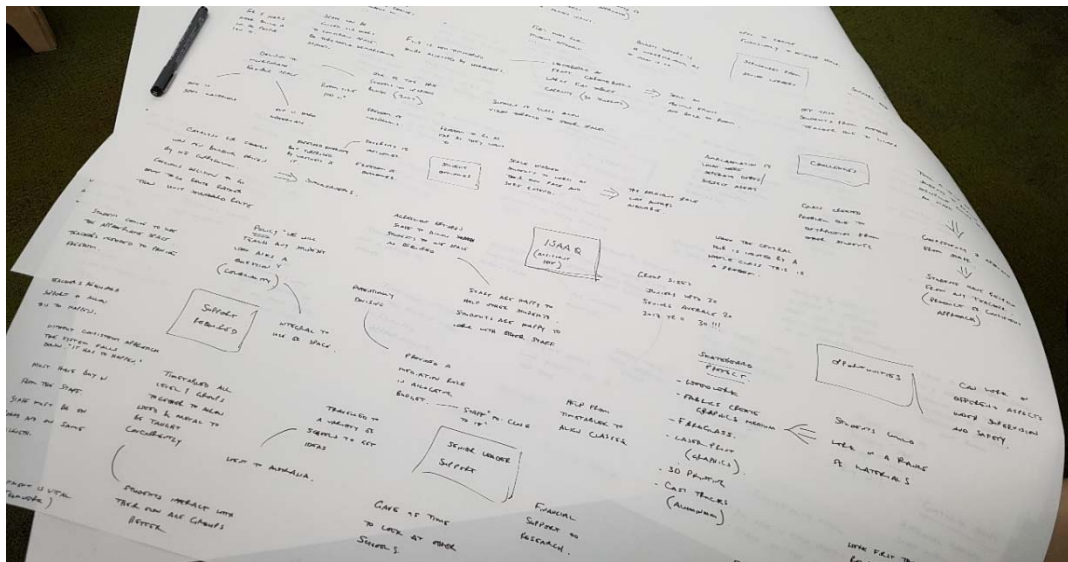


Figure 3. Mapping of Interview Data

From the mapping of the interview data illustrated in Figure 3 on page 30 a thematic map was developed and is shown in Figure 4 on page 32. In the first instance this yielded nine different themes illustrated in Table 2 below.

Table 2
Development of Themes for Data Analysis

| Initial themes for data analysis | Synthesized data analysis themes |
|--|--|
| <ol style="list-style-type: none"> 1. Impact of the senior leadership team 2. Teaching group structure 3. Staff development 4. Collaboration 5. Trust 6. Collegiality 7. Culture 8. The nature of Technology 9. The nature of space | <ol style="list-style-type: none"> 1. Impact of the senior leadership team 2. Teaching group structure 3. Staff development 4. Trust, collegiality, culture and collaboration 5. The nature of Technology 6. The nature of space |

Through initial refinement, this total was synthesized to six themes as shown on the right side of Table 2 above. Trust, collegiality, culture and collaboration were grouped due to the relationship between them. Two meta-themes emerged pertaining to 'impacting on' and 'acting on' the flexible use of space within each context. Further refinement of the six themes listed above resulted in the decision to remove staff development from the list to focus upon the

provision of teacher agency. Naturally the themes of trust, collegiality, culture and collaboration evolved to trust, flexibility and agency. This occurred as it was felt that collaboration, culture and collegiality were too broad and were actually products of trust, flexibility and agency. Table 3 Themes for data analysis on page 38 illustrates the final themes used for coding. The transcripts were coded using these finalised themes to allow for the data and lived experiences within them to be analysed. These themes also form the structure in presenting the results of each participant in chapter 4.



Figure 4. Thematic Analysis Map

The mapping and refinement process above reflects an iterative approach whereby the themes evolve through reading and rereading the data. When considering this approach to the analysis of qualitative data, thematic analysis is often not specifically named as a method in its own right. This is perhaps due to its application across a number of different approaches. Braun and Clarke (2006) contend that whilst much qualitative analysis is thematic, it is often claimed as part of another approach, for example grounded theory or narrative analysis.

In determining the coding used, an empirical approach was taken. Harding (2015) makes the distinction between a priori and empirical approach to coding as to whether it was derived prior to or after the data collection. Given the phenomenological nature of the study, deriving codes using a priori approach would result in the potential for me to impose my own opinions on the coding used and therefore the outcomes. As the focus was on the lived experience of each participant, an a priori approach would be inappropriate as it would leverage participant responses into predetermined themes, rather than allow these to emerge from the experiences of the participants. As acknowledged by Harding (2015) however, empirical coding is influenced

by the decisions made by the researcher based on their own prior knowledge and for that reason care was taken to ensure that this did not divert the participants intent towards the agenda of the researcher.

In considering the approach taken it is also important to consider why others were rejected. One approach that could have been adopted during this study was that of grounded theory. This would have required a methodological focus shift from the participants' lived experiences or phenomenology to an inductive approach whereby the data itself derives the theoretical explanation (Melia, 2010). Whilst the approach taken in grounded theory is similar to that of thematic analysis it is important to note that often grounded theory in research is applied as "grounded theory 'lite'" (Braun & Clarke, 2006, p. 81) and the emergent themes do not acknowledge the "active role" (p. 80) of the researcher. It is also important to note that the intention of this research was not to provide generalisable theory, but to understand and learn from the lived experiences of others, whilst also acknowledging the impact that I will inherently have on the research process.

Ethical considerations

Ethics are fundamental in any study in-so-much as without strong ethical considerations there is the potential to cause harm to participants. Importantly, it is the researcher's role to protect their participants (Creswell, 2014). Leavy (2017) describes ethics as being about character and identifies "morality, integrity, fairness, and truthfulness" (p. 24) as integral to an ethical study. This focus is on the fundamental importance of knowing right from wrong and then acting on it (Leavy, 2017). Given this study is phenomenological in nature and the lived experiences of individuals form the data for analysis, it was important to not only consider morality throughout the study but in order to gain the richness of data it was vital to establish a mutual trust or rapport between myself and each participant. This provided for a safe space to discuss issues that are potentially emotive, particularly when considering the support or potential lack of support provided from Senior Leaders or staff within the subject area. Participants were provided with an information sheet, contained in Appendix B, to allow for the opportunity to freely partake in the research through informed consent, which is discussed later in this chapter. This contained the details of the study and its associated risks. Accompanying the information sheet was a consent form, also contained in Appendix B, which was completed by each participant prior to the gathering of any data.

In conducting this study the approval of the AUT Ethics Committee was applied for and granted. As part of this approval process I met with an ethics adviser to discuss concerns and clarify

ethical implications for the study. The topic of this study was one of FLEs but more than that it was further narrowed to a particular subject area of the New Zealand Curriculum, Technology. The main driver for this was that FLEs are a phenomenon that have tended to be researched from a primary school focus however with the focus of the Ministry of Education, through the *The New Zealand school property strategy 2011-2021* (Ministry of Education, 2011), that is now changing. Technology as a subject area has also received limited exposure to research but moreover the focus of the building of FLEs is situated predominantly in the primary education sector. This is perhaps due to the more straightforward fit for changing educational spaces due to the smaller size of primary schools and the traditional nature of one lead teacher delivering the majority of educational content to the same group of students. This is in stark contrast to the traditional specialist teacher working within a particular subject area and students moving from educational spaces developed to teach specific subjects in a particular space which is prevalent within secondary educational contexts.

Whilst working within an area of significant experience it is of vital importance assumptions are not made of the research participants as the belief system of the researcher may be significantly and fundamentally different from that of the participant. One methodological stance is that the researcher does not impose his beliefs on the participant in the process of undertaking the research as this will impact on the outcomes gained during the research. An alternate paradigm is that we all impose our beliefs and understanding the inevitability of this and acknowledging this position is an important part of qualitative research. This conflict is illustrated by Shudak (2018) who, when considering phenomenology, discusses the differing philosophies of Husserl and Heidegger. Husserl, he argued, bracketed or suspended researcher preconceptions to prevent distortion of the phenomenon, whereas for Heidegger the context of the individuals was acknowledged as opposed to suspending or removing them from the study. This acknowledgement of the position of individuals was deemed an important aspect of the methodology. My own position from within this research leans towards the interpretive philosophy of Heidegger as opposed to the descriptive stance of Husserl. Given the limitation of not being able to be physically present in each participant's teaching environment this interpretivist stance was a natural choice. The phenomenological nature of this study must put the participants lived experiences front and centre. The experiences and opinions of each participant may align with the beliefs of the researcher however they may also be significantly different. From a moral perspective and to protect the views of each participant it is essential that these experiences and views are heard and evidenced, even though they may be contradictory to those of the researcher. Not doing so would be an injustice to the participant or participants.

In considering the risk of harm to participants it is also poignant to consider the potential benefits of the study. Participation in the study provided the opportunity for participants to share experiences from within a particular teaching community with a broader group of people and contribute to the present discussion of the flexible use of space along with furthering the understanding of FLEs within a subject area where this type of responsive practise has occurred for some time.

Participant selection

The selection of participants was one that was heavily guided by the topic selection. Participants had to be secondary school Technology leaders who had engaged in the flexible use of space within their teaching. Recruiting participants was completed primarily through the use of the New Zealand Graphics and Technology Teachers Association (NZGTTA) Google forum. Permission was sought from the Chairperson of NZGTTA to use the forum to recruit potential candidates. Once permission was obtained an advert was placed on the forum for potential participants to respond to. The initial response was good with two participants immediately expressing interest in participation. A subsequent and final advert was reposted on the forum from which a further participant was recruited before I made contact with another suitable participant from my own professional network.

When selecting participants the original intention was to work with solely Heads of Technology departments as people in these middle leadership roles formed the intersection between teaching staff and senior leadership. During the interview phase one of the participants revealed however, that they were an experienced teacher and not a middle leader. Nevertheless, the depth of and richness of his experience provided validity to the data and the decision was made to broaden the topic from Heads of Technology departments to Technology leaders. The Head of Technology in my current school would have not been eligible to participate should he have responded to the advertisement due to the issue of power relationships from my current role as a Deputy Principal at the school and the potential impact this could have on the participants freedom to discuss potentially sensitive issues.

Informed consent

Informed consent provides each participant with the relevant details about the study to make an informed decision as to whether they would like to be considered to participate in the study. When potential participants made contact they were provided with the Research Project Information Form and Consent Form, contained in Appendix B. This form was completed, signed and returned prior to conducting the interview.

During the ethics application process the decision was made to only request consent from the individual participants and not the Principal of each school. As the intention was to explore the lived experiences of the participants, the focus of the study was on those individual experiences and not the practices of the institution. It was deemed unnecessary to involve the Principal as there was no risk to the institution. Perhaps more importantly, involving another person would provide a further means to identify the participant. Involving the Principal of the institution may also have added the burden of portraying the institution solely in a positive light rather than describing experiences openly and honestly. Involving the Principal could also further impact on the data as aspects of the study focused around the impact senior leadership had on the implementation of and use of the space. Had those same Senior Leaders been involved in the consenting process there could have been the opportunity for power relationships to impact on the quality and authenticity of the data gained. It was therefore important to protect participants from the pressure to portray the institution in a positive light when their experience was not necessarily a positive one. Participants were also informed as to my role in the research and the contribution of the study towards obtaining a Master's degree in educational leadership. This transparency revealed one element of my interest within the study and provided participants with additional context and knowledge to make an informed decision about their participation.

Anonymity and confidentiality

Given the scope and nature of the study it was impossible to assure the participants of anonymity. Despite only the researcher and participant knowing of their involvement in conducting this research, within New Zealand there is a relatively small pool of people from which to draw from. Each school in the country will only have one Head of Technology and given the need to set the scene within each context, there is the scope through deduction for the reader to speculate on each of the participants. What was provided to participants was confidentiality in so far as the context and their positional role provided. Pseudonyms were used for individuals and institution names to withhold the identity of participating individuals and specific institutions. Pseudonyms were also applied to any people mentioned within the context of the interview and these pseudonyms were applied on the interview transcripts ensuring that the data stored contained no means of identifying participants. Due to the focus of the study being centred on the lived experiences of the participants and not the visiting of teaching and learning environments, there was no need to restrict potential participants geographically due to the time and expense of travelling to schools. Interviews could be and were conducted via video conferencing with participants anywhere in the country, thus widening the scope of the

project and providing a greater chance of participant confidentiality through a much broader potential participant base.

The original intention during the ethics application had been to involve a transcriber in the transcription of the interview recordings. At the point of data collection and analysis I made the decision to not utilise a transcriber. One advantage of this was to be able to withhold participant details from a third party. The main driver for the decision to personally transcribe the interview recordings however, was to provide the opportunity to immerse myself in the data from the very start of the analysis stage, therefore positioning myself to become familiar in the themes and narrative provided by the participants from the outset.

Summary - Research methodology

This chapter has identified and reasoned the choice of research methodology identifying its appropriateness for the study. The phenomenological stance has been justified along with the consideration of grounded theory as a potential alternative approach. The research tools which include the semi-structured approach to interviewing and the protocol employed in gathering the data that follows has also been discussed. The chapter proceeded to explain the thematic analysis of the data and the empirical process of developing the code used to analyse the data. The final aspect of chapter three has been to identify the ethical considerations related to this research project. What follows in chapter four is the presentation of the data collected and the subsequent findings.

Chapter Four | Results and findings

The results of the four semi-structured interviews have been presented individually to allow for the lived experiences of each participant to be understood in isolation. Broader trends, similarities and differences of the entire data set will be considered in the discussion section of chapter five.

Through the thematic analysis of the data described in chapter four, five themes were identified and structured under the two meta themes of 'impacting on' and 'acting on'. These themes are shown in Table 2 below and have provided the structure for presenting the results and findings for each of the four participants in this chapter.

Table 3
Themes for Data Analysis

| META THEME | THEME | DEFINITION |
|---------------------|---|---|
| IMPACTING ON | The nature of Technology | The characteristics of the subject area of Technology and how these have impacted upon the utilisation of space. |
| | The nature of space | The characteristics of the space within each context and how this has impacted upon its utilisation. |
| | Teaching group structure | How teaching groups have been structured both physically and systemically to facilitate the use of space in flexible ways. |
| | Impact of the Senior Leadership Team (SLT) | The role and impact of the Senior Leadership Team within each context in changing to and sustaining the flexible use of space. |
| ACTING ON | Trust, flexibility and agency | The role that trust and flexibility play in developing collegial and collaborative cultures which provide agency to those working within the space. |

Participant one | George - Cairnhill College

Cairnhill College is an integrated, Catholic College situated in a rural town in the North Island of New Zealand. It is a very small co-educational school with approximately 250 students on the

roll from years 7 through to 13. The College has had a falling roll in recent years having had around 400 students on roll around seven years ago. George is a digital technologies teacher who works within a department containing three other staff, each of whom has a particular room which is timetabled based on their subject specialism. George has worked at Cairnhill College for the past ten years and has experience of teaching Technology overseas in the United Kingdom. Within the Technology department at Cairnhill they offer a diverse range of different subjects for a school of this size, teaching digital technology, soft materials, hard materials, food technology and design and visual communication (DVC).

George | The nature of Technology

Technology at Cairnhill takes a project based learning (PBL) approach with students opting for a particular strand of the Technology curriculum at senior levels. There is significant overlap in the strands offered in each course with a particularly integrated approach being the norm. This was illustrated when discussing the current approach to digital-technology and the requirements for specialist space.

... at the moment in digi-tech we are making clocks with binary numbers and we are making clocks with recycled materials and that means that the requirements to cut up pieces of wood and put holes in multiple parts means that we have to go to the metal shop to work.

The impact of this type of approach sees the students at Cairnhill learn technological concepts and develop capability through doing. This emphasis on capability and situating digital technology in a tangible and physical product embeds a requirement for particular resourcing and this flowed through in a broad description of the essence of Technology at Cairnhill College. "All the Technology subjects at the College, they're all very hands on and so you need a whole suite of resources not just a few drills". In catering for this resourcing need it is simply not practical to resource each room with everything required to teach the range of groups encountered. As such George acknowledged, "the subject lends itself to the sharing of space". The overlap in technological strands coupled with the sharing of space led to student interest in alternate pathways and the suitability of other courses to meet their particular interests and needs. One experience which George recounted involved a student opting into digital technology from a hard materials based course.

... we had a kid come in and use the computer for his hard materials project, I think he was writing his report, and he was enjoying the coding that the boy sitting next to him

was doing and thought he might do digi-tech next year. And he ended up doing digi-tech and was really good at it

This situation was embraced and centred around the student, not the course structure. The overlap of content within the broader domain of Technology enabled this situation to occur and students were able to thrive through broadening their horizons.

George | The nature of space

George described the Technology facility at Cairnhill College as a typical 'type A' teaching and learning space as represented in Figure 2 on page 18. There are four classrooms, all accessible from the same corridor, with no interlinking doors. From that perspective it is very much a single cell environment. In discussing how this space has been used flexibly and has been opened up metaphorically George responded,

... it's allowed them to try using different resources which aren't just restricted to a desktop computer. They need to go and use a hot glue gun next door, or if they need to use a guillotine in the DVC room or a light box for instance, it's allowed them to use those other facilities when not one subject could afford due to the size of the school.

The inherent link of resources to space, along with task to space, has seen a single cell environment utilised for more than it was originally intended. The restrictive nature of a single access point into each room, along with the closed visual nature of the space through a lack of glass to view students in other environments results however, in a significant compromise and a high degree of trust from the teacher towards the students. This was mitigated by teachers being present in each room and accepting oversight of the activities of the students from other different groups.

George | Teaching group structure

Given the small size of the College in comparison to the other secondary schools studied and the variety of strands of technology available, decisions had to be made carefully regarding the structuring of groups in order to make them economically viable. The nature of the group sizes meant that multi-levelled classes were employed. Whilst this was imposed upon the Department structurally, the multi-levelling of classes was supported by George and seen as a positive aspect of teaching at the College. This approach complemented a collaborative approach as students were exposed to the subject on a variety of levels and younger students could see how they might progress in the subject area. The multi-levelling of classes presents its

own challenges as lessons within lessons are required to be taught and this is a feature of Technology teaching at Cairnhill to which George feels he has only just come to terms with.

... well they are multi-level classes so we have Year 11, 12 and 13 and they are all of them combined in the same class basically. So it has taken me a couple of years to be able to accommodate all those levels at once in one room.

With three different year groups attending the same timetabled lesson George described a requirement to be a flexible and to embrace collaboration between students. Often senior students are able to assist younger students in sharing and reinforcing knowledge through their own understanding. In ensuring that this is manageable and not overwhelming for the teacher, courses are planned and structured around similar Achievement Standards on the Technology matrix, resulting in programmes that build on the previous year but retain a commonality in potential tasks. Due to this structuring there is a diverse requirement for resources necessitating the use of multiple spaces by students within the same group. George describes this as being managed on an ad-hoc or as required basis.

... in terms of the shared space it is just left up to the teachers and if they want to use a hard materials workshop and they teach soft materials and they want to borrow tools they can borrow them although we can book a hard materials room.

This bookable nature of spaces within the subject area is managed on KAMAR, the College's student management system, and allows for staff to plan in advance when a particular environment may be required. In terms of default spaces, each teacher is timetabled 'their' classroom based on their specialist teaching area and for George this is the computing suite.

One major contributing factor on how space is used is driven by its size. In this regard George acknowledges that the flexibility in the use of space is enabled by the size of the groups encountered within technology at Cairnhill.

... we have small class sizes and we can get away with it as well. If we had a class size of 30, having them going into four different areas in a lesson. Things could be a bit tight.

A further means of using space flexibly is in terms of who occupies which room. Frequently the room which is required by individuals is already being used by an existing, timetabled class and therefore not bookable,

... because it is a small school it is quite an inter-personal choice almost, where you can say to the guy next door to you, if I'm doing DVC and he is doing hard materials, 'Can I bring my class in on Friday and we can perhaps swap rooms?' You come and use my computer suite and I'll come and use your hard materials workshop.

This approach clearly relies on a mutual appreciation as to the demands and requirements across courses and this responsiveness to the needs of others is a feature of the Technology department at Cairnhill. On an individual student level there is an acceptance of staff to look after students from other groups if their specific work at the time requires it. This is particularly prevalent "in a computer suite which is my teaching base, we will have teachers using it as a dropping zone" allowing students to catch up or extend themselves as appropriate. This provides support to other teachers as well as agency to students in allowing them to work in the most appropriate way, based on their individual progress and the specific nature of their project.

George | Impact of the Senior Leadership Team

In considering the impact of the Senior Leadership Team (SLT) at Cairnhill, George is particularly positive. This is a relatively new team and their work has been hugely beneficial for the school. From George's experience the approach of the SLT has indirectly been an enabling one.

They have never put any barriers in place to prevent any progress in shared spaces. Although, neither have they helped either. It has been an organic development. It hasn't been encouraged nor has it been discouraged, it is all based on the individual.

This decision to not become involved in a subject area through specific structural decisions was very much seen as a positive. This has allowed a genuine collegial approach to be developed and allowed those staff directly impacted upon to determine their own approach, and that "maybe them keeping out of the collegial approach was the best thing. Letting individuals determine their own space was perhaps the best way to go". He also acknowledged the impact of a more prescriptive approach by the SLT in the use of space in Technology, noting "I think it would be a little reckless of them to come in and talk to three teachers and then encourage the practice unless they know the dynamic between the three teachers". Contriving particular practices regarding space usage and imposing this upon the department was identified by George as a detrimental approach from the SLT towards teaching staff but this has not happened in this context.

George | Trust, flexibility and agency

Central to the use of space at Cairnhill College was a collegial and supportive approach by all staff members. George suggested that it is “based on the goodwill of the teacher” and is central to its success. He also attributed the broader culture at the College as impacting upon the customs and practice within Technology, identifying the positive impact of the underlying College values “because it is a Catholic school....I think we arethinking of the greater good rather than of ourselves”. He expanded upon this religious context, identifying that “it would be a little bit awkward to start the day with a prayer and then tell your colleague ‘No, you can’t share facilities’” and “if someone says ‘Oh no you can’t use the room’ you could always say ‘That’s not very Catholic like’”.

One frustration associated with the opening up of spatial possibilities for groups outside of the timetabled lesson was that of the consistency of expectations. “If there are students coming over from DVC into my classroom and the teacher has different expectations of the students it can sometimes be a little bit awkward”. This awkwardness often related to discipline expectations across staff indicating that different staff had differing expectations regarding acceptable classroom behaviour for students where, “...sometimes if the teachers are a little slap happy with discipline and you are having to manage another teacher’s classroom behaviour that can sometimes be a little awkward”.

Alongside the potential issue of staff in having to address differences of expectation regarding students, the structure of multi-levelling and having students in the room from other groups or subject areas is a positive. The manifestation of this positivity emerges through the trust, support and agency of students within multi-level classes when George reflects, “I think that this would have been our third year of having multi-level classes and I think we have nearly cracked it whereby you can have the older kids supporting the younger ones”. Through a mutual support of and collaboration between students their experience is enriched and the value of metaphorically ‘opening space’ up across groups is reinforced.

Whilst the physical nature of the space is still very much closed at Cairnhill College the open nature in the way staff interact and work together has been a thoroughly positive experience. Through having other staff drop into classrooms to support their own students it has developed a greater awareness as to the wider work of the subject area. This, George contends, leads to an opportunity to develop professionally.

I guess the shared space has allowed staff to have some sympathy for what other teachers are going through. Not to feel sorry for them but at least you can have common issues to talk about such as if you are using similar standards or where there is room for improvement in your own practice.

This ability to grow as a teaching group is perceived as valuable and promotes professional discussion within the department. Interestingly one example pertaining to discipline, which previously was a source of frustration, is now portrayed in a positive light through the aligning of expectations when he commented “some other teacher might say ‘You were a bit harsh with so-and-so’ or vice versa. I could say ‘Sarah’s doing really well in her soft materials’ because we are in like that shared environment”. The second part of this statement reflects something that remained unspoken in the interview which is that of the implicit trust in having others enter a classroom without judgement, alongside the teaching staff being interested in and working towards the greater good of all students within the department.

Participant two | Andrew - Arrabella Girls Grammar School

Arrabella Girls Grammar School is an inner-city state school situated in a major centre of New Zealand. Arrabella Girls has approximately 1300 students on roll from Year 9 through to Year 13. The school has the facilities to teach hard materials, soft materials, DVC and bio-technology however due to a falling roll and falling numbers within the department not all of these options are currently available. This was attributed to wider school decisions made surrounding the junior timetabling structure and ensuring one particular subject area was possibly privileged at the expense of others, including Technology.

Andrew | The nature of Technology

Having been at the school for over ten years, Andrew’s experience of Technology and the changing nature of the subject area has been significant. His account of what Technology was like as he arrived at the school illustrated this.

Essentially Arrabella Girls had a focus on woodwork and metalwork. It was just over there [points towards the main block through the window] and they designed this building with the input of the previous Head of Faculty and that... but they also had textiles and cooking halfway up the school, so location wise, hard-tech which was down here for accessibility and cooking facilities up there.

The focus within the school was very much centred on workshop technology with separate and disparate strands spread across the campus. When he arrived Technology “was primarily make and procedural skills and very little conceptual” and this was something that, to enable student success within the Technology curriculum, needed to change. From a staffing perspective Andrew describes the feeling as being that staff “couldn’t quite figure out this Technology thing and were very resistant”. This was the feeling in numerous schools at the time of transition to the new curriculum and was not unique to Arrabella Girls Grammar School.

Andrew | The nature of space

After the implementation of the Technology curriculum at Arrabella Girls, a new Technology block was conceived and built in 2003. This consolidated the separate subject facilities into the same accommodation, having been spread across the campus previously. The new building was developed over two levels from which classroom access was gained through a central atrium area. This area provides the opportunity to have students undertake work, alongside exhibiting student work. The practical areas were served by an individual design studio in a physically open environment which placed the design room as a mezzanine above the workshop. This was quite different from other environments where the use of glass provided for visual continuity.

One of the priorities for Andrew was to provide a changed way of practice when using the facility. Previously students worked in a single space, due to disparate locations on the School campus, but with the integrated block there was now the opportunity to share resources, including space.

So coming to the physical side of things is like making sure that potentially I was trying to cross blend a range of physical resources across having a scanner, ... sewing machine, multi-materials instead, as this school was used to just wood, not much metal and a little bit of plastics so in essence just saying ‘you can walk anywhere around here’ and have a sense of what you are doing because ... it wasn’t that you stayed in your class.

The space allowed for students to work in a number of different environments depending upon task. One break-out or meeting room served the entire block and could also be used by groups of students as required. Due to the multiplicity of spaces, different classes can be taught the same skills together.

This particular building allows for that opportunity. Because you have big cutting tables and you can say 'Right kids ... you 18, ten DVC and eight textiles (students). Sit here and I will show you how to use the watercolours'.

The nature of the space provided the opportunity for students to observe other strands of Technology alongside the possibility of being taught alongside them as described above. This was provided for by the space due to,

First of all they have the flexibility to go anywhere and then second of all they come together and so some of the outcomes have been very good across [pause] you know sometimes you will get a textiles class that are really good at some achievement and your multi-materials are not very good but when they see other peoples work they go 'Oh gee whiz, you know that class, what are they doing?'.

The fostering of engagement through observing other groups was seen as a positive attribute of the space. From opening the opportunities afforded by the space the next step was described by Andrew as "We needed to ensure that our resourcing allowed for that flexibility".

[Andrew | Teaching group structure](#)

In allowing for this very different space to function effectively, Andrew's first priority was towards resourcing and inventory management.

So for me it took a number of years to try and first of all I had to make sure the inventory was tidy, understanding where some of the resources were. So as HoF I said 'let's understand what inventory we have got so that you are clear on when you order things' and I left it open for them to order.

In understanding the shared inventory within the faculty, staff were able to be better resourced. Through consolidating ordering across subject areas it allowed the faculty to work with greater efficiency in "working out better ways and smarter ways of resourcing materials". Alongside the structuring of the physical resources within the faculty, there were also changes made to the way in which staff could structure lessons,

... you know, if they (students) wanted to go next door or upstairs that's fine and then on the organisational side of things you need to have your laptops where you can book

them and they are portable and mobile, TV's are on wheels so you can open up the space so that it is like an atrium where you can have people in here doing stuff.

This approach proved problematic with some staff as the accountability of students was less obvious and with regards to behavioural management, it provided challenges. On one hand the space offered an opportunity to work in the most appropriate space for the task but on the other it posed questions.

It's sort of double edged. How as a teacher do you know that? [pause] Where's your...? [pause] Are you meeting these objectives? Are you getting where you are supposed to be?

Structurally there has been a change towards multi-levelled classes due to falling numbers within the subject area, in part caused by a decreasing roll at the school. This has been imposed by the SLT due to economic reasons surrounding group numbers falling below the school driven threshold of 16.

We have multi-level classes now. Which is a lot of [pause] Senior Management won't [pause] For a class to run you have got to have 16... So we combine them with [pause] I've got ten Year 11s and eight year 12s.

Given the semi-open nature of the space and the visual continuity from design area to workshop this multi-levelling is arguably more manageable than in the single cell environment of Cairnhill College.

[Andrew | Impact of the Senior Leadership team](#)

In providing financial support and commissioning a new Technology block the Board of Trustees alongside the Principal presented a great opportunity for Technology education at the school. Due to a lack of understanding of the subject things did not, however, play out as expected. "So essentially they built a building and thought it would be wonderful and they would get these million dollar outcomes but they haven't structurally organised themselves to understand (the subject)". This lack of understanding played out through a perceived pigeon holing staff by the SLT to specialist areas whilst Andrew was trying to "build curriculum capacity and understanding" across areas. Also, the transient nature of the Technology staff compounded this inability to build capacity. Alongside this school-wide structural changes were implemented compounding issues for Technology as a subject area.

So what's happened recently, last year, structural change where the Principal [pause] she didn't even discuss it with HOFs ... she wanted a full year for Social Studies. Essentially what it meant that Languages, PE and Arts and Technology have scrambled around. So what it meant was my student numbers have gone (down) in total Technology wise.

This structural change by the Principal impacted upon student numbers as it restricted the number of options available to junior students. The loss in junior numbers has a subsequent impact on senior numbers, compounding the need for multi-levelled classes within the subject area.

Andrew | Trust, flexibility and agency

In working in an open space there is a requirement for collegiality and collaboration amongst staff. In describing this Andrew reflected on staffing early in the life of the Technology block,

So when I first came here they (the teachers) were very limited in not only NCEA but also in understanding the perception of Technology and staff were very... just totally, only focussed on their course and there wasn't the connection between how useful Technology could be across the areas.

This resulted in a situation whereby there was a need "to create first of all collegiality between different areas and you know understand that a DVC student can get up and do textiles" as this was one of the premises behind how the block would operate. Andrew identified a further issue in that the revised space required the teacher "to figure out the opportunities for space" prior to being able to utilise it effectively. As such the ability of staff to use the space was potentially compromised by their lack of spatial literacy.

Reflecting on other problems regarding the use of space and staff within the faculty diversifying their approach Andrew identified staff lacking a desire to embrace this approach.

... one area I have found in human resources is the gaps in teachers' confidence. So they were like [pause] I did a lot of individual PD⁴ just doing some hard materials stuff with them and I had staff members Who refused to use the band saw and kept telling their students not to use the band saw because it is dangerous and it sends the wrong signal

⁴ PD or professional development is the term used to refer to in service training or professional learning in education.

[to students through teachers filtering the equipment students are exposed to due to a lack of personal ability or comfort].

This approach limited the opportunity for students to fully utilise the opportunity of the resources available to staff and students. Andrew describes his role “As a HoF I was trying to plug all these holes”. One aspect in addressing this was to offer support to staff members.

So I used to wander through and help teachers but again some of the teachers were very defensive having me come into a space and say ‘hey I can teach these girls fashion sketching or rendering’ so they [teachers] wanted to know all the knowledge first so that they can [teach it themselves].

Andrew found himself in a cycle of inflexibility with staff who were not receptive towards a Middle Leader entering their space and becoming a part of the lesson. This reluctance to embrace a second teacher input in accepting Andrew’s perceived support resulted in a defensive response and had the impact of reducing their own agency in utilising the space effectively rather than growing within the space. A contributing factor to this condition was the transient nature of the Technology staffroom acknowledged by Andrew. This change provided a barrier to ongoing trust which perhaps contributed to this situation of resistance.

Participant three | Isaac - Otaenga College

Otaenga College is large a co-educational state secondary school situated in a major New Zealand centre. Otaenga College has approximately 1900 students on the roll from Year 9 to 13. Isaac has been teaching at the College since the introduction of Technology in the New Zealand Curriculum and the department caters for a diverse range of technology specialisms including, DVC, hard materials, soft materials and food technology. Isaac is the Assistant Head of Faculty and he has significant experience in this position having served under a number of Heads of Faculty.

Isaac | The nature of Technology

In discussing the nature of Technology at Otaenga College it was clear that the focus was firmly on the practical problem solving nature of the *New Zealand Curriculum*. The shift towards a more flexible use of space stemmed from numerous factors, centred around a perception of how to most effectively deliver the curriculum as well as the opportunity to commission a new building around 18 years ago.

The catalyst for change was the job of the building and the Technology curriculum at the time. We were a strong workshop technology school and we were always going to go down the technology line.

This development and the approach towards Technology education at Otaenga has allowed for students to explore the definition of, and the solving of, authentic problems through studying within the subject area. The outcome of the new building and the then new and subsequently revised curriculum document provided students different opportunities to those that were previously possible.

It's opened up the diversity of outcomes and it has given them a [pause] It's allowed them more freedom in the outcomes.

It is this diversity which is a feature of student outcomes within the College. This is illustrated by students opting to study a metal based course but subsequently, due to their solution requiring it, completing a product predominantly fabricated from timber. This flexibility with students due to the generic nature of the Achievement Standards⁵ offered and the flexibility across timetabled areas is a real characteristic of life in this department.

Isaac | The nature of space

In offering the programme described above, the nature of the space plays an integral role. At the time of implementation, the new curriculum offered the opportunity to review and revise how the subject was delivered and a new facility was developed in which Isaac played a significant role.

We were one of the first schools that had an upgrade of our Technology block and we had the upgrade back in the year 2000 and I was involved with the architect team and the actual design of the building and we decided then that we wanted to incorporate a flexible learning space into our block.

In the quote above the reference to 'our block' speaks volumes for the approach of the department and the leader. It is more than just an object but a shared resourced and the use of the word 'our' acknowledges this. The philosophical decision to design flexibility of space into

⁵ Achievement Standards are the units of and criteria for assessment of the National Certificate of Educational Achievement (NCEA). This is the national education qualification within New Zealand. Each standard allows students to accrue credits in subject areas which contribute towards the award of an NCEA certificate at either Level 1 (Year 11), Level 2 (Year 12) or Level 3 (Year 13).

the facility, thus providing the opportunity to develop flexible systems, is still a real feature of the work undertaken some 18 years on. In describing the flexible nature of the space, Isaac defined its physical nature.

... what they are is they are non-timetabled space that adjoin all the traditional workshops if you like. It's like a central hub in the centre. Off each wall there is the traditional two engineering workshops and two workshops on the hard materials side and on the soft materials side there is two food rooms and a fabrics room.

The essence of the concept was that there were two spaces which were non-timetabled and to which all other relevant spaces adjoined. This conjures up imagery of an amalgamation between typologies C and D from Figure 2 on page 18, in that the hub or flexible space would serve as a teaching and learning area but also as street space in accessing other areas of the building.

A further enabling feature of the space, in terms of teacher efficacy in managing students in multiple areas, was glass as a functional design feature "...on the hard materials side, actually on the soft materials side, there's three walls of glass. Three walls that look through from the design area into the other rooms". Combined with the orientation of the room, where the whiteboard determined the 'front' this glass could present problems for some spaces. "...another challenge that we had was that the whiteboard was facing the engineering room. That was quite good, but then the woodwork room, the wood based room, it was behind the teachers back if you like". This visual openness provides opportunity in terms of monitoring students not physically in the same space as the teacher, but conversely resulted in occasions where students from other groups provide a distraction or disruption. This occurs when another group of students are undertaking some directed learning within the hub space. The nature of the space is such that areas are demarcated by doors which define the respective spaces from being workshops, design studios or computing areas.

And there is..... you can..... there is [double] doors right, so you can door the place. You can close the design room off. You can close that off and they have to go out a door to go into another classroom if you like, into the wood shop. So there's a line in the sand. You are in this room and you're not going over that line.

Interestingly these doors are not able to be locked to secure certain zones. They serve as demarcated boundaries but not barriers.

Isaac | Teaching group structure

The shift in approach due to the change in facility was a significant one from teachers being allocated a specific space for their group to a freedom of movement based on the activity of and dictated by the student.

It required a bit of a change of ... not so much pedagogy but just the way Technology operated. It happened at a simultaneous time when Technology came online. And so suddenly we had students that may not always be in our room. They may just choose to be on a computer in our design room and if that's what they needed at the time, that was fine. And we as teachers needed to give them that freedom to sit in the room and just to ... In the workshop we could watch them through windows and they were on task and if they need to go to the woodwork room or they need to go to a fabrics room we just gave them that autonomy just to go and said 'if you need to go, that's where you are'. And just to support the teachers to allow them to have that freedom.

The quote above identifies that pedagogy didn't change, but where and how that pedagogy could be enacted was transformed. A large part of this transformative process was centred on teachers being comfortable in providing their students with freedom and also supporting individual teachers in that transition. Trust on a number of levels enabled this to occur but was predicated on the trust of the student to be productive in the first instance. The enabling characteristics of the building as well as the structures and approaches enacted within the building, opened up possibilities for teaching and learning whereby "The opportunities were that we could do, we could have students that were working in a whole range of materials and it just opened up the programme."

In reflecting on what this practice looks like some years on, things have developed to a point whereby students view teachers as resources and identify with numerous teachers rather than just 'their' teacher.

... today, I was talking to one of the fabrics girls and she came in and had a chat to me ... She designed this dress that has got these plastic panels on the front and it was quite tricky in the end but we ended up ... I got her to design them on Solidworks [CAD Software] and then we are going to 3D print them and then vacuum mould these for the front of her dress. I have never taught her before but she just bowled up in my class and wanted a hand.

This comfort in students seeking help from an alternative teacher reflects a collaborative and collegial approach to teaching and learning. The willingness of teachers to assist in the education of all students, rather than just those to which they are formally accountable, demonstrates a deliberate and considered cultural shift within the department. This shift has had to occur on a teacher and student level and is central to the approach of Technology education at Otaenga College.

Isaac | Impact of the Senior Leadership team

In discussing the impact of the SLT on this approach to teaching and learning Isaac reflected on his experience in conceiving and implementing the Technology facility.

The big thing from Senior Leaders was they gave us time. Time off school to go and look at other schools and [they] said go and we want you to do this building, we don't want to do it again in ten or twenty years, we want the building to be future proofed. We want to do it right.

This investment in staff from a time perspective but also in trusting their opinion and judgement from the SLT is significant. Indirectly providing time also meant that the subject area was financially supported however, the SLT went further in encouraging a broader perspective on Technology education outside of the New Zealand context. "We went over to Australia, to these future schools in Australia ... and we looked at those and came back with these ideas and that support was absolutely critical". This was important due to the New Zealand Technology curriculum being in its infancy at the time but it also demonstrated the flexibility in use of space as an integral feature of the buildings design and the intended approach from a structural perspective and the support that this received from the SLT. Isaac's comment of future proofing the facility is a crucial one given the level of investment involved in developing a new building project.

The development of a shared facility brought with it structural issues due to previously discrete subject areas amalgamating.

One of the big issues that we had at the time was that we were building this block and suddenly we were amalgamating the food and the fabrics and the wood and the metal based rooms, and we were given ... oh I forget now. We were given \$900,000 to equip the rooms. It became a really ... that was really quite difficult to manage because everyone wanted to build their own little empire.

This issue of 'empire building', resulted in staff wanting to purchase equipment for the good of their Technology strand and potential detriment of others. Support of the SLT was employed to rationalise this process.

We were too close to it and we ended up giving the job to the Deputy Principal saying here's the money. Here we want you to decide where it goes ... They will put a case forward for what they think they will need and then the wise one, the Deputy Principal can then sort it out because it was a real bone of contention.

This use of the Deputy Principal as an arbitrator in determining the allocation of financial resources perhaps saved and protected relationships within the subject area where trust and collaboration would be a feature going forward.

Isaac | Trust, flexibility and agency

Fundamental to the flexibility of the Technology environment at Otaenga College is their student centred approach for the good of the subject and not just the individual teacher or group.

We have a policy in our faculty that we will teach any kid that asks us a question. Whether we actually teach them or not we will teach them. Like that girl who came in today with that huge problem, I've no idea what her name was, she just came in.

This explicit policy has contributed to the success of the subject area and provides agency to teachers in feeling that it is acceptable to help another student. It also allows the students to feel that they can ask, get a second opinion or simply access the most available source of support. In terms of the centrality of this policy to success Isaac identified that "It just happens and it has to happen".

This flexible approach hasn't been without challenge. Differing behavioural expectations created tension illustrated by "When you were in a room and you saw some students from another teacher off task, right. That was a challenge because you would want to go and rip into them". This challenge has matured into a cultural shift over a period of time where "It took us a while for the kids to realise that any teacher was going to give them a rocket at any time". In an environment where there are significant health and safety challenges this universal teaching approach has provided "just that flexibility to allow them [students] to go and do that in the block and know that they are still under control. They are still being watched by teachers. They are still being safe."

The flexibility of approach at Otaenga College is not limited to the structure within lessons. There is also the scope to be flexible in terms of the timetable where appropriate.

... that programme has worked really well for us and what it does is that it allows the lunchtime, which is 50 minutes to be incorporated as well. And so it is not unusual, if you want a double period because you are cooking something, right. And what happens is say you might do that on the Wednesday and you'll have the kids at lunchtime and you would have them period five. So you have got them for an hour and 50. And then the next day they need to come in at first period but they don't because they have already done their period.

In considering student agency afforded by flexible space coupled with the specific departmental approach, Isaac is clear that it directly impacts upon student outcomes.

I taught this boy called Calvin Harrison [name changed] and Calvin Harrison got top scholar in Technology. I taught him and he got that because we had flexible learning spaces. It would not have been possible without flexible learning spaces. Just to run.... He was miles ahead of everyone. He was just going and I said 'Just go, go Calvin do it, do the business'.

This ability to self-extend due to unshackling the student from a particular space at a particular time, significantly helped in supporting and differentiating students. Whilst again referring to the top scholar, Isaac noted,

So we weren't limited to swapping rooms or whatever if he needed to use a computer, the space was there for him every period if he needed to use it. If he didn't, if he needed to use the workshop then the space was there for him to use the workshop.

In successfully fostering a collegial and collaborative approach at Otaenga College, Isaac identified the essence was to "make sure that everyone is on the same paradigm if you like or the same wavelength".

Participant four | Michael - Admiral's Grammar School

Admiral's Grammar School is a very large inner-city school situated in a major New Zealand centre. It has approximately 2400 students from Year 9 to 13 on roll. Michael is now in his tenth year at the school having taught previously in the United Kingdom and has been recently

promoted to the Head of Department role. Within the Technology Department at Admiral's Grammar a fairly concentrated range of subjects are taught including hard materials, DVC, systems and control alongside a vocationally focussed furniture making course, which is centred on the acquisition of skills, working predominantly in timber. The department contains seven other staff including a technician.

Michael | The nature of Technology

The nature of the subject area at Admiral's Grammar School is very much centred on Technology as a practical problem solving activity and this drives the use of space, as acknowledged by Michael when he identified "... the curriculum drives how we need to use our spaces more than anything. The curriculum that we teach ... means that the boys need access to different equipment at different times". This practical problem solving, project based learning approach ensures that students need to explore, research, design and model or manufacture the solution to the problem. As such spatial use at Admiral's Grammar is dictated by activity and the specialist equipment found within that particular space. The opportunities presented by the space contribute to the location of resources within it. As such the flexible use of space and freedom presented to students is determined by the task they are undertaking and the opportunity that space provides along with the structure or limits individual teachers impose on their students. Michael describes teaching and learning in Technology at the school as,

When you are involved in project based learning and working through a design process, sometimes they need a theory driven lesson... almost a lecture theatre style approach or you might have other times where they have to be in a workshop and they have to be modelling and there has to be a more creative set up where they have got access to machinery and specialist equipment so more than anything within Technology no two lessons are the same.

In comparing Technology to other subjects areas and other approaches to teaching and learning Michael acknowledges that, "It's not a chalk and talk subject ... it can be at times in which case any classroom will do but then at other times you have got to have specialist space". This diverse approach dictates that spatial use is predominantly determined by task and the ability of the space to sustain that task.

Michael | The nature of space

In understanding the nature of space within the school the Technology block is very linear in design with an exterior corridor providing access to graphics studios and workshops. To facilitate

movement between rooms there are internal doors resulting in there being no need to enter the street space to move between rooms. These internal doors are lockable providing control to teachers in isolating or opening up areas for student use. In terms of how this space is used, there are multi-purpose and specialist spaces that, by their nature or through the equipment located within them, provide opportunity for particular tasks to be completed by students. Glass separates the design studios from workshop space providing for visual continuity and allowing staff to monitor both spaces simultaneously.

... our setup is fairly varied in terms of the facilities we have available in each room. We have some spaces that are multi-use such as room 3 where you have got the ability to do Computer Aided Design (CAD), 3D printing, as well as a graphics setup at the front of the room and then we have got more specialist areas where you have got room 1 which is very much a computer space, albeit with the use of a laser cutter as well, room 2 which is a graphics studio ... and then the specialist kind of workshop areas as well.

In determining the relevance of space and how the Technology curriculum impacts upon this, Michael identifies this as,

... the most appropriate environment for what we are doing. So I think that whether it is new curriculum, old curriculum, whatever style it is that you are looking at within the subject you need specialist areas, one hundred percent.

Currently within the department there are changes in spatial layout as a result of a review of the courses being offered. This review is in response to making efficiency gains within the subject area whereby,

... we are now going through a process of changing the use of some of our areas and having them even more sort of focussed on saying that this is an area for that ... so that will be the place for that task ... and so it is not so disorganised and not so ad-hoc in terms of boys just grabbing machines out of a cupboard and going right 'I'm going to use it here'. It's like 'Well no, that is not the area for it'.

This approach in developing specialist spaces and situating particular tasks to that space is an interesting concept as it prioritises a task to a space rather than prioritising a transformative nature to space which would result in an agility to the space. Michael aligns this thinking to an

authenticity in spatial use when considering life outside of education as “it brings in that realism as well. You know in the real world you need different spaces for different activities”.

Michael | Teaching group structure

In determining the use of space by teaching groups Michael plays a major role in the timetabling of rooms. This timetabling is based on the programme and not the teacher and teachers will find themselves teaching out of multiple rooms.

Teaching staff are given their timetable in terms of what classes they are going to be teaching for the following year and instantly they want to know, well what rooms am I in and when do I get access to those rooms? So the first point for me as HoD is, how do I allocate these spaces fairly and appropriately for the scheme of work that those staff are going to be following and even it out?

This focus on equity for staff is important. In determining prioritisation of space, senior groups are accommodated first. This is due to the more diverse needs of these groups in terms of the outcomes produced. The process is then to “work back from there and go OK, where can we fit the junior programme around that and make sure that everyone gets an equal share if you like”. This transparent approach doesn’t privilege any staff member and as such increases teacher support of the timetabling structure.

Whilst rooms are formally timetabled and allocated to groups, the departmental approach is one of accommodating the greater needs of the department, resulting in the splitting of some groups across spaces.

More often than not we are pretty flexible, it might be three or four boys that you say (to the other teacher) ‘Do you mind if they sit in on the back of your lesson just to finish the work they are doing?’ and then you go back in and check on them every 20 minutes or so and manage it that way. But I guess it is group specific.

This supportive and collegial approach is a feature of the way in which staff operate within the subject area at the School. Another feature is the process of “bartering for rooms at the start of the day”. Staff will frequently trade rooms in the workroom at the start of the day based on group progress from the previous day. Due to the fairly compact nature of the Technology block this informal room change doesn’t cause disruption to students and small whiteboards are located on each door for staff to communicate this to their groups. With numerous teachers

working out of numerous spaces there is strong requirement for shared expectations for how those spaces should be left. This is a source of frustration at times for Michael when he acknowledges “When you are in a lot of different rooms, sometimes people don’t always take the same ownership that you would like” and this shared value of how rooms should be left and subsequently found by the next group can be challenging.

Michael | Impact of the Senior Leadership Team

In determining the impact that the SLT have had on the utilisation of space in this way, Michael identifies the School appraisal system and more specifically the four minute walkthrough⁶ structure of observing classroom practice as being influential. “I think that this is a big, sort of, mentality shift school-wide when the whole new appraisal system came in ... people in a lot of departments were not used to having people in their space”. This deterritorialisation with other staff coming into classrooms makes having additional odd students or other staff members dropping into and out of lessons to use specialist equipment within the department less of a problem.

Michael acknowledges that a big impact of the SLT on Technology recently has been through the financial backing in repurposing space and funding the associated cost of new equipment. This also involved support from facilities in carrying out the renovation of the relevant spaces.

I think that once they felt that there was a real plan in place and there was support of other key people around. The Director of Property for example, they were quite responsive to that. But there is always the challenge of explaining why that is needed.

This support has been the catalyst for the evolution in spatial use within the department and the development of specialist spaces from what were previously multi-materials workshops.

Building upon the four minute walkthrough aspect of the School appraisal system, Michael views this as an opportunity to not only open up spaces to others but also to educate the SLT. He describes a misconception of the Technology subject area amongst other staff groups and views the visiting of the SLT for walkthroughs positively.

⁶ A four minute walkthrough is a structure of observing teachers’ practice with the intent being on developing a more diverse picture of practice through numerous four minute observations in contrast to a potentially contrived pre-planned observation of a lesson in its entirety (Downey, Steffy, Poston Jr, & English, 2009). Four minute walkthroughs are one of many data gathering tools used in teacher appraisal.

This is somebody walking in, coming to watch me teach and coming to see what I do and this is my space, this is my domain. I think, in this department it has always been, 'Hey come in, see what we do', encouraged, almost the other way. Do you know what I mean? 'Quite happy to see you, love to see you here. Come and have a look, come and understand what the subject is about'.

In linking this education back to a bigger plan of how space is used within the subject area Michael acknowledges that "The biggest support they (SLT) can provide as far as I am concerned is of understanding of what it is you are trying to achieve". This opportunity to advertise the subject promotes and fosters potential support amongst the SLT.

Michael | Trust, flexibility and agency

In facilitating flexibility amongst staff there is a necessarily collegial approach to how space is cared for and looked after. Michael identifies the need for "a clear expectation from me as to what they can expect to find in each room and how we expect that room to be found and left". In setting out this structure the following is expected by the middle leader in return.

So I need to be able to say I am going to come up with the goods in terms of what you need from me. And then you need staff to support what it is that you are trying to achieve. So you need them to be on the same page ...

This clear transactional relationship is centred around the space and relevant equipment being ready for use when required, ensuring that students can work efficiently and effectively. An emphasis is placed on staff to manage their students and the respective environments accordingly.

When considering the impact of different students, particularly senior students undertaking diverse projects, being at different stages and requiring different facilities Michael felt that,

... by and large people are pretty accommodating of that ... There is pressures sometimes when groups have got to be put in the same room even, which can present its own challenges. Sometimes it can be a real opportunity; that can be really positive, in terms of input from two teachers ... I find that powerful.

Indeed, as a Middle Leader, Michael enjoyed the opportunity to pass through lessons, expressing that, "personally, I love going around and seeing what is going on in other people's lessons".

Importantly this was not undertaken as a surveillance exercise but more to develop a collaborative culture within the team of staff within the department. When something that could be of benefit to the wider group is seen, the staff member is encouraged to share this within the context of departmental meetings. This has resulted in “a certain shift in the mind-set of staff when you go, ‘would you mind just spending two minutes going through what you were doing there?’ and they get a real sense of ownership of it”. This collaborative approach which is led by the Middle Leader is acknowledged when “I guess it comes back to shared spaces to develop staff”. This provision of agency to work as part of the group and not in an insular way has been a direct result of opening up practice due to opening up space

Trust of students is also a strong feature of working within this way, particularly at senior level, due to the diversity of outcomes and the impossibility of all students working on the same task at the same time.

That’s where you need a fairly high trust model with those senior boys but you need to establish that in the junior years so that they know what is expected with them in each space. So just like we do with staff to say ‘Hey, I need that to go back where it belongs’, you need to establish that with your boys as well.

In establishing the trust and expectations associated with providing this flexibility, Michael identifies the need for all staff to have similar standards regarding student expectations. Due to the inherent health and safety issues associated with a practical subject there is a need for all staff to own behavioural management as Michael describes, acknowledging the need to say “‘I’ve seen that and I am going to act upon it’ because as soon as they turn a blind eye to it the boys know that, all of a sudden it becomes acceptable”. This consolidated approach makes the life of all staff easier “because you are in each-others space all the time”. This occupation of the physical space of other teachers and classes in this department was a key feature of using space flexibly. By physically working within the same environment there is by default an occupation of social space, especially when there is an expectation to react to the actions of and interact with students from other groups.

Summary – Results and findings

The presentation of the data in chapter four has quite deliberately been presented and structured under the meta-themes of ‘impacting on’ and ‘acting on’. This structuring identifies the influences impacting on the work within the Technology department from outside the institution which includes the nature of Technology and the NZC. It also encompasses the

influences within the institution but outside of the department which will include the SLT and school wide structures such as the timetable or option structure which impact upon the work within the respective Technology department. These internal influences will also include the nature of space as the ability for staff to drastically change the use of space will be limited by the existing architecture or the significant financial resources required to drastically alter the functionality of the space. The last part of the structuring of this chapter has been the ability of the Technology leader and other staff within the department to act on the use of space. This acting on will be influenced by the internal and external factors impacting on the department resulting in action taken by the technology leader. From this action and the actions from inside and outside the department there is also a reaction and these impacting on influences surround and constrain the Technology department but also provide opportunity. The nature of these actions and reactions are best illustrated graphically in Figure 5 shown in the conclusion section on page 76.

Chapter five provides synthesis of this data across the participants through the meta themes illustrated above. It is structured around the themes identified in Table 3 on page 38.

Chapter Five | Discussion

Introduction

In chapter five discussion is provided around the findings from chapter four and presented as a critical analysis identifying the threads across the four stories presented in the previous chapter. Chapter five has been structured to provide discussion on external factors impacting on change, leading to Technology leaders acting on change and culminating in impacting on change from within the organisation. This sandwich approach is important as it reflects the lived experiences of the Technology leaders studied inasmuch as the external impact on the department provided the rationale for a change in approach. Acting on change was the response from the Technology leader to address these external requirements. Finally, the organisational influence through impacting on the flexible practice in many ways provided the rules within which the Technology Department could 'play the game'. As subsequently discussed this could be an enabler to the flexible practices undertaken but equally a disabling one. This sandwich approach is further expanded with relevant subheadings which formed threads of comparison and contrast across the participant responses.

External factors impacting on change

In understanding the catalyst for a shift towards the FLEs there were two predominant drivers impacting and influencing change. The stories told by the four participants all referred to the importance of and the emergence of the Technology curriculum and three of the four experienced a new facility developed as a reaction to this curriculum change, not because of an idealised pedagogical change.

The Technology curriculum as a driver for environmental change

The primary catalyst for change for all schools was that of the implementation of the Technology curriculum in 1995. As discussed in chapter one, this curriculum encouraged the use of collaboration and co-operation and through an emphasis on the application of conceptual knowledge from a variety of other subject areas, promoting the "horizontal connectedness across learning areas" (OECD, 2015, p. 18) in the 7+3 framework. As well as the removal of siloed subjects, the document also encouraged "lateral and divergent thinking" (Ministry of Education, 1995, p. 8) and the scene was set to work in a more socially constructed and flexible way, again aligning to the 7+3 framework of the OECD (2015). One important but almost implied facet that the Technology curriculum provided was the opportunity to diversify outcomes of students by developing outcomes in the most appropriate material, not necessarily a material predetermined by an option choice. This approach to the subject was valued and encouraged

by all the research participants and was a strong driver in initiating and developing the flexible approaches enacted in their faculties as frequently a change in material meant a change in spatial need

The diversity of student outcome emerged from the bringing together of previously discrete subject areas in a unified curriculum and within programmes that provided students the potential to work across these subject areas. This development had important implications with regards to how teachers perceived themselves. They became broader technology teachers first, with an area of specialism second. This was a subtle but important shift within Technology faculties and shaping a culture associated around diversification and capacity building within a faculty determined its success and is the subject of discussion around question two in chapter six. The experiences of participants varied greatly with some encountering strong resistance to this phenomena. This resistance manifested in avoidance of particular environments, processes or tools. The lived realities of others involved the embracing of this, providing a structure and agency for staff to work with students to which they were not timetabled and had no formal accountability for but whose work may fall within an area of strength for that particular teacher. Alongside the expected diversity of outcome came an associated and necessary diversity of pedagogy, with each participant reflecting upon the need for a variety of spatial requirements in supporting a necessary diversity of pedagogy. These student centred approaches stemmed directly from the curriculum document and the very nature of the subject area.

A further theme that was unanimous amongst participants was the appropriateness of space, with the requirement of matching the task to space. Interestingly this is at the heart of the argument for FLEs, with authors arguing that the traditional single cell classroom is unsuitable for a 21st century approach to teaching and learning which should be student centred (Kennedy, 2017) and less didactic (Neill & Etheridge, 2008; Woolner et al., 2012). In a technology context this driver for a different space stems from the diversity of task dictated by the practical nature of the realisation of prototyping a solution. The driver for this is predicated by the need for an appropriate space to assist in the student completing the task safely and in ensuring a high quality of outcome as much as it is for the enabling of diverse and engaging pedagogy.

Facility development

The reaction to this philosophical change to the learning area was the development of facilities. Three of the participants worked within schools in which a new Technology facility was developed between 2000 and 2003. Importantly, the development of practices through buildings in these schools was in reaction to curriculum change and the according pedagogical

shifts made because of this. It was the curriculum shift that came first followed by the environmental one. This important sequence of events reiterates the observation that “space does not have agency nor does it cause pedagogy, yet it is an enabler. Pedagogy (i.e. practices and the thinking underlying the practices) evolves in response to space, and what it enables.” (Benade, 2017a, p. 132). This enabling characteristic of space is certainly the experience of Michael and Isaac whose classrooms, through the use of glass and the visual continuity that this provides, are able to provide students with far greater freedom and were afforded an opportunity through the nature of the space. The space did not cause the change in pedagogy, however, as it could equally have been used as a discrete classroom. Through acting within as well as on this space, through the development of policy and practise, staff within these environments have been provided agency to teach in this way. The space has enabled this and the teacher, in conjunction with the conditions fostered by the Middle Leader, has been provided the agency to allow for this use of space to occur. The leap of faith made by some at the time, particularly where space was redefined significantly, was the locking in of this approach and the potential inability to return to past practices (Tse et al., 2015). In the one context in this study where the building was not developed, the flexibility of practice in terms of relative student freedom and diverse student outcomes prevailed. Although due to a lack of visual continuity and access between rooming it should be noted that it has occurred in sub-optimal conditions. This reinforces the concept of space having the potential to act as an enabler (Benade, 2017a; Imms & Byers, 2017). It also demonstrates that pedagogy, space and curriculum are separate entities but they can significantly influence and enhance one another.

Acting on change within Technology departments

The structures and support mechanisms implemented by and experienced by all those within the faculty play a significant role in the success or failure of such initiatives. Whilst the contexts of all the participants in the study engaged in using space and resources flexibly, the degree to which this was done and the nature of flexibility varied significantly due to faculty policy, culture and staff ‘buy in’ alongside the development of staff within the faculty area.

Development of Faculty policy

One of the fundamental aspects of work within each participant’s context is that of collegiality and collaboration. Achieving this through regulation, compulsion and an implementation-orientation, as policy making would imply, are as Datnow (2011) argues not collaboration but contrived collegiality. One of the most important aspects defined by the participants centred, however, on policy or direction offered by the Head of Technology. Isaac spoke of a policy within Otaenga College that “we will teach any kid that asks us any question. Whether we actually teach

them or not, we will teach them". This cultural norm was implemented in a contrived way but exists because the team see it as an important part of the way in which they do things in this context. Michael and Andrew discussed the importance of inventory management with Michael mentioning the requirement of "a clear expectation from me as to what they can expect to find in each room and how we expect that room to be left and found". In the terms of this being dictated by the middle leader this approach would likely be unsustainable. The reality of these participants was, however, that the policy was a representation of shared values and was not imposed upon staff but more developed in conjunction with staff. In being actively involved in creating shared values, staff were provided opportunity to shape the constructs of the environment within which they work. The candidness of Isaac when referring to teaching any student who asks a question was one of "it just happens and it has to happen". This is a reflection on a core cultural belief shared by all and in reality not imposed by policy but by a shared set of values upheld by staff and developed over time. It was not only at Otaenga College where there was an ability for students to engage with a teacher other than their 'own' however, it was here that this 'policy' was formalised and explicitly stated. In other contexts this was more a factor of goodwill and co-operation.

An integral aspect of the experiences of all participants was the necessity for student freedom. This freedom manifested itself in a variety of ways and indeed across different contexts varied in terms of the amount of freedom students required. In essence the freedom was required due to the potential for students to be at different stages of their project and therefore require different space due to a difference in task. It is important to differentiate at this stage the nature of this type of flexibility in contrast to the transformational flexibility or agility of space identified in the literature by Benade (2017b); Dovey and Fisher (2014); Perkins (2009). Within all four technology contexts the flexibility was determined by the use of rigid or fixed space and not the manipulation of flexible space. It was the combination of spaces and the flexibility afforded to working within them rather than the transformative nature of the space that provided the flexibility. This is again driven by the appropriateness or efficacy of a space in relation to the task and the diversity of task required within the subject and this need, given the amount of specialist equipment, is a unique feature of Technology education and project based learning

Staff development

A frequent theme to emerge from all the participants was the impact of working flexibly and in each other's space as a means to develop staff. The context surrounding development ranged from capacity building within the subject area to allow new space to be utilised effectively, through to development through stumbling across practice and then disseminating this with

others. In other forms it involved co-teaching and working with a broader group of students. In all these situations the importance of de-privatisation and trust cannot be overstated.

Mackey et al. (2017) acknowledge co-teaching as occurring when two or more teachers work with and have a shared accountability of a larger group of students. They also acknowledge this scenario as an opportunity to create “teacher collaboration and professional growth, and less favourably, the potential for misunderstanding, conflict and challenge” (p. 98). In the contexts studied it was clear that all of these possibilities were experienced although not all of them by all contexts. Clearly the intended outcome from this type of approach is to foster professional growth without the negativity of conflict and challenge and the means of implementing co-teaching differed hugely across participants. At one extreme, co-teaching was embedded in the approach of all teachers at Otaenga College. The expectation that all teachers would teach any student who asked them a question opened the door for students to gain feedback from other teachers and also for teachers to converse and discuss solutions to projects together. This was hugely successful in the generation of diverse outcomes not just within groups but also across groups, providing staff the opportunity to develop a skill set in an unfamiliar material with the safety net of a relevant specialist available as required.

At Admiral’s Grammar this manifested itself in a much more ad-hoc, less structured way. The opportunity to engage in this practise was there but by choice and not necessarily as a cultural expectation. This is a potentially dangerous space to be due to the possibility of conflict and challenge, however, this is driven by the Head of Department and the shared responsibility is one of teacher and Head of Department working together. It is not clear how far this extends beyond the Middle Leader providing support on a teacher to teacher level. It is clear, however, that the teaching staff have an implicit trust in the leader and there is an understanding from staff of capacity building due to their buy in and willingness to share practice with colleagues.

The experience of Andrew was a different one. From having a seemingly similar approach to Michael whereby the Middle Leader engages in co-teaching practices with staff, some of the negative traits of conflict and misunderstanding described by Mackey et al. (2017) manifested. The experience of resistance encountered at Arabella Girls Grammar School through an unwillingness of teaching staff to engage in co-teaching practices where, as described by Andrew, teaching staff wanting to understand new concepts first to enable them to teach these themselves rather than rely upon somebody else. Deprivatisation of the teachers practice through Andrew entering the classrooms of others was confronting and presented a barrier to the effective use of the space. This was confronting for staff for whom there was not the

opportunity to develop trust prior to their line manager entering their space and, in their eyes, highlighting a gap in their knowledge or a weakness in their teaching practice. How this practice is framed by the Middle Leader will dictate the receptiveness of staff. Where a feeling of review and surveillance exists there will be resistance. Mackey et al. (2017) consider the time taken to build trust, teacher disagreement and public practice as being problems inherent in the practice of co-teaching and given the transient nature of staffing within the school this could have been a factor in the resistance experienced as the time to develop trust was not there.

A further reason for resistance could be that of contrived collegiality. As described by Datnow (2011) contrived collegiality is a product of regulation, is compulsory in nature and is unsustainable. A Head of Department or Faculty, as a holder of positional power, would experience this resistance if the teaching staff felt it was imposed upon them without the opportunity to build trust in this approach and with this particular person. Further problems would develop if they felt a lack of choice in engaging in co-teaching and were unwilling or reluctant participants. Without the foundation of trust there is the potential for teacher deficiencies or weaknesses to be revealed in a public forum. It should also be noted that the rationale for co-teaching in the latter two contexts related strongly to capacity building and professional learning. This is in contrast to the experience at Otaenga, where the impact on the student was intentional and explicit rather than associated and implied. Whilst the 'policy' to teach any student at Otaenga was an imposed structure on staff, Isaac's comment of "it just happens and it has to happen" identifies a cultural acceptance of this method of practice within that context. This culture may have, in the first instance, been initiated by an initiative or policy but has evolved beyond a mandate to become valued by the group due to the support, reciprocity, agency and trust prevalent within that particular context. This provision and utilisation of teacher agency has impacted upon the sustainability of the initiative as well as the effectiveness of developing staff within this context. Where these opportunities provided by the leader were not utilised by teaching staff these initiatives have floundered.

Opportunity to experiment

One of the fundamental aspects of working in a more open way both physically, through visually connected spaces, and metaphorically, by providing freedom to students and agency to staff, in the use of space is the willingness to deprivatise practice. This is a foundation to co-teaching through having another teacher in and around the lessons of others. Michael identified a revised appraisal structure as opening up otherwise closed lessons to other staff, both from within but predominantly outside the department through having others in their physical space. The nature of the walkthrough system of lesson observation meant that having other teachers in classrooms

was less of an abnormality due to their frequency. He also acknowledged the structural fact within the department that other staff “are in each other’s space all the time”, both in physical and social terms, as being part of the daily experience of teaching Technology in this context. The opportunity to experiment is a fundamental aspect of Technology as a subject. Indeed it is identified in the curriculum document (Ministry of Education, 1995) as a promotion of trial and error alongside risk taking. As a group of professionals who espouse this approach in their students, Technology educators are in a potentially advantageous space regarding the opportunity to experiment in their own practice. Garvey Berger and Johnston (2015) identified the “safe to fail experiment” (p. 93) as a means to explore approaches within safe boundaries created by the leader. All of the participant experiences have involved the diversification of student outcomes through developing an approach that crosses traditional subject boundaries. The approach of the two contexts whose facility was designed and built around a flexible, more open, space was arguably less safe in failure. In many ways, two of the contexts use of space have been developed through this approach as the physical environment is based around a traditional single cell, albeit at Admiral’s Grammar with glass providing visual continuity in some environments. The flexible use of space was a safe to fail experiment bounded by the constraints of a school timetable, the willingness of staff to participate and the support structures implemented by the middle leader.

In a deterritorialised environment, such as the spaces experienced by all participants promoting an experimental approach, is challenging. Experimenting publically, amongst colleagues and in front of students, where things may not go as intended, involves staff being vulnerable and a key structure in experimenting and the provision of agency to staff is that of trust. In contexts where there is a culture of judgement and surveillance, the willingness for staff to experiment decreases significantly. In an environment separated by a mezzanine but no acoustic barrier between teaching groups, as was the case at Arrabella Girls, the space has less privacy and greater physical openness. In considering trust in relation to the openness of space, Benade (2017b) notes, teachers’ fear of observation and judgement is negated through high levels of trust which relieves teacher pressure. Much of the success in this kind of approach is determined by the boundaries applied by and approach of the middle leader in firstly making staff feel safe and secondly in ensuring that risk of failure in that approach is mitigated.

Staff ‘buy in’ through culture building

The experimental approach above identified the themes of agency, trust and supportive structures implemented and enacted by the Middle Leader. A unanimous and overwhelming thread from all participants was the essential nature of staff ‘buy in’. The policy and structures

laid out by the middle leader provide the framework for staff to work within. Contributing to this could be the degree of freedom afforded to students and staff. Certainly in the experiences of two participants this structure was one of total freedom regarding the use of space. The experience Isaac portrayed was one of a high degree of student freedom. Students were encouraged to be in the most relevant space for the task they were completing and were accountable to all teachers. This required a consistency of approach, a shared set of values or an accepted way of doing things that cannot come from working in isolation. Acting out of self-interest or turning a blind eye to a particular behaviour erodes the work and efforts of all staff. In much of the data, a real sense of collectiveness through the use of the word 'our' when describing things was important. This sub-conscious, almost minor aspect embedded in the data conveyed a huge sense of the experience of working within this particular context. It communicated a real sense of team and ownership and its frequency conveyed a conviction that this shared approach was integral to the departmental culture. When considering this growth and fostering of culture it is useful to consider that in developing these spaces, previously separate subjects in silos were broken down to create an amalgamation of previously discrete subject areas. In doing this successfully and sustainably the development of a departmental culture through trust and agency, fostered through a deprivatised approach was imperative.

Impacting on change within the institution

Alongside the structures developed from within the subject area, participants identified the significant impact from the wider school context. This impact from outside the subject area provided the rules by which the middle leader can 'play the game' situating the subject area within the institution. For some this was enabling, whilst for others this provided a disabling or constraining aspect in the effective utilisation of space.

The role of the Senior Leadership Team

In understanding the role of the SLT in shaping the use of these spaces the levels of impact and involvement varied hugely. The experience in Cairnhill College was one of a hands-off SLT whose willingness to trust the members of the department to work effectively and appropriately within the wider context of the College was acknowledged as a defining aspect. George's identification of the risk on sustainability of a solution associated with trying to impress a preferred approach on a department from above was an important and insightful observation. In this instance the SLT allowed the department to determine the best approach themselves, providing the opportunity for collegiality that is not contrived but determined from within rather than by an outsider. This allowed for the most efficient and effective use of resources to be determined by those directly involved in enacting and interacting within the space.

The degree of impact from the SLT in terms of financial and structural support is obvious and for some participants profound. The real sense was that the SLT were integral in the success of flexibly using space due to their support, both financial and through the provision of time. This was at the forefront of Isaac's response. It would be easy to look at the cost of taking staff off timetable or paying for travel, both nationally and internationally, as being a significant expenditure and investment. If this investment didn't occur however, the risk involved in getting the new building development wrong or having to reinvest in correcting initial flaws is far greater. This support and willingness to trust those staff who work within the environment to develop the most appropriate solution for a very large capital project is hugely powerful. The philosophical decision to integrate flexible spaces within this build significantly before it came to the fore in contemporary educational discussions shows a significant degree of forward thinking and understanding of the nature of a new curriculum.

Financial support was a factor identified by other participants in allowing them to develop the specialist shared areas, particularly within the practical spaces of the subject. This occurred through the purchasing of resources to change or improve the capability of particular tasks making that the 'go to space' for that task for all groups, not just the students timetabled there. However, the more important point of the SLT understanding some of the subtleties or specific needs of the subject and more specifically, the intent of change when presenting proposals, was a characteristic valued more highly than just the provision of finance. This understanding is bi-directional and shows some clever thinking from the perspective of the middle leader. By educating the SLT as to the nature and direction of the subject, more support and potential leverage for future change, staffing decisions and other school wide impacts could be gained from those with positional power and influence. This provided a degree of support for the direction of departmental culture, in this case towards the flexible use of specialist spaces, and developed 'buy in' from above as well from below from teaching staff.

School wide policy change

One of the biggest direct impacts on subject areas can be that of school wide policy changes. In the eyes of the participants of this study this was seen as both a positive and negative. Through small changes in aspects such as the timetable, Otaenga College showed that huge benefits can be made through the ability to use time flexibly. Through the ability for the entire group to trade a lunchtime for a future period, making a 'virtual double period', provided opportunity to undertake activities that would otherwise be impossible. To be able to work this on a structural level is one thing but to provide the department with the agency to allow this to occur is something entirely different and illustrates the trust shown by the SLT in the middle leader and

subject area as a whole. Conversely, a school wide structural change can impact significantly on subject numbers through privileging other subject areas above others as experienced by Andrew.

The unintended impact of a change in appraisal system fostering a more open and less territorially driven mind-set around teaching and learning provided for other staff to more frequently visit the department thereby providing an opportunity to show off what they were about and educate outsiders. This opening of classroom doors also shifted the culture within the school from one of seclusion and teacher domains to that of openness and acceptance of others in classrooms. This created a climate whereby possibilities for deprivatisation grow through reduced resistance.

Staffing – resistance and change

In determining the impact of a teaching and learning environment, Mulcahy and Morrison (2017) presented a sociomaterial assemblage, moving away from a space and practice binary. The importance of considering that an environment is socially constructed as well as physically constructed is profound. This is especially the case in moving from a traditional approach to that of greater flexibility over space and students or enacting any other change. How the people or actors react to change and how that change is situated in space will define it. Minimising resistance or understanding the reality of resistance and being sensitive to this during any change process is important. When considering the effects of impacts upon and acting on the use of space it is clear that the development of a departmental culture through trust, agency and flexibility is important. It is also clear that “a learning environment’s practice must be tangible, not aspirational” (Imms, 2017, p. 25) indicating that how the physical environment is used is as important if not of greater importance than the infrastructure or building. This is illustrated in the experience of George whose practice is situated in a single cell environment.

Chapter Six | Conclusion

The discussion occurring in chapter five illustrated the alignment between the findings from the participants and the literature in providing a narrative for the experiences of the participants of the study. When concluding this study it is important to consider how the discussion addresses the research questions

- I. What was the catalyst that drove the change process towards a more flexible learning environment within the technology department?
- II. What structures and support mechanisms did Heads' of Technology provide to their teaching staff in enabling flexible use of space and resources?
- III. What external factors (from outside of the Technology Department) provided support or barriers for change towards flexible learning environments?

In answering these questions there will be significant overlap across questions due to the inter-related nature of the subject area. Through addressing these focussed questions in the first instance the overarching research question of,

How do Secondary School Technology leaders account for their experiences of change associated with utilising flexible learning environments?

can then be addressed in understanding the experiences of these middle leaders relating to FLEs with the subject area of Technology.

The discussion in chapter five centred itself on the factors that have impact on the FLEs in four Technology departments spread throughout the North Island of New Zealand. It also discussed the action taken in acting on the use of this space within each specific department. The overarching question remains though, how do Technology leaders account for their experience of change associated with utilising flexible learning environments?

Question One | The catalyst for change

In answering this from the discussion in chapter five the main driver for the changes in the use of space came from the shift in focus to a new curriculum. This document emphasised the use of knowledge to inform practical problem solving and a push away from the finite skills training approach of Workshop Technology discussed in chapter one. This required Technology departments to use the same facilities in different ways and provided the opportunity for some contexts to develop purpose built facilities suited to this new delivery style. This development

occurred prior to the present day discussion around FLEs and *The New Zealand school property strategy 2011-2021* (Ministry of Education, 2011). Interestingly many of the architectural features identified as features of FLEs already exist in these redeveloped Technology facilities conceived and built around ten years prior to this discussion starting.

Question Two | Structures and support mechanisms

Coupled with this potential change in space was the requirement to change pedagogy in providing the right areas with the right equipment to the right students at the right time. At this point it is important to acknowledge the difference in flexible use of space in a Technology context and the current day broader context FLEs which focus on the physically transformative nature and agility of space. This change in approach naturally required stronger collaboration and greater flexibility in approach for all staff working within the subject area, irrespective of their own particular area of specialism. This was essential in order to maximise the use of limited resources in meeting diverse needs. These are framed in terms of the potential scope of student projects and the materials with which each student could be engaging. This pedagogical change was potentially made easier for some at the time who embraced and believed in the approach of the new curriculum. As a subject area at the time of greatest change, Technology was still grappling to define itself and so was perhaps more adept at embracing new approaches to environments and pedagogy.

It is the driver of specialist space and resources to improve educational outcomes which has potentially had the greatest impact on the use of FLEs within Technology. It is undoubtedly a challenge for teachers to work within this complex environment and requires certain conditions to be fostered and developed by the middle leader to provide the opportunity to maximise this potential. These conditions have included the development of departmental policy to 'standardise' teaching approaches within the spaces, thus ensuring that all students and staff play by the 'rules of the game'. To be successful this cultural shift needs to be embraced and upheld by all staff and students alike.

It is much more than providing a rulebook to follow though, as the deprivatisation of space can be confronting for some. This deprivatisation is achieved through; opening areas, retaining non-timetabled space or increasing visual continuity through the use of glass, and this creates potential vulnerability in teaching staff and a source of distraction for students. One benefit of deprivatisation is the ability of staff to develop and indeed the theme of flexible spaces to develop staff was a strong one across all participants. This development through deprivatisation allowed for the maximising of specialist skill sets, the diversification of staff skills and capacity

building within the faculty. Providing staff with the opportunity to teach and discipline a wider group of students rather than their 'allocated class' is an important step in all engaging effectively with the space. The provision of this agency allows for further reinforcement of departmental cultures and working practices. Indeed in workshop areas it is an imperative for staff to intervene when sighting bad practice. This is due to health and safety and a duty of care for all students, not just those in a particular timetabled group. In working publically and effectively within each other's space, the opportunity for trusting relationships to be formed and reinforced is an essential factor and where this is undermined there is the potential for the system to break and disillusionment to set in. A vital factor identified by the participants was that of 'buy-in' from staff but a key point which was left unspoken was the need to create something to buy in to. It is the creation and framing of these conditions by the middle leader which will dictate this success.

Question three | External support of the subject area

The impact of the SLT on any initiative undertaken by individual subject areas can be profound and the lived experiences of all participants reflect this. The theme of financial support is an obvious mechanism that dictates the success of working in different ways. Given the limiting, finite nature of money and the need to distribute this effectively throughout the institution, however, there needs to be more than just financial backing. Perhaps the greatest support, as indicated by Michael, is that of the SLT putting to one side preconceptions and fully understanding the subject area and the intent of the middle leader so that they can support initiatives. This also allows them be better placed to understand the impact of school wide change on a particularly unique subject area. There is also a responsibility on the Technology leader to engage in educating the SLT to remove these misconceptions.

In determining the impact that space has on learning it is clear that the physicality of space as an enabler is important, but it is the understanding of space and its sociomaterial nature or the way in which the space and actors interact and interrelate which is of greater importance. At the apex of this discussion around impact, however, is that of the discrete nature of curriculum and pedagogy. Perhaps with a mandatory drive towards FLEs the focus is misplaced on the engaging nature of space rather than the far greater impact of space enabling engaging pedagogy. Within the subject area of Technology it is clear that the flexible use of space predates that of the *The New Zealand school property strategy 2011-2021* (Ministry of Education, 2011) and the 7+3 framework (OECD, 2015) but it is important to acknowledge that the nature of Technology as a subject area is enabling in that regard as it naturally aligns to these frameworks.

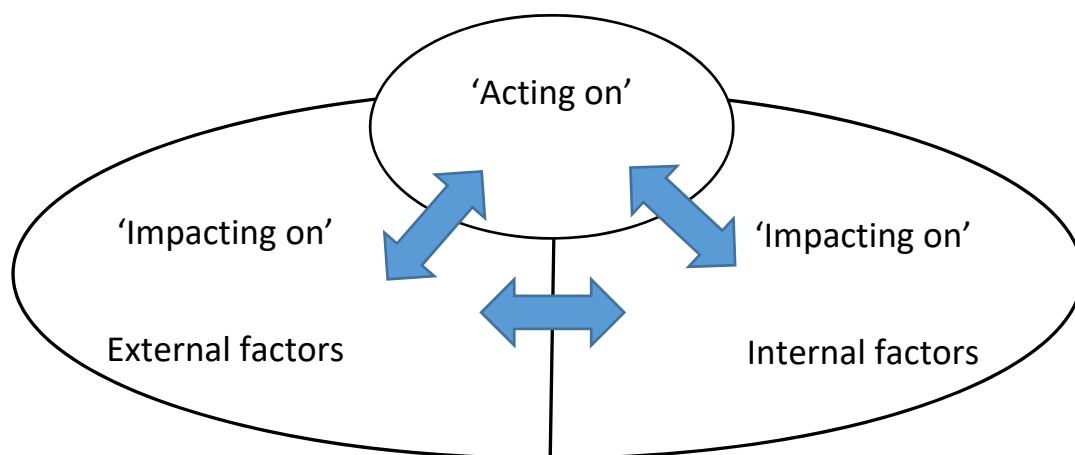


Figure 5. Data Analysis Model

The model presented above in Figure 5 represents the two way interaction of the impacting on and acting on factors from both internal and external sources. Whilst there was an impact on Technology departments from the conception of Technology as an essential learning area within the New Zealand Curriculum, through acting on this document there was a reaction to it and this reaction subsequently shaped the external factor through curriculum reviews. In the instance of Technology department architecture it led to the development of facilities in some contexts that promoted and developed aspects of FLEs prior to the contemporary conversations about such space. This action and reaction also applies to internally driven factors as Technology departments act on and react to internally driven school wide change within their context through course structuring, timetable formats and the support of the SLT. In understanding the impact of learning environments, Imms (2017) identifies the environment as “an amalgamation of its physical design and the practices that happen within. They cannot be separated and in this case must be considered an analogous whole” (p. 25). In the case of this study the two way nature of factors contributing through ‘impacting on’ and ‘acting on’ influences the practice undertaken, whilst the physical environment enables or disables these thus influencing the nature and possibilities for practice.

The impact on learning outcomes through maximising the spatial potential of a facility is significant and when asked about his perceived impact of flexible learning spaces on student outcomes Michael responded.

I think about it the other way, because we have always kind of used multiple spaces so I don't think we have necessarily, in my time here, we really shifted to the point where we are using lots more spaces than we ever did before. I think we always did that, how it impacts on their learning outcomes versus not being able to do that would be huge.

The question now is what can be learnt from Technology to further the effectiveness of this kind of spatial utilisation within other subject areas?

Limitations of study

As an interpretive study there are a number of limitations imposed on the findings presented. As the methodology focused on lived experiences of participants, only one side of a complex story has been told. Gaining some further perspective by questioning the implications for teaching staff and the SLT in such a change process could provide further understanding and a different set of findings. Through selecting only Technology leaders who work within flexible spaces there is an entirely different story to be told of those teachers who teach the same subject without engaging in space in these ways. It should be noted that the findings and conclusions drawn here are context specific and the Technology departments worked within and contributed towards a much broader institutional context. Blindly applying these findings to other, potentially very different, contexts would be unwise. Likewise, this study has been conducted within the particular subject area of Technology which, as illustrated in chapter one, has its own particular characteristics and epistemological assumptions. Blindly transferring these findings to other subject areas is dangerous and problematic. There are however, aspects from this study that are of value to other contexts and the following recommendations identify some of these.

Recommendations

In completing this research the following recommendations are made for subsequent understanding or study.

1. Focusing on the development of a social constructivist curriculum treads a different but not necessarily better path. This could be the enabler or rationale for spatial change but project based learning can be limiting in other ways in terms of the development of breadth over depth of conceptual knowledge. An assumption that spatial and curriculum typologies have to be linked is unhelpful. PBL suits Technology but is not necessarily suited to other subject areas. A perceived restriction regarding an inherent link between FLE and 21st Century learning and subsequent assumption therefore that FLEs hold little value in a traditional curriculum needs to be broken down. This could come from further exploration into the concept of powerful knowledge proposed by Young and Muller (2014) which values knowledge but rejects didactic pedagogy.
2. Future focus needs to be placed on the development of the spatial literacy of teachers to ensure that FLEs are utilised effectively and that pre-existing spaces are able to be

used in innovative ways. This will allow for the focus to shift from the characteristics of the physical space towards an understanding of the interplay of people and the agency of space, thus promoting and enabling more effective pedagogy within space. This development of spatial literacy will see these FLEs continue to develop as understanding evolves, ensuring that these spaces are sustainable in the longer term.

3. Exploration is needed into the agility of space and how this could make further efficiency and effectiveness gains. Within Technology this could enable the subject area to move from the flexible use of spaces chosen for their appropriateness for specific tasks, into spaces that are more fluid and less of a hybrid of classroom with adjoining workshop or specialised environment which is the current situation as experienced in this study. This understanding could feed into further understanding across subject areas as to how space can be utilised.
4. The focus of spatial development should be on appropriateness, agility and responsiveness. Single cell forward facing classrooms are highly appropriate for teacher centric lessons but miss the point of potential diversity in lessons through varied pedagogy which is enabled through space and the interaction between people. A shift is needed in the negative rhetoric towards FLEs from large groups in open plan environments and beanbags to space which is as narrow in scope as the positioning of traditional spaces as single-cell egg crates. This is not an either or binary but more an opening up from the restrictive nature of a traditional classroom and single teacher to class model. This is strongly linked to recommendation 2 but will also involve development and exploration away from traditional schooling structures such as the timetable for example.

The discussion around FLEs and their merits is a complex one and any preconceived ideas of open plan space with large groups served by multiple teachers are narrow. Purely focusing on the architecture of such spaces is also a flawed concept as whilst space can be enabling, if it doesn't suit the pedagogy and practices employed it is a limiting factor. Aligning space to a particular curriculum type is problematic. Whilst the project based learning approach predominantly taken in Technology education is posited by some as the way forward generally in education, it is vital that pedagogy and curricula remain complimentary and are not blurred to become one. The danger is that socially constructed learning becomes the rationale for architectural change but the shift towards this new approach does not learn from the past mistakes made from previous environmental change in the open plan movement of yesteryear. Whilst within a Technology context the flexibility in environment comes from the freedom of student use of functionally fixed environments, the challenge now is to determine how the

agility of space through transformable environments could contribute towards exciting and engaging pedagogy that provides for an epistemic structure and depth in other subjects.

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Glossary

3D Printing – A additive process where (generally in schools) plastic parts can manufactured from a three dimensional CAD file.

Achievement Standards - the units of and criteria for assessment of the National Certificate of Educational Achievement (NCEA).

CAD (Computer Aided Design) – The use of a computer to model a solution to a problem in 2D and/or 3D

DVC (Design and Visual Communication) – The revised name for the subject area Graphics in the curriculum realignment project in 2011.

FLE (Flexible Learning Environment) – A teaching and learning environment that allows for a variety of different tasks or pedagogy through its transformational nature. Frequently this enabled through the agility of the space and furniture within it.

Hard materials – A strand of Technology where the emphasis of learning is in developing products using wood, metal and plastic.

ILE (Innovative Learning Environment) – The term used by the OECD and more recently the New Zealand Ministry of Education to describe the holistic nature of learning environments and related structure that are centred on the 7+3 framework (OECD, 2015). These environments prioritise and make central the learner, collaborative and social learning and making the environment powerful through relating pedagogy to spatial possibility.

MLE (Modern Learning Environment) - The initial term used by the Ministry of Education in describing what are now termed Innovative Learning Environments.

Multi-materials (spaces or lessons) – Spaces or lessons where the focus is on the manipulation or learning about a variety of materials. This is usually an alternative term for describing a hard materials space or lesson. For example one using wood, metal or plastic.

NCEA (National Certificate of Educational Achievement) – The national secondary education qualification undertaken in New Zealand secondary schools. NCEA is structured in three levels and follows a standards based assessment model where students undertake Achievement

Standards to attain credits which contribute towards attaining a holistic certificate at the respective level.

PBL (Project Based Learning) – The teaching and learning of subject content centred around the focal point or context of a project.

SLT (Senior Leadership Team) – Senior leaders are appointed to school-wide leadership roles. In larger secondary schools there may be a hierarchical senior leadership structure with an Associate Principal working under the Principal and overseeing a team of Deputy Principals. In other contexts this team may be composed of a team of Deputy Principals who work under the Principal.

Soft materials – A strand of Technology where the emphasis of learning is in developing products using textile materials.

Vacuum Moulding – A plastics forming process where a sheet plastics is heated and formed over a male pattern or mould.

AUTEC Secretariat

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13 February 2018

Howard Youngs
Faculty of Culture and Society

Dear Howard

Ethics Application: **18/40 Lived experiences of secondary school heads of technology departments when changing flexible learning environments**

I wish to advise you that a subcommittee of the Auckland University of Technology Ethics Committee (AUTEC) has **approved** your ethics application.

This approval is for three years, expiring 12 February 2021.

Non-Standard Conditions of Approval

1. In the Information Sheet please clarify the statement which limits the offer of confidentiality, given the small pool of potential participants who may be known to each other, and given the fact that interviews will occur at the workplace

Non-standard conditions must be completed before commencing your study. Non-standard conditions do not need to be submitted to or reviewed by AUTEC before commencing your study

Standard Conditions of Approval

1. A progress report is due annually on the anniversary of the approval date, using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>.

2. A final report is due at the expiration of the approval period, or, upon completion of project, using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>.
3. Any amendments to the project must be approved by AUTEK prior to being implemented. Amendments can be requested using the EA2 form: <http://www.aut.ac.nz/researchethics>.
4. Any serious or unexpected adverse events must be reported to AUTEK Secretariat as a matter of priority.
5. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEK Secretariat as a matter of priority.

Please quote the application number and title on all future correspondence related to this project.

AUTEK grants ethical approval only. If you require management approval for access for your research from another institution or organisation then you are responsible for obtaining it. You are reminded that it is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard.

For any enquiries please contact ethics@aut.ac.nz

Yours sincerely,



Kate O'Connor

Executive Manager

Auckland University of Technology Ethics Committee

Cc: jsh4540@autuni.ac.nz

Appendix B | Tools

Interview questions

Project title: Lived experiences of Secondary School Heads of Technology Departments with flexible learning environments

Observe the physical environment prior to conducting the interview to situate the responses of the participant.

1. Background – What was the background to the use of flexible space and pedagogy in your context?
 - a. What was the catalyst for change? (internally or externally driven)
2. What support was required by and from Teaching staff within your department/faculty?
 - a. What opportunities and challenges did this provide?
3. What support structures and mechanisms were provided by Senior Leaders to assist in this change process?
 - a. What support did you require in facilitating this change? Was it provided? What else would have helped?
4. Describe the challenges faced during this process
5. How has the shift towards more flexible approaches impacted upon student outcomes within Technology education within your context?
6. What were the surprising outcomes from this process for you?

Return to any interesting threads identified by the participant in earlier responses or by the physical environment and related pedagogy.

Participant Information Sheet

Date Information Sheet Produced:

16th January 2018

Project Title

Lived experiences of Secondary School Heads of Technology Departments with flexible learning environments

An Invitation

My name is Matt Bennett and as a postgraduate student and experienced Head of a Technology Faculty I have developed an interest in how space is used within Technology education. In order to further this understanding I need your help in sharing your experiences of how you have utilised space in a flexible way both in an Innovative Learning Environment and in perhaps a more traditional, classroom based, environment. I am particularly interested in the structures developed and support you have provided and were provided in implementing this change.

This information sheet is an invitation to participate voluntarily in this research project aimed at furthering understanding of how space is used in Technology education. The research is the final component in me completing a Master of Educational Leadership degree.

What is the purpose of this research?

The purpose of this research is to provide the opportunity for me to complete a Master of Educational Leadership degree and will provide the data with which to write my dissertation. I am hopeful however that this work can contribute to the growing research on educational spaces and how they can be or are used. By linking this to Technology education I hope to understand if and how space is already being used in a flexible or innovative way in a subject area that is naturally conducive to working in this way. I hope that this provides secondary teachers a voice in the ILE space as much of the existing literature is based around a primary school education context.

How was I identified and why am I being invited to participate in this research?

Your invitation to participate in this research has been based on your expertise as a middle leader within Technology education and experience of working flexibly within a more traditional or Innovative Learning

Environment. The selection process for the research has been based on professional contacts in the teaching profession or through your response to the advert placed on the NZGTTA Google Forum.

How do I agree to participate in this research?

To participate in this research opportunity please contact me directly at jsh4540@autuni.ac.nz where I can provide a Consent Form. The completed consent form can either be returned to me at the same email address or personally prior to the interview.

Your participation in this research is voluntary (it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. You are able to withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible.

What will happen in this research?

By participating in this study you will undertake a semi-structured interview whereby you can voice your current experiences of setting up and/or working within flexible learning environments. A copy of the interview questions or themes will be provided to you prior to the interview providing you with time to consider your responses. The data collected will be analysed and will form the basis for my dissertation as part of a Master of Educational Leadership degree. Application has been made for this information to also be used in other academic publications or presentations to further understanding on the topic of FLEs.

What are the discomforts and risks?

There is very minimal potential risk or discomfort attached to participating within this research. The most obvious risk would be that of identification by other education professionals. The interview will involve you discussing the experiences of working with colleagues and for some this may be uncomfortable.

How will these discomforts and risks be alleviated?

Every possible opportunity will be taken to retain your confidentiality in participating in this research. This will include not referring to institutions or any participant by name. In presenting and writing up the dissertation care will be taken to prevent revealing obviously identifying features of an institution therefore protecting all participants.

What are the benefits?

There are numerous benefits to this research both in terms of the researcher and the participant. The study will provide the opportunity to clarify the journey that you have undertaken in your practice regarding the flexible use of environments. It will also provide the opportunity to engage in an academic research project, perhaps stimulating an interest or desire for your own personal study. The benefits to the researcher include the opportunity to complete a Master of Educational Leadership degree alongside furthering understanding of FLEs/ILEs.

How will my privacy be protected?

Your confidentiality will be provided as far as the context and your positional role provides. This provision will include confidentiality agreements between the researcher and any third parties (e.g. interview transcribers). Institutions and participant details will be changed to prevent any obvious identification.

What are the costs of participating in this research?

There are no financial cost involved in participating in this research. It is expected that the interview will take between 45 minutes to 1 hour. In addition to the interview time there will be the opportunity for you to check the transcription of the interview.

What opportunity do I have to consider this invitation?

There is one week to consider participating in the study. Further information if required can be obtained from the researcher at the contact details included below.

Will I receive feedback on the results of this research?

Feedback will be provided to all participants on the results of this research through a single page summary sheet. Once assessed, a digital copy of the dissertation can be provided upon request.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Howard Youngs, howard.youngs@aut.ac.nz, 09 921 9999 ext 9633.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTC, Kate O'Connor, ethics@aut.ac.nz, 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please keep this Information Sheet and a copy of the Consent Form for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:

Matt Bennett, jsh4540@autuni.ac.nz

Project Supervisor Contact Details:

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Approved by the Auckland University of Technology Ethics Committee on **13th February 2018**, AUTC Reference number **18/40**.

Research Project Information – Participants

16th January 2018

Project title: Lived experiences of Secondary School Heads of Technology Departments with flexible learning environments

Innovative Learning Environments (ILEs) are a transforming aspect in New Zealand education. In understanding the effects of the there is a need to explore the leadership behaviours, actions and support mechanisms afforded to and provided by Heads of Technology Departments in secondary schools. Technology is a curriculum area whereby students undertake wide and varied tasks often within approaches incorporating project based learning. Due to this there is huge scope and a strong potential fit to using space flexibly. The specific focus of the study is on the leadership experiences of the Heads of Department and the support provided by Senior Leaders in facilitating this shift to more flexible use of space. This may be in the form of a moving to a specific purpose built environment or in the changing of practice from within an existing setting. ILE Literature identifies tangible or physical features of the environment along with intangibles such as school and classroom culture, sense of belonging and self-efficacy as being important factors in the relationship between learning outcomes and space. It is these intangibles and how they have been developed in positive ways, predominantly by the middle leader that I wish to focus upon.

In participating within this research there is a requirement for you to be interviewed. It is anticipated that the interview will last no more than 45 minutes. The interview will be semi-structured to allow you as the participant to identify experiences related to the use of flexible space and pedagogy. It will also provide the opportunity for you to tell your story, emphasising what you consider to be the defining experienced in the setup, structure and use of flexible space within your Schools Technology curriculum. The intention is for the researcher to conduct the interview within your School. This will allow the researcher to visit the Technology department and make meaning from the experiences that you describe in the interview. It is anticipated that in total the entire experience will last for no more than one hour.

For efficiency and to expedite the process the interview will be recorded and then transcribed. To allow you to think in advance about your response a copy of the interview structure has been enclosed. In the writing up of the dissertation pseudonyms will be used for individuals and schools to prevent the possibility of identification of institutions and individuals. The researcher also agrees not to discuss other participants as part of the research process. This means that by participating you will not be able to identify or be identified by other participants within the study. Feedback through a summary of findings will be distributed at the end of the research project to each of the participants involved in the research. This will be in the form of a one to two page summary.

If you have any questions or reservations about the study please feel free to contact Matt Bennett, jsh4540@autuni.ac.nz.

Thank you for your interest in participating in the study your help in this is very much appreciated.

Consent form

Project title: Lived experiences of Secondary School Heads of Technology Departments with flexible learning environments

Project Supervisor: **Dr Howard Youngs**

Researcher: **Matthew Bennett**

- ☐ I have read and understood the information provided about this research project in the Information Sheet dated 16th January 2018.
- ☐ I have had an opportunity to ask questions and to have them answered.
- ☐ I understand that notes will be taken during the interviews and that they will also be audio-taped and transcribed.
- ☐ I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- ☐ I understand that if I withdraw from the study then I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a summary of the research findings (please tick one): Yes ☐ No ☐

Participant's signature:

Participant's name:

Participant's Contact Details (if appropriate):

.....

.....

Date:

Approved by the Auckland University of Technology Ethics Committee on 13th February 2018
AUTEC Reference number 18/40

Note: The Participant should retain a copy of this form

Please return a copy of this form to Matt Bennett - jsh4540@autuni.ac.nz

Interview protocol

Interview protocol

What to say to the interviewees – when setting up

- *Introduce myself and my interests in ILEs and FLEs.*
- *Record this aspect of the interview to ensure that the recording device is functioning and that responses are audible.*
- *Ensure that consent form has been completed and both parties have a copies. Ensure respondent understanding of the consent form.*

What to say to the interviewees when beginning the interview

- *Explain the background behind the research - Go through the interview information sheet to ensure understanding.*

Conduct the interview as detailed in the attached interview question sheet.

What to say when concluding the interview

- *Is there anything relating to the research topic that hasn't been covered and you would like to contribute?*
- *Is there response within the interview which upon reflection you would like to clarify?*

Thank the respondent for their time and input

What to do during the interview

- *The interview will be recorded to allow for efficient recording of the data*
- *The interviewer may make notes to flag up useful threads that could be explored later in the interview.*

What to do immediately after the interview

- *Write up any notes taken as soon as possible to prevent meaning being altered through memory.*

Appendix C | Sample of coding

| | |
|--|---|
| <p>twenty years, we want it to be a building that will be future proofed. We want to do it right. We want to give you time to go and visit other schools in Auckland, we went to schools in Gisborne, we went to Schools all over the show. And we would visit them and just suck up the ideas. And in fact I remember we actually applied and then HoD Ross Davidson, we went over to Australia, to these future schools in Australia and possibly similar things to what you were doing and we looked at those and came back with these ideas and that support was absolutely crucial.</p> | <ul style="list-style-type: none"> • Collaboration • Staff development • Staff buy-in |
| <p>M- So it was a financial and time based support to go and carry out your own research work I guess?</p> | |
| <p>I- Yeah. Exactly.</p> | |
| <p>M- Was there anything else that they could have provided but that they didn't? Or even in this Obviously you are fifteen years down the track now. What structures could be provided that perhaps aren't at the moment.</p> | |
| <p>I- One of the big issues that we had at the time was that we were building this block and suddenly we were amalgamating the food and the fabrics and the wood and the metal based rooms, and we were given.....oh I forget now. We were given \$900,000 to equip the rooms. It became a really that was really quite difficult to manage because everybody wanted to build their own little empire. And you know..... It became quite difficult about whether the cooking teacher, forgive me for sounding rude, the Food Tech teacher needed a new salamander, which we had no idea at the time what that even was. Or whether we needed a new vacuum moulder. You know, that was the balance and that was quite tricky. We were too close to it and we ended up giving the job to the Deputy Principal saying here's the money. Here we want you to decide where it goes. We will just put a case forward for what we think we need. They will put a case forward for what they think they will need and then the wise one, the Deputy Principal can then sort it out because it was a real bone of contention.</p> | <ul style="list-style-type: none"> • Staff development • Management of conflict. • Impact of SLT • Staff buy-in / collegiality. • Collegiality |
| <p>M- And I guess that becomes quite divisive in an environment whereby ultimately you are all going to have to work pretty closely together, be pretty collegial.</p> | |
| <p>I- Exactly. Everyone wanted the world. Oh \$900,000 we want microwaves and fan ovens and commercial kitchens and sewing machines etc.</p> | <ul style="list-style-type: none"> • Collegiality |
| <p>M- And what about from the day-to-day side of things. Is there anything that could of changed? In places that I have worked there has always been frustration with perhaps the structure of the day or perhaps lessons not being long enough. Has there been any curriculum changes that have been a bit broader than just Technology.</p> | <ul style="list-style-type: none"> • Impact of SLT |
| <p>I- Yeah. Our school changed, at a similar time as well. We changed to a two-two-one structure. Twenty five periods in a week and we have two before morning tea, two before lunch and then one after lunch. And that programme or that system has worked really well for us and what it does for us is that it allows the lunchtime, which is fifty minutes to be incorporated as well. And so it is</p> | <ul style="list-style-type: none"> • Timetable structure change. |