



Innovative learning environments in New Zealand: Student teachers' perceptions

Jo Fletcher¹ · John Everatt¹

Received: 2 July 2020 / Accepted: 22 January 2021 / Published online: 16 March 2021
© New Zealand Association for Research in Education 2021

Abstract

Innovations in schooling and the architectural design of schools offer the opportunity to re-examine existing pedagogical practices. Graduating teachers need to be ready to teach and conversant with changing school environments and approaches to school organisation. However, there is a dearth of research that explores the student teachers' perceptions of their experiences on practicum in innovative learning environments (ILEs). This article discusses the perceptions of over 100 student teachers undertaking primary teaching qualifications in New Zealand. An online questionnaire asked for responses to a range of statements about innovative learning environments (ILEs) and teacher education preparation for this type of school environment. Analysis of the findings indicated a wide range of experiences on professional practices, with more experience of ILEs generally leading to more positive perceptions of these environments. Student teachers perceived that more course-based preparation about ILEs was needed, though others perceived that the best way to learn about ILEs was during professional practice placements.

Keywords Student teachers · Schools · Innovative learning environments

Introduction

The preparation of student teachers to become expert teachers necessitates effectively integrating a complex range of knowledge, understandings, skills and strategies within the changing pedagogies and architectural spaces designed for learning in twenty-first century schools. There have been tensions reported in the literature internationally on the quality of teacher education, which have been evidenced in

✉ Jo Fletcher
jo.fletcher@canterbury.ac.nz

John Everatt
john.everatt@canterbury.ac.nz

¹ College of Education, Health and Human Development, University of Canterbury, Christchurch, New Zealand

many reforms in various countries (see, for example, Hoban 2005; Ramsey 2000). Debate has been evident between highly theoretically based teacher education courses, which may have little specific connection to the reality of practices in the real world of teaching, and courses with a coherent connection to classroom practices that may lack justification of these as best research-based practices (see, for example, Darling-Hammond et al. 2005; Furlong 2002; Teaching Council New Zealand: Matatū Aotearoa 2020). These types of conceptual and structural fragmentations have required careful consideration and reflection by teacher educators, if graduating teachers are to be ready to teach effectively in a wide range of educational environments and utilise accompanying pedagogical approaches. The changes to the architectural design of school buildings where students are situated in larger open flexible spaces has provided another challenge in the preparation of graduating teachers. Given the increase in the number of ILE schools in New Zealand, and the potential need for further innovation in teaching settings (particularly following the COVID-19 pandemic), studying the views of student teachers about ILEs, and their experiences in such environments, would be worthwhile. This would increase our understanding of the benefits/challenges of ILEs, but also provide a basis for further developments in teacher education courses.

Numerous terms have been used to label these larger architectural spaces: modern learning environments, innovative learning environments, new generation learning environments, superblocks, and flexible learning spaces (Byers et al. 2018; Charteris and Smardon 2018). Initially, the terms modern learning environments and flexible learning spaces were more commonly used in New Zealand, which tended to emphasise the change in architectural design, rather than the underlying teaching and learning philosophy that underpinned this change. The move to the term innovative learning environments more closely aligned with changes to pedagogical practices, such as the wider use of educational technologies and the encouragement of self-regulated learning and independent inquiry (Carvalho and Yeoman 2018; OECD 2013). In this article, the term innovative learning environment (ILE) is used, as at the time of gathering the research data, the term was more common when referring to these spaces in the geographical region where this research took place. Thus, the student teachers were more likely to know what this term referred to when responding to the questionnaire.

The Move to Innovative Learning Environments in New Zealand and Internationally

The historical evolution of the changes from the traditional single teacher classrooms to larger open spaces with two or more teachers was evident in the UK, with the building of the first open plan school at Finmere in 1959 (Woolner 2010). During the mid-1970s to the mid-1980s in New Zealand there was a move to building what was termed open plan or variable space classrooms which allowed students more freedom from the often rigid seating structures and teacher dominated pedagogical practices of many traditional single teacher classrooms. In the open plan spaces students were encouraged to work together cooperatively and their teachers

were encouraged to collaboratively plan and teach alongside fellow teachers, utilising each other's strengths. However over time, dissatisfaction from parents and some teachers led to many of these open plan spaces being gradually converted back to single teacher traditional classrooms. A lack of professional development in preparing teachers to work in these open spaces was evident and may have contributed to their demise (Cameron and Robinson 1986). More recently in New Zealand there has been a move to building schools with very large open flexible spaces where between two to six teachers work collaboratively together with larger cohorts of students, of anywhere between 45 and 180 students. A number of these ILEs have been designed with closed-off withdrawal areas for teachers to work with smaller groups of students, but the decisions about how and why they are best utilised may vary from school to school, and may reflect the practices and perceptions of teachers within the school. Alongside this, has been the remodelling of existing traditional single teacher classrooms into larger adjoining teaching spaces. This has resulted in a resurgence of interest in the development of more flexible open spaces that align to the changing pedagogical beliefs of educators (Charteris and Smardon, 2018; Smardon et al. 2015).

Charteris and Smardon (2018), in their case study in New Zealand, investigated how principals and teachers facilitated the professional learning development when new generation learning environments (the term used by these researchers for ILEs) were being established in their schools. It was evident that the restructuring of the school buildings did not always guarantee a change to the learning culture and pedagogical practices of all teachers. There was a resistance to change by some staff. Nevertheless, the study did highlight key areas that could be the focus of professional learning development, and the key role of school leadership and professional learning development have been evident in other studies around innovative learning environments (Carvalho et al. 2020; Colleagues and author 2017; 2018). The notion of a shared vision between the school leadership team and the teachers was highlighted in the findings of a national questionnaire in New Zealand by Carvalho, Nicholson, Yoeman and Thibaut (2020). Although teachers often were supported by their school leaders, they reported a lack of time and advice on how to transition successfully to co-teaching in multi teacher learning spaces. Carvalho and colleagues suggest that this transition stage from single teacher classrooms to innovative learning environments calls for policy-makers and government to provide effective support for school leaders and their staff. As discussed earlier, lessons learnt from the open plan era in New Zealand in the 1970s to 1980s suggested that there was a lack of professional development to support this change (Cameron and Robinson 1986).

The rationale underpinning this change to innovation in teaching is complex and includes several imperatives. For example, education systems have been criticised for being inequitable, and being driven by sorting and selecting students for different roles in society with varying economic advantages (OECD 2015). A further imperative is to create a serious change in the culture of schooling to prepare students to be active and successful participants in a changing society that is knowledge-intensive, with readily accessible digital global connectedness (Voogt et al. 2013). Traditional single teacher classrooms have given a low visibility to teacher work which can result in a fragmentation of the school curriculum with differing shared values and

behavioural expectations within a school (Aladjem and Borman 2006). This isolation of teachers, where they have been left undisturbed in their classrooms to enact under their own professional autonomy, can present challenges to many established teachers when confronted with deprivatisation in the move to innovative learning ecosystems (OECD 2015).

Learning spaces which provide flexibility for a wide range of learning types are established on the premise that learning is social and teachers should encourage well-organised collaborative learning (Walker 2003). The flexibility of the layout of school buildings and learning spaces, the types of seating arrangements, the incorporation of social media and information technologies, and the provision of a variety of sites for learning, beyond those found in conventional classrooms are central to the idea of ILEs (OECD 2015).

Listening to the Perceptions of Student Teachers

Student teachers in New Zealand, similar to many student teachers in international teacher education programmes, have practical teaching experiences in schools, usually referred to as professional practice or teaching practicum. The joint undertaking by teacher education providers and schools to collaboratively prepare student teachers requires academic, practical and personal support to ensure success in differing school settings (Mtika et al. 2014). A student teacher's motivation to be an effective teacher and self-perceptions of their teaching competence link to the experiences during professional practice (Poulou 2007). Frequently studies on student teachers' perceptions and beliefs about teaching have found that student teachers are limited by their prior personal schooling experiences and that they use these beliefs and perceptions to filter content in courses and experiences whilst on practicum (see, for example, Leavy et al. 2007; Lee et al. 2019; Ng et al. 2010). Although there has been growing research on ILEs in New Zealand, there is little research on the preparation of student teachers for the changing spatialized practices (Nelson and Johnson 2017). 'Knowing the learner' can be more challenging when a student teacher is on practicum in an ILE, where there are larger numbers of students that they will be teaching in various groupings to meet curriculum and learning needs. This concurs with findings from Nelson and Johnson's study of student teachers in New Zealand learning to teach in ILEs. However, Nelson and Johnson expected that collaborative teaching would be the main challenge of an ILE practicum, but "participants identified this as a significant source of support and efficacy" (p. 73).

Theoretical Framework

Central to learning are students' sociocultural values and beliefs which are shaped by family, the wider social community, and to some extent the teaching and learning environment within their school. A social constructivist view of learning is that it is created through exchanges with others (Cullen 2002). Vygotsky's (1978) theoretical writings are pivotal to such theoretical perspectives, particularly the zone of proximal development which provides opportunities to

learn and extend new knowledge from the expertise of fellow students and teachers. Accordingly, a socio-cognitive perspective of learning reflects student's knowledge, socio-cultural background, motivation and design of the learning context which work together in shaping and transforming positive learning opportunities (Alexander and Fox 2004). The architectural design of a place of learning and the associated furniture can contribute to the spatial affordances that offer flexibility and mobility to readily adapt the space to differing needs throughout the school day, which can enhance opportunities for self-regulated learning (Charteris and Smardon 2018).

Sociocultural learning theory aligns with the spatial affordances offered in ILEs where students can find or adapt spaces so they can discuss and debate their differing understandings of issues, texts or matters of interest. This learning theory acknowledges the central roles of the teacher and peers in enabling individual learning (Galda and Beach 2004; Nystrand 2006; Pearson 2009; Vygotsky 1978). For this manner of dialogic discourse to happen, the learning culture should allow the teacher/s to step back from an authoritative role, to one where students can facilitate in the meaning-negotiation processes (Soter et al. 2008). This aligns with the self-regulated and independent learning frequently encouraged in ILEs.

The Current Research

Student teachers' development as teachers is dependent on their capabilities acquired in the education institution where they are studying, but also will be influenced by the practical experiences they gain on professional placement, as well as the individuals with whom they interact during their learning. These will likely effect their understanding and perceptions of varying teaching practices, tools and environments. The current study focused on a cohort of student teachers many of whom were studying and practising their teaching within Christchurch, New Zealand. This city experienced a large number of earthquakes that led to the need to re-build or modify school buildings at a time when ILEs were favoured by the officials making decisions about school environments. This led to a large number of purpose built ILE schools and modified classroom spaces to incorporate the ideas of ILEs. Hence, many of those teaching in Christchurch will have reasonable experience of these spaces, including student teachers who are likely to have had some experience of a professional placement in an ILE. This provided an opportunity to explore the views of student teachers about these environments, many of whom will also have experience of a more traditional single teacher classroom environment. It also provided the opportunity to discuss these views in the light of those of teachers and principals about the same environments by using a similar questionnaire instrument to that used in previous research (Everatt and Fletcher 2019; Everatt et al. 2019; Fletcher et al. 2020). Given that the previous research focused mainly on primary school staff, the current research focused on student teachers training to be primary school teachers.

Method

A questionnaire was developed to sample the perceptions of New Zealand student teachers on the recent changes to ILEs, particularly in regards to teaching pedagogies and relationships amongst teachers and between teachers and students in these spaces. The questionnaire comprised questions on the background of the respondent (discussed in the following paragraphs to describe the cohort) and a series of statements about ILEs as they relate to teaching practice and issues of student learning, as well as statements more focused on management. (Tables 1 and 2 in the results section present the statements used in the current analyses.) The statements were developed from a prior national questionnaire of school leaders and teachers (Fletcher et al. 2020) and from findings of earlier case study research on ILEs (Fletcher et al. 2017; Mackey et al. 2017, 2018). Opportunities were also given for the respondents to provide comments to clarify their perceptions, providing more qualitative data to support the findings of the quantitative analyses.

The questionnaire was loaded into the Qualtrics questionnaire system and distributed to emails of student teachers studying to be primary teachers. The Qualtrics site was open for about one month and 109 respondents completed the questionnaire. Of these, 63 were studying in Christchurch and the rest were distance students or studying in centres in more remote parts of New Zealand. The majority (90) were studying on a Bachelor course, with the rest studying on a Graduate course. Most of those on the Bachelor course were in their second or third year of the course (87). The majority of respondents (95) were female and were roughly equally split between the age groups 18 to 20, 21 to 25 and 26 to 39, with 15 respondents being 40 or over.

Questions about the student teachers' last professional placement indicated that the majority (approximately 80 students) had been at a state full-primary school. The schools were typically in towns or cities (87 students) in which English was the language of teaching (only 14 students took their last placement in a Māori-English bilingual school). Roughly equal numbers of student teachers perceived that the school was primarily New Zealand European (56) versus multicultural (51). The schools covered the full range of deciles, but more student teachers had placements in higher decile schools (78 indicating decile 6 to 10 compared to 21 indicating decile 1 to 5).

Background questions also asked student teachers to report their experiences of ILEs, and the type of classrooms in which they had been working primarily in their last professional practice placements. Just under half (52 student teachers) reported being in an ILE classroom on their last placement, with the rest either in traditional single teacher classrooms (46) or another type of classroom space (10 student teachers – one student teacher did not respond). There were also a range of responses about the type of school they took their last placement in: from recently built all ILE spaces (17) to recently built and adapted ILE spaces (19) to recently built ILE spaces with traditional classrooms (19) to mainly adapted ILE spaces (22) and all traditional single teacher classrooms (31) (one student teacher did not respond).

The questionnaire also asked student teachers about their exposure to ILEs. Only 16 student teachers reported no experience of ILEs during their professional

Table 1 Questions focusing on teachers

Question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree		
Teachers find it more time consuming working in ILEs because more time is needed to plan, evaluate, share information, review logistics and discuss teaching strategies	No exposure	0 (-1.3)	5 (-.4)	10 (1.7)	1 (-0.8)	0 (-0.5)	$\chi^2 = 19.33$ p = .013
	Limited exposure	8 (1.7)	20 (1.4)	7 (-1.9)	4 (-0.5)	0 (-0.9)	
	High exposure	4 (-0.8)	15 (-1)	22 (0.7)	9 (.8)	2 (1)	
Collaboration amongst teachers is essential for effective use of ILEs	No exposure	10 (-.6)	5 (.7)	1 (2.2)	0	0	$\chi^2 = 14.03$ p = .007
	Limited exposure	25 (-.8)	14 (1.6)	0 (-.6)	0	0	
	High exposure	46 (1.1)	6 (-1.8)	0 (-.7)	0	0	
The large cohorts of students taught in ILEs can adversely affect a teacher's judgements about individual children's learning in curriculum areas	No exposure	1 (-1.0)	6 (1)	9 (1)	0 (-1.1)	0 (-.4)	$\chi^2 = 9.76$ p = .283
	Limited exposure	10 (1.5)	15 (.3)	12 (-.9)	2 (-.5)	0 (-.6)	
	High exposure	6 (-.8)	17 (-.3)	22 (.2)	6 (1.1)	1 (.7)	
What do you consider to be the optimum number of teachers for ILEs teaching?	No exposure	Two	Three	Four	Five	Six plus	$\chi^2 = 6.84$ p = .554
	Limited exposure	7 (1)	7 (1)	2 (-.4)	0 (-1)	0 (-.8)	
	High exposure	12 (2)	18 (.5)	4 (-1)	2 (-.3)	2 (.5)	
		13 (-.7)	20 (-.4)	12 (1.1)	5 (.8)	2 (0)	

Number of responses by ILE exposure and statistical comparisons (χ^2 analyses and standardised residuals in brackets)

Bolded figures indicate the modal (most frequent) response for each group of students and additional figures in italics are associated with a residual of 1 or greater, indicative of larger than expected frequencies of responses

Table 2 Questions focusing on students

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	
Students in ILEs have more opportunity to relate to others and develop effective interaction skills with a diverse range of people in a variety of contexts	0 (-1.2)	7 (0)	7 (1.2)	2 (-1)	0 (-1.0)	$\chi^2 = 11.25$ p = .188
Limited exposure	3 (-.2)	12 (-1.2)	14 (.9)	6 (.4)	4 (.9)	
High exposure	6 (.8)	28 (1.1)	9 (-1.5)	6 (-.3)	3 (-.2)	
Students in ILEs have more opportunity to develop skills as self-regulated learners	0 (-1.3)	4 (-.9)	8 (1.5)	4 (1)	0 (-.9)	$\chi^2 = 14.63$ p = .067
Limited exposure	3 (-.7)	15 (0)	15 (1)	3 (-1.2)	3 (.5)	
High exposure	9 (1.3)	22 (0.5)	9 (-1.7)	9 (.4)	3 (0)	
ILEs are noisy, making it difficult for students to concentrate	2 (-1)	8 (0.4)	4 (.2)	2 (.3)	0	$\chi^2 = 5.73$ p = .454
Limited exposure	10 (0.2)	18 (0.3)	10 (.4)	1 (-1.5)	0	
High exposure	14 (0.4)	20 (-0.5)	10 (-.5)	8 (1.1)	0	
Teaching in ILEs can assist with the management of difficult students	0 (-0.9)	5 (0.1)	6 (1)	5 (0.2)	0 (-1.3)	$\chi^2 = 9.15$ p = 0.330
Limited exposure	2 (-0.1)	8 (-1.1)	9 (-.3)	13 (0.5)	7 (1.5)	
High exposure	4 (0.6)	19 (0.9)	12 (-0.3)	13 (-0.5)	4 (-.6)	
Teaching in ILEs makes acceleration of low progress learners difficult	0 (-1.6)	3 (-.9)	12 (2.9)	1 (-1.1)	0 (-.4)	$\chi^2 = 24.08$ p = 0.002
Limited exposure	10 (1.3)	13 (.3)	13 (0)	3 (-1.5)	0 (-.6)	
High exposure	8 (-.3)	17 (.2)	11 (-1.6)	15 (1.9)	1 (.7)	

Number of responses by ILE exposure and statistical comparisons (χ^2 analyses and standardised residuals in brackets)

Bolded figures indicate the modal (most frequent) response for each group of students and additional figures in italics are associated with a residual of 1 or greater, indicative of larger than expected frequencies of responses

placements ('No exposure'), whereas 52 student teachers reported that they had spent at least all of one placement in an ILE ('High exposure'), and 39 student teachers reported experiencing an ILE in at least part of one of their professional placements ('Limited exposure') (two student teachers did not respond to this question). The three groups of student teachers produced via these reports provided the opportunity to contrast their cumulative views and experiences, and the following quantitative results are based on comparisons of these three groups.

The student teachers' responses were analysed via quantitative assessments of their answers to multiple-choice statements, and by using qualitative analyses of open-end comments. Quantitative analyses involved calculating the frequency of responses to items, and used χ^2 analyses to contrast students with differing exposure to ILE classrooms. Initial analysis of the qualitative data led to emerging themes being identified and filtered into coding categories (Fraenkel and Wallen 2006). Links between these coding categories were ascertained based on analysis of the researcher (see, Strauss and Corbin 1990). This involved considering the concepts and themes in the data which related with one another and/or established clusters to identify main ideas. Lastly, selective coding scanned the data and prior codes to structure the entire analysis around a reduced set of core ideas (Strauss and Corbin 1990). During this process of selective coding the significant codes that reappeared frequently guided the interpretation of the findings reported in this article. The six significant codes that arose were around: teacher numbers, student progress, behaviour, noise, teacher collaboration and experience in an ILE. Divergent viewpoints were captured within these themes.

Results and Discussion

The findings from the questionnaire responses will be reported within quantitative and qualitative sub-sections. However, these two types of data need to be considered together, so the qualitative sub-section will also provide a discussion of the findings.

Quantitative Data

The questions related to the student teachers' perceptions of ILEs can be found in Tables 1 and 2. For ease of presentation, the results are divided across the two tables, with the first concentrating on questions about teachers and the second focusing more on questions related to pupils. In each table, the frequency of response to each point on the Likert scale is presented. The results of the χ^2 analyses contrasting student teachers with differing exposure to ILEs are also reported, as are standardised residuals to determine if a frequency count is larger (or smaller in the case of a negative value) than might be expected based on the distribution of counts.

Of the four questions that related to perceptions about teacher's responses to ILEs, two produced significant results indicative of differences between those student teachers with higher levels of exposure to ILEs compared to those with more limited exposure. Those with limited exposure were more likely to agree that teachers find

ILEs more time consuming, whereas those with higher levels of exposure were more likely to be neutral and to veer towards disagreement with this statement. Those with no exposure were primarily neutral about this statement. For the statement about teacher collaboration, those with higher levels of exposure were fairly consistent in strongly agreeing that collaboration is vital, whereas more limited exposure lead to less certainty. Although non-significant, more exposure also seemed to increase the likelihood of disagreeing that ILEs adversely affect teacher judgements about individual children's learning in curriculum areas, and higher levels of exposure seemed to lead to more acceptance of larger numbers of teachers working in an ILE.

The five questions related to perceptions about students showed a similar trend in that higher levels of exposure to ILEs seemed to lead to more positive response about students' learning in ILEs. The statement about low progress learners produced a significant effect suggesting that those with more limited exposure were more likely to agree that ILEs will make acceleration difficult for students struggling with learning, in contrast to those with higher levels of exposure who showed a greater likelihood of disagreeing with this statement. The statement about self-regulated learning approached significance, with higher levels of exposure to ILEs seeming to show a trend for a greater likelihood to strongly agree that ILEs can support the development of self-regulated learning in students. For the statement about students being able to relate to others and develop interaction skills in ILEs, again those with more exposure showed a greater likelihood of agreeing with this statement compared to those with limited exposure. Those with the largest level of exposure also seemed to show a greater likelihood to agree that ILEs can assist in the management of difficult students, and to disagree that ILEs were noisy and led to a lack of concentration among students.

Items in the questionnaire also consider the student teachers' perceptions about their preparation for working in ILEs: the results can be found in Table 3. The first two questions considered the student teachers' perceptions about preparation for supporting pupils in ILEs and working with other teachers in ILEs. The third asked about using digital technologies, given that these might be expected to be used more extensively in ILEs. There were no significant differences between the three ILE exposure groups on these items; however, the majority of student teachers seemed to feel that they had been provided with only minimal amounts of preparation. There was an interesting trend for these higher exposure student teachers to feel that their preparation for using digital technologies was 'minimal', in contrast to the majority of those with limited and no exposure to ILEs who reported that they perceived they had received 'some' preparation for using digital technologies. This may reflect a trend for the perceived need for these types of tools by those with higher levels of ILE classroom experience.

Qualitative Responses

Six themes arose from analyses of the qualitative responses of the participants on their perceptions of ILEs during their professional practice in schools, and how they perceived these experiences might be related to their teacher qualification. These

Table 3 Questions focusing on perceptions of preparation for involvement in ILEs

Questions	Minimal	Some	Extensive		
How would you rank the amount of preparation you have so far received during your qualification on engaging student learning in Innovative Learning Environments?	No exposure	10 (.3)	6 (.2)	0 (-1.2)	$\chi^2 = 3.92$ $p = .417$
	Limited exposure	25 (.6)	10 (-0.9)	4 (.4)	
	High exposure	26 (-.7)	21 (0.7)	5 (.3)	
How would you rank the amount of preparation you have been provided during your qualification on co-teaching in Innovative Learning Environments?	No exposure	8 (.1)	8 (.4)	0 (-1.2)	$\chi^2 = 5.53$ $p = .237$
	Limited exposure	23 (1)	13 (-1)	3 (-.2)	
	High exposure	20 (-1)	26 (.7)	6 (.8)	
How would you rank the amount of preparation you have so far received during your qualification on working with digital technologies?	No exposure	5 (-1.1)	10 (.9)	1 (1.3)	$\chi^2 = 6.53$ $p = .163$
	Limited exposure	18 (-.4)	21 (.6)	0 (-.9)	
	High exposure	31 (.9)	20 (-1)	1 (0)	

Number of responses by ILE exposure and statistical comparisons (χ^2 analyses and standardised residuals in brackets)

Bolded figures indicate the modal (most frequent) response for each group of students and additional figures in italics are associated with a residual of 1 or greater, indicative of larger than expected frequencies of responses

themes are discussed below with examples of comments provided by the student teachers. We have focused on examples from student teachers with higher levels of exposure to ILEs since these comments are more likely to be based on accumulative experiences of ILEs, rather than what they have been told or observed in a short-term or restricted context.

Teacher Numbers

The number of teachers in an ILE is variable depending on the circumstances and decisions made by individual school leadership teams around building design and what they consider best practices. The New Zealand Ministry of Education does not state what number of teachers there should be in a designated ILE. However, the teacher to student staffing ratio funding to a state school is set by common criteria across all state schools (New Zealand Ministry of Education 2020). From our experience as teacher educators most ILE architectural school structures are found in New Zealand state schools. Thus, there should be little difference between the teacher to student staffing in ILE schools and traditional school types. Some of the responses from the student teachers indicated that they did not take into account how staffing ratio levels rely on government funding.

Depending on the class size, I think three to four teachers is an optimum number for effective teaching in ILE. The more teachers the class has, the less likely students will fall through the cracks as they will gain more attention and help. I saw multiple cases of students being left behind on placement, simply because there were not enough teachers for so many children! (Second year student teacher).

Although an ILE may be operating in terms of established student/teacher ratios, these concerns may indicate that some of the student teachers' perceived that more teachers appeared to be needed in the up-scaled environment of the ILE. A number of other student teachers held differing viewpoints about the number of teachers related to the number of students within a school. For example, this comment below was indicative of many of the respondents.

There is no 'one number fits all' solution to these questions. The optimum number of teachers depends on student numbers, the type of teachers they have in that space, who is managing the space etc..... It's very varied. (First year student teacher).

What is evident is that some understanding of how schools are funded and staffed by the Ministry of Education would help student teachers have a basic understanding of the overall education system. The comment from the first year student teacher above also seemed to be aware of the importance of the effectiveness of individual teachers and team management within ILEs. In contrast, the earlier comment from a second year student teacher was more concerned about learners 'being left behind' in large classrooms, which they seem to suggest would be counter-balanced by more teachers. Although our findings indicate that further professional development will

be needed in order to maximise strategies aimed at allowing all pupils to progress within ILEs, and within the confines of teacher-student ratios, further research in this area is necessary in order to gain a more in-depth understanding.

Progress

The first student teacher's comment above about learners' lack of progress in ILEs was echoed in other comments. For example, the following student teacher perceived that it was easy for children in ILEs to 'get lost or forgotten about' in that where there were high numbers of students in large spaces it was easier for a student to find a space out of view of the teacher/s. The student teachers were clearly concerned about the level of noise and the lack of management leading to pupils not focusing on their school work which concurs with other research. The noise level and its effect on students being able to concentrate on their learning and hear others in ILEs has been noted in other research focused on ILEs (see, for example, Mealings et al. 2015; Shield et al. 2010; Smardon et al. 2015).

I observed and found it hard to keep track of students learning so it was easy for students to get lost or forgotten about. It was always noisy and chaotic. Most lessons only some students were doing quality work and the others were mucking around because they knew they could get away with it. (Graduate student teacher).

This was not a universal observation, though. For example, the following student teachers had more positive comments about learners' progress in ILEs.

I ... saw the teachers working well together and no student was left behind. The students enjoyed working with different peers and teachers for different subjects. (Third year student teacher).

Another student teacher made the following observation about low progress learners in ILEs.

... if the day is structured in a way that students are independent in their learning, these times can easily be used to give more attention to these learners. The use of support teachers/teacher aides is also important to achieve success with these students. (Third year student teacher).

Observations about the management of the structure of learning and the effective use of staff within the classroom seemed to lead to more positive statements about progress. Within ILEs, there may be a need for more flexibility in classroom practices, but the respondents seem to perceive these positively in terms of progress. Differences in views about the effects of ILEs on those who may be perceived as struggling with learning were also observed in previous data obtained from a questionnaire distributed to New Zealand teachers and principals (see Everatt et al. 2019; Everatt and Fletcher 2019). As in the quantitative data in the present paper, increased experience of ILEs among teachers and principals led to generally more positive perspectives about ILES, but both data sets suggest an awareness of the need for

good teacher management practices to make these teaching environments effective, and additional planning is often of primary importance when working with low progress learners. The perspectives of student teachers, teachers and principals all suggest that supporting low progress learners may be a specific area for further professional development, particularly within the more flexible environments that teachers today will need to work within.

Behaviour

The potential for increases in distraction have also been associated with struggling students (see, Everatt et al. 2011; Prochnow et al. 2013). In the current data, participants often also referred to various types of negative behaviours in ILE placements, and this was a theme that comprised mostly of worries. For example:

I think another thing to consider is behavioural problems. As the number of students with behaviour problems grow, the more other students miss out on learning experiences and attention from their teachers. (Second year student teacher).

Managing children with behavioural difficulties also becomes difficult as it is already difficult managing 50+ children in one space as well as a learner who needs more teacher attention. (Third year student teacher).

Sizeable numbers of students within flexible but large learning spaces may also be seen as making it more difficult for staff to monitor students who may find self-engagement in learning more challenging. Without careful planning and effective teaching strategies, there may be limited benefits from co-teaching with colleagues who may have more experience of supporting students with learning problems (see also Everatt et al. 2019; Everatt and Fletcher 2019). Equally, however, motivation and self-regulation will be an issue for children in any learning context – educators around the world trying to support children learning at home during the COVID-19 pandemic are just as much in need of strategies to keep the learner focused on their school work. The quantitative data suggested that some of those with more experience of ILEs understood the importance of training in the use of these tools, and similar views about the usefulness of digital tools in ILEs have been reported by New Zealand teachers (see Fletcher et al. 2020).

The simple use of digital tools is not enough, of course, and good classroom management strategies will be required as in all learning contexts; and the need for such management strategies resonates with many of the perceptions of the student teachers. Effective management and use of space and staff will be a key issue to support learning in most classrooms, but may be particularly vital in a large ILE space. A crucial role for teacher educators will be the development of key learning outcomes in course delivery that focus on a range of strategies to develop and enhance positive learning environments for all learners in differing ILE spaces. Furthermore, an understanding of how to appropriately structure and use the ILE will also be necessary, which can be seen in some of the comments of the students discussed below.

Noise

Management of noise (another source of distraction) in large open-plan classroom spaces has been seen as a key challenge (Mealings et al. 2015; Shield et al. 2010; Smardon et al. 2015), and the current student teachers also commented on this issue.

I have found that children struggle to concentrate in ILEs because of the uncontrollable noise levels. (Third year student teacher).

This comment seems to be typical of the sort of worries about such spaces that have followed the introduction of more open and larger teaching spaces that are associated with ILEs. For example, issues with open-plan classrooms related to noise and distraction have been an on-going theme. Research has suggested that the speech perception of younger students should not be compromised in large open teaching spaces (Mealings et al. 2015; Shield et al. 2010) and that better acoustics can minimise background noise in purpose-built ILE environments or carefully restructured ILE buildings. However, the student teachers on placement also recognised that this need not be an issue. For example, one third year student teacher noted that the management of learners, and collaboration among teachers, can avoid excessive noise.

Any environment has the potential to be noisy. It's the management of learners, monitoring and planning that relies on a strong supportive, collaborative, teaching team. (Third year student teacher).

And another student commented on how varying the way the ILE space was used can lead to less negative impact from noise.

Some ILEs are noisy. It depends on the layout the school has adopted. Recently I visited [a] new school and the layout of the learning environments allowed for quieter spaces, and noise didn't seem to travel. (Second year student teacher).

The latter observation is consistent with those in the literature (see discussions in Mealings et al. 2015, and Shield et al. 2010) about reducing noise by providing more sound proof materials and the option of varying the layout of the space to fit the needs of the teachers and students. Combining better layout and materials with effective management and collaborative strategies should further reduce problems evident in such spaces. Again, professional development will need to play its part in the latter.

Teacher Collaboration and Cohesion

Effective teamwork among teachers appears in most of the themes suggested by an analysis of the current data. This can also be found in many statements from the respondents across differing classroom environments.

I think the effectivity of an ILE on student advancement and learning comes down to the effectivity of the teaching team, how well they communicate and

collaborate. I believe a cohesive team makes the environment work. (Third year student teacher).

However, the prospect of such collaborative teaching work may not be seen by all as a positive feature of the way the students anticipate that their teaching practices may develop in the future. For example, one third year student teacher commented:

In traditional classroom settings, I feel that you are able to be your own teacher without having to adapt your teaching style to work with another's. As a beginning teacher myself, I feel when I get out into schools and begin teaching, I would rather have a single cell classroom to really discover who I am as a teacher independently. (Third year student.)

Such views were not universally expressed, however. For example, another student teacher stated:

During my last placement, I had the opportunity to work alongside three teachers in an ILE. I had the opportunity to observe each of their teaching styles and try out their strategies myself to see what works for me. I witnessed the teachers challenge each-others' thoughts and continuously learn from each other. (Second year student teacher).

These varying perspectives on their own teacher development indicates potential differences in attitudes, but may also reflect positive and negative placement experiences. Whatever the reason, teacher efficacy and attitudes influence the teacher's practice and learners' experiences. Thus, the extent to which teachers believe they can affect student learning plays an important part of the multiple layers (Allington and McGill-Franzen 2004; Ruddell and Unrau 2004). For example, Bandura (1986) when discussing concepts of teacher efficacy suggested that the two factors influencing motivation are 'outcome expectations' which refer to one's expectations about the possible consequences of a particular behaviour; and 'efficacy expectations' which are related to one's expectations to achieve or influence a required result.

Again, it may be appropriate to provide a more comprehensive discussion of ILEs as part of teacher education that future teachers can develop their own practice by seeing the benefits and challenges of varying learning contexts.

Experience in an ILE During Teacher Education

This perspective on developing collaborative teaching practices that are founded on positive relationships was evident in the comments of the student teacher participants.

I believe collaboration skills are essential for all teachers to have, for both single cell and ILEs, teachers have to collaborate in many different contexts. Having experience of an ILE is definitely beneficial (for future employment). However it is not essential, having an adaptable pedagogy of teaching that enables you to teach in both collaboratively and independently is more important. (Third year student teacher).

It is interesting also that many student teachers clearly perceived that it was this development of practice that was more important than experiencing different environments. This can be most clearly seen in comments such as:

I do not believe ILEs to be all that 'innovative' nor conducive to effective learning. As such, I do not believe it should be a necessary component of teacher training, that an individual should spend time in an ILE, as opposed to traditional classroom styles. (Second year student teacher).

However, there was still the feeling amongst the respondents that more explicit coursework within the teacher education qualification would be useful. The following comment is consistent with the quantitative data indicating that most student teachers perceived that they had not had enough course related work about how to work in ILEs.

We have been taught what they are and why they are important, but have received little instruction about what to do if we are placed in one. (Graduate student teacher).

All of these comments show the importance of both coursework and placement practice, though. The importance of the latter is best summed up by the following comment:

Most of the preparation or learning that I have had in digital technologies or in teaching within an ILE have been due to professional experiences within an ILE. Before a placement in an ILE, I had little understanding of how things worked. I had to re-learn my understanding of planning lessons and units, and the very nature of teaching to fit its context. Once I understood these things, I found pre-service learning in this environment extremely supportive and informative and learning experiences helped me to become more adaptive. (Third year student teacher).

Overall, the data indicates that student teachers perceived that during their teacher education qualification a more specific focus on explicit issues related to being well prepared to teach in ILEs would enhance the professional practice experiences and ultimately their teaching once they graduated.

Conclusions

The present study reports student teachers' perceptions of ILEs. The perceptions of the student teachers can be contrasted with our previous research considering teachers' and school leaders' perceptions of factors related to ILEs (Everatt et al. 2019; Everatt and Fletcher 2019; Fletcher et al. 2020). An emerging finding across these studies that encompassed the perceptions of student teachers, teachers and principals was that the more experience a teacher, principal or student teacher had working in an ILE, the more likely they were to be supportive of the advantages of ILEs. Exposure to a range of environments would be useful for

new teachers to understand how to make best use of the differing contexts within which they will find themselves. For teacher education providers to logistically implement such a range of experiences for all student teachers may be a challenge. Student teachers can study both on campus in large cities and by distance in varying locations geographically throughout New Zealand meaning that the availability of undertaking a practicum in an ILE in some locations where students live may be more limited.

In addition, we contend that student teachers need more support in skills that would be useful within ILE contexts. Key parts of coursework could be: the logistics of the differing ways multiple teachers can teach collaboratively in an effective manner; the critical issues around developing professional relationships with teaching colleagues; and ways to effectively manage larger cohorts of students so all of the students' progress is tracked and monitored effectively. These may need to cover group-based collaborative work with other teachers with varying levels of experience and the better use of digital tools. These findings align with the research of Charteris and Smardon (2018) on ILEs, which highlighted key areas for professional learning development of teachers and principals, such as, teaching and peer coaching, professional cross-pollination of teaching strategies, fostering spatial literacy where there was peer observation, quality learning circles and critical friend relationships. We contend that the type of professional learning development that benefits teachers will also benefit student teachers. Most student teachers may have had their schooling in traditional single teacher classrooms and thus can come with preconceived ideas about what happens in classroom teaching. As discussed earlier, prior personal schooling experiences can influence attitudes and beliefs whilst student teachers are undertaking their teaching qualification (Leavy et al. 2007; Lee et al. 2019; Ng et al. 2010).

Unpacking strategies and skills in teacher education course delivery on ways to identify students who are taking advantage of the larger spaces to keep out of the view of the teachers to avoid learning, as well as those students showing increasing levels of behaviour problems, will be very useful for supporting student teachers working in ILEs. However, such strategies will need to link with an understanding of the explicit learning needs of individual students, including how to support the development of an independent learner in a new learning setting. We suggest from our findings that ILEs require working collaboratively with other teachers and this means that student teachers need to have excellent communication, flexible attitudes and respect for others. This also means that preparation of graduating teachers will continue to be a joint undertaking by teacher education providers and schools.

A limitation of this research is it only includes the perceptions of the student teachers from one teacher education provider and does not include the views of the student teachers' mentor teachers or visiting professional practice lecturers. Further research exploring student teachers' experiences once they graduate and enter their first years of teaching in ILEs may provide better understandings of ways to bring a closer connection between teacher education programme coursework delivery and the lived realities of being an effective teacher.

References

- Aladjem, D., & Borman, K. (2006). An introduction to comprehensive school reform. In D. Aladjem & K. Borman (Eds.), *Examining comprehensive school reform* (pp. 1–9). Urban Institute Press.
- Alexander, P. A., & Fox, E. (2004). A historical perspective on reading research and practice. In R. Ruddell & N. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 33–68). International Reading Association.
- Allington, R. L., & McGill-Franzen, A. (2004). Looking back, looking forward: A conversation about teaching reading in the 21st century. In R. Ruddell & N. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 5–32). International Reading Association.
- Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Byers, T., Mahat, M., Liu, K., Knock, A., & Imms, W. (2018). *A systematic review of the effects of learning environments on student learning outcomes*. The University of Melbourne. http://www.ilet.com.au/wp-content/uploads/2018/07/TR4_Web.pdf
- Cameron, P., & Robinson, G. (1986). Ten years of open plan. *SET Research Information for Teachers*, 1(2), 2–19.
- Carvalho, L., Nicholson, T., Yoeman, P., & Thibaut, P. (2020). Space matters framing the New Zealand learning landscape. *Learning Environments Research*, 23, 307–329. <https://doi.org/10.1007/s10984-020-09311-4>.
- Carvalho, L., & Yeoman, P. (2018). Learning to teach in innovative spaces: A toolkit for action. <https://learningtoteachininnovativespaces.wordpress.com/>
- Charteris, J., & Smardon, D. (2018). Professional Learning on Steroids”: Implications for Teacher Learning Through Spatialised Practice in New Generation Learning Environments. *Australian Journal of Teacher Education*. <https://doi.org/10.14221/ajte.2018v43n12.2>.
- Cullen, J. (2002). The social and cultural contexts of early literacy: Making the links between homes, centres and schools. In P. Adams & H. Ryan (Eds.), *Learning to Read in Aotearoa New Zealand: A collaboration between early childhood educators, families and schools* (pp. 66–81). Dunmore.
- Darling-Hammond, L., Hammerness, K., Grossman, P., Rust, F., & Shulman, L. (2005) The design of teacher education programs. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 390 - 441). Jossey-Bass.
- Everatt, J., Al-Sharhan, Y., Al-Azmi, N., Al-Menaye, N., & Elbeheri, G. (2011). Behavioural/Attentional problems and literacy learning difficulties in children from non-English language/cultural backgrounds. *Support for Learning*, 26(3), 127–133. <https://doi.org/10.1111/1/j.1467-9604.2011.01491.1>.
- Everatt, J., & Fletcher, J. (2019). Children with learning difficulties and the move to Innovative Learning Environments. *Australian Journal of Learning Difficulties: Special issue on reading and writing difficulties*, 6(1), 49–73.
- Everatt, J., Fletcher, J., & Fickel, L. (2019). School leaders’ perceptions on reading writing and mathematics in innovative learning environments. *Education 3-13 International Journal of Primary, Elementary and Early Years Education*, 47(8), 906–919. <https://doi.org/10.1080/03004279.2018.1538256>.
- Fletcher, J., Everatt, J., Mackey, J., & Fickel, L. H. (2020). Digital technologies and innovative learning environments in schooling: A New Zealand experience. *New Zealand Journal of Educational Studies*, 55(1), 91–112. <https://doi.org/10.1007/s40841-020-00156-2>.
- Fletcher, J., Mackey, J., & Fickel, L. (2017) A New Zealand case study What is happening to lead changes to effective co-teaching in flexible learning spaces. *Journal of Educational Leadership, Policy and Practice (JELPP) Special edition Leading innovative learning environments*, 32(1): 66–79.
- Fraenkel, J., & Wallen, N. (2006). *How to design and evaluate research in education* (6th ed.). McGraw Hill.
- Furlong, J. (2002). Ideology and reform in teacher education in England: Some reflections on Cochran-Smith and Fries. *Educational Researcher*, 31(6), 23–25.
- Galda, L., & Beach, R. (2004). Response of literature as a cultural activity. In R. Ruddell & N. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 852–869). International Reading Association.
- Hoban, G. (2005). Developing a multi-linked conceptual framework for teacher education design. In G. Hoban (Ed.), *The missing link in teacher education design* (pp. 1–18). Springer.

- Leavy, A., McSorley, F., & Bote, L. (2007). An examination of what metaphor construction reveals about the evolution of preservice teachers' beliefs about teaching and learning. *Teaching and Teacher Education*, 23(7), 1217–1233.
- Lee, K., Courtney, M., McGlashan, A., Neveldsen, P., & Toso, M. (2019). Initial teacher education students' perceptions of technology and technology education in New Zealand. *International Journal of Technology and Design Education*, 30(3), 437–458.
- Mackey, J., O'Reilly, N., Jansen, C., & Fletcher, J. (2017). What do teachers and leaders have to say about co-teaching in flexible learning spaces? *Journal of Educational Leadership, Policy and Practice (JELPP) Special edition Leading innovative learning environments*, 32(1), 93–106.
- Mackey, J., O'Reilly, N., Jansen, C., & Fletcher, J. (2018). Leading change to co-teaching in primary schools: A 'Down Under' experience. *Educational Review*, 70(4), 465–485.
- Mealings, K., Demuth, K., Buchholz, J., & Dillon, H. (2015). The effect of different open plan and enclosed classroom acoustic conditions on speech perception in Kindergarten children. *Journal of the Acoustical Society of America*, 138(4), 2458–2469.
- Mtika, P., Robson, D., & Fitzpatrick, R. (2014). Joint observations of students teaching and related tripartite dialogue during field experience partner perspectives. *Teaching and Teacher Education*, 39, 66–76.
- Nelson, E., & Johnson, L. (2017). Learning to teach in ILEs on practicum : anchoring practices for challenging times. *Waikato Journal of Education*, 22(3).
- New Zealand Ministry of Education. (2020). Curriculum staffing: Primary curriculum staffing - for Year 1 to 8 students. <https://www.education.govt.nz/school/funding-and-financials/resourcing/school-staffing/entitlement-staffing/curriculum-staffing/#Primary>
- Ng, W., Nicholas, H., & Williams, A. (2010). School experience influences on pre-service teachers' evolving beliefs about effective teaching. *Teaching and Teacher Education*, 26(2), 278–289. <https://doi.org/10.1016/j.tate.2009.03.010>.
- Nystrand, M. (2006). Research on the role of classroom discourse as it affects reading comprehension. *Research in the Teaching of English*, 40(4), 392–412.
- OECD. (2013). Innovative learning environments: Educational research and innovation. <http://dx.doi.org/https://doi.org/10.1787/9789264203488-en>
- OECD. (2015). Schooling redesigned: Towards innovative learning systems. *Educational Research and Innovation*, OECD Publishing. <https://doi.org/10.1787/9789264245914-en>.
- Pearson, P. D. (2009). The roots of reading comprehension instruction. In S. E. Israel & G. G. Duffy (Eds.), *Handbook of research on reading comprehension* (pp. 3–31). New York: Routledge.
- Poulou, M. (2007). Personal teaching efficacy and its sources: Student teachers' perceptions. *Educational Psychology*, 27(2), 191–218.
- Prochnow, J. E., Tunmer, W. E., & Chapman, J. W. (2013). A longitudinal investigation of the influence of literacy-related skills, reading self-perceptions, and inattentive behaviours on the development of literacy learning difficulties. *International Journal of Disability, Development and Education*, 60(3), 185–207. <https://doi.org/10.1080/1034912X.2013.812188>.
- Ramsey, G. (2000). *Quality matters: Revitalising teacher education policy: Critical choices: Report of the review of teacher education, New South Wales. (Executive summary)*.
- Ruddell, R., & Unrau, N. (2004). Reading as a meaning-construction process: the reader, the text, and the teacher. In R. Ruddell & N. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 1462–1521). International Reading Association.
- Shield, B., Greenland, E., & Dockrell, J. (2010). Noise in open plan classrooms in primary schools: A review. *Noise & Health*, 12(4), 225–234.
- Sardon, D., Charteris, J., & Nelson, E. (2015). Shifts to learning eco-systems: Principals' and teachers' perceptions of innovative learning environments. *New Zealand Journal of Teachers' Work*, 12(2), 149–171.
- Soter, A., Wilkinson, I., Murphy, P., Reninger, K., Rudge, L., & Edwards, M. (2008). What the discourse tells us: Talk and indicators of high-level comprehension. *International Journal of Educational Research*, 47(6), 372–391. <https://doi.org/10.1177/001440290006700107>.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Sage.
- Teaching Council New Zealand: Matatū Aotearoa. (2020). Initial teacher education providers. <https://teachingcouncil.nz/content/initial-teacher-education-providers>

- Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of computer assisted learning*, 29(5), 403–413. <https://doi.org/10.1111/jcal.12029>.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Walker, R. (2003). Teacher development through communities of learning. In D. McNerney & S. Van Etten (Eds.), *Sociocultural influences and teacher education programs* (pp. 223–246). IAP Information Age.
- Woolner, P. (2010). *The design of learning spaces*. Continuum International Publishing Group.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.