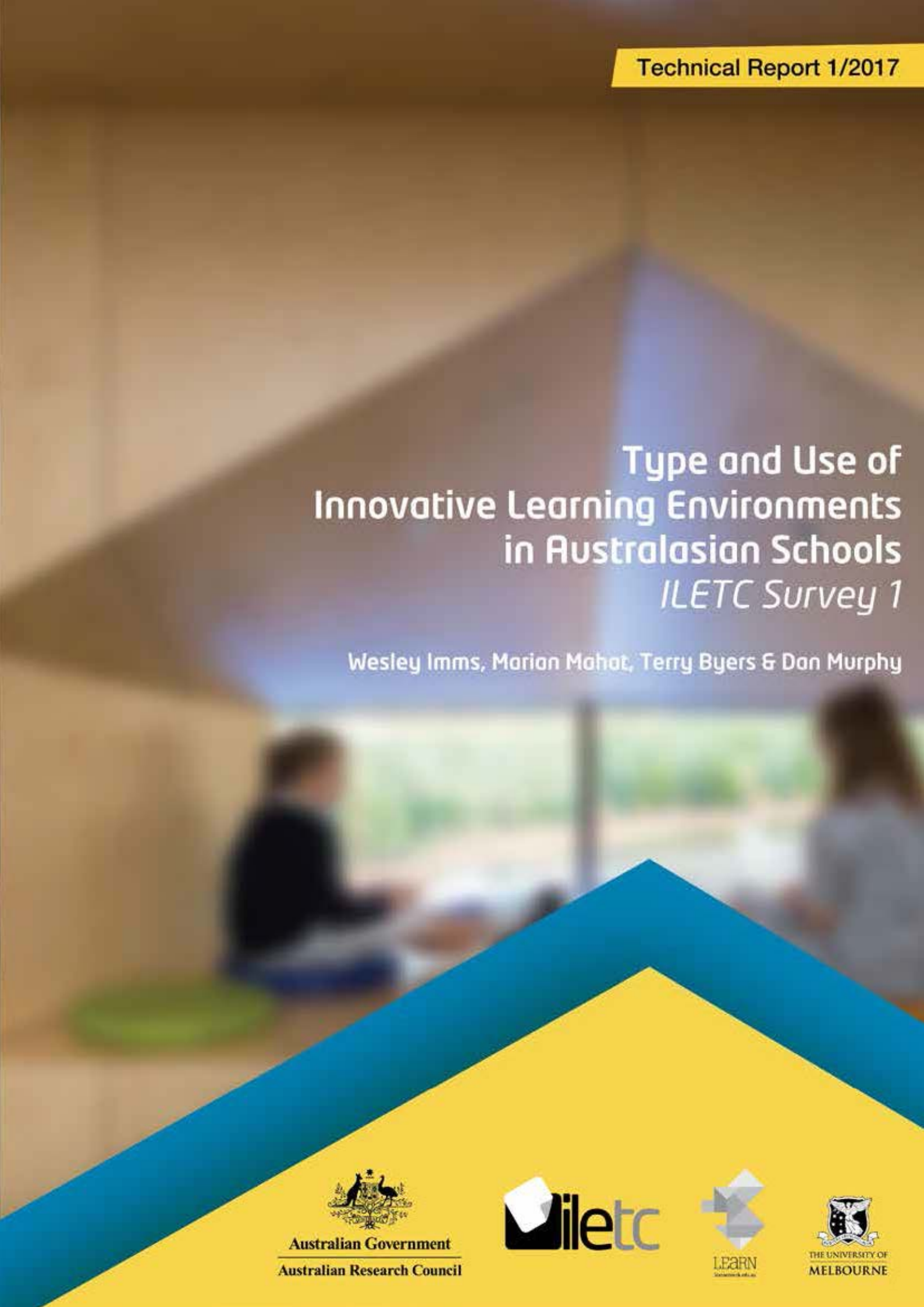


Technical Report 1/2017

Type and Use of Innovative Learning Environments in Australasian Schools

ILETC Survey 1

Wesley Imms, Marion Mahat, Terry Byers & Dan Murphy

Australian Government
Australian Research Council

ILETC

LEARN

THE UNIVERSITY OF MELBOURNE

Technical Report
Type and Use of Innovative Learning Environments in Australasian Schools
ILETC Survey 1

Imms, W., Mahat, M., Byers, T. & Murphy, D. (2017). *Type and Use of Innovative Learning Environments in Australasian Schools* ILETC Survey No. 1. Melbourne: University of Melbourne, LEaRN, Retrieved from: http://www.iletc.com.au/publications/reports.

ISBN: 978 0 7340 5381 7

ARC Linkage project (2016-2019)

This research is supported under Australian Research Council's Linkage Projects funding scheme (project LP150100022). The views expressed herein are those of the authors and are not necessarily those of the Australian Research Council.

Acknowledgements

We would like to acknowledge the contributions of Joann Cattlin, Kirra Liu, Lachlan Stewart and the ILETC Chief Investigators. We would like to thank Professor Kim Dovey and Associate Professor Kenn Fisher for their permission to adapt content from Dovey, K., & Fisher, K. (2014). Designing for adaptation: the school as socio-spatial assemblage. *The Journal of Architecture*, 19(1), 43-63.

ILETC would like to thank our partner organisations for their cooperation and support. For a list of our partners, please turn to the final page of the document.

Design: Lachlan Stewart.

Cover image: Marshland School. Stephenson & Turner / Hayball. Photography: Paul McCredie.

Lead Chief Investigator
Associate Professor Wesley Imms

Chief Investigators
Professor David Clarke
Dr Ben Cleveland
Associate Professor Kenn Fisher
Professor Lisa Grocott
Professor John Hattie
Professor Thomas Kvan
Associate Professor Clare Newton

Project Manager
Joann Cattlin

Lead Research Fellow/Research Manager
Dr Marian Mahat

Research Fellows
Chris Bradbeer
Dr Terry Byers

Research Assistants
Kirra Liu
Lachlan Stewart

Graduate Researchers
Raechel French
Anne Knock
Victoria Leighton
Daniel Murphy
Dion Tuckwell
Ethel Villafranca
Pamela Yang
Fiona Young

TECHNICAL REPORT

Type and Use of Innovative Learning Environments in Australasian Schools
ILETC Survey 1

Overview

- What types of learning environments are in use in Australian and New Zealand schools?
- What types of teaching approaches happen in these?
- What types of learning do they facilitate?

Innovative Learning Environments (ILEs), celebrated by some for the 'transformational' educational opportunities they may provide, raise questions whether the anticipated pedagogical value of these 'non-traditional' spaces is based on idealised visions of teaching and learning rather than sound evidence. Before such complex issues can be efficiently addressed, evidence of the actual 'state of play' of the nature of school spaces is required. This report provides results of a survey disseminated to over 6000 school principals in Australia and New Zealand (NZ). Participants were invited to provide their perceptions of (1) the types of learning spaces in their schools; (2) the types of teaching approaches observed in those spaces; (3) the degree to which teachers in those spaces utilised progressive 'mind frames'; and (4) the degree to which students engaged in 'deep' as opposed to 'surface' learning in those spaces. With a response rate of 14%, the 822 responses provided unique data on the distribution, use, and perceived impact of use of particular learning environment types in these Australasian regions. Findings, based on principals' perceptions, indicated that in this sample of schools: (1) traditional classrooms were the dominant classroom type, amounting to approximately 75% of all spaces; (2) the dominant teaching approach was characteristics of teacher-led pedagogies; (3) participants from schools with a higher

prevalence of traditional classroom spaces reported a lower assessment along the teacher mind frame continuum, with the reverse in more flexible learning spaces; and (4) students in traditional classrooms exhibited less deep learning characteristics, with the opposite in more flexible learning environments. The study concluded that while this research was dependent on the perceptions of leading teachers, the response rate and framing of the questions indicates that there existed evidence of a relationship between types of learning environments, teaching practices, teacher mind frames, and student deep learning.

This technical report does not argue generalizable results, nor the existence of demonstrable causal relationships between spatial types and pedagogic approaches/ types of learning. Such discussion and further analysis will stem from this technical report. It does, however, provide a detailed overview of the structure, implementation and results from a large-scale survey that focused on such issues. This constitutes an evidence-based platform for future discussion and academic inquiry about the opportunities and challenges surrounding the use and practice of ILEs in Australia and NZ. The direction of this enquiry may, conceivably, extend to questioning if more flexible learning environments facilitate, encourage or allow the types of learning and teaching characteristics being sought by policy and educational specialists, and proponents of '21st century learning skills'.

Contents

Marist College. Y2 Architecture. Photography: Bill Conroy.

Introduction

This report presents an analysis of data collected through a survey of school principals in Australia and NZ as part of an Australian Research Council Linkage project. The Innovative Learning Environments and Teacher Change (ILETC) project brings together researchers in education, architecture and design, along with 15 partner organisations, to examine the support required to assist teachers to realise the possibility of space as a component of their pedagogic practice, and examine the impact of this 'change' on student learning. It works from the assumption that a range of facets exist that contribute to 'best practices', whilst also acknowledging that there are substantial gaps to actualising these in the classroom. To aid in strategically overcoming this, ILETC will build an evidence-base of 'what works' for teachers transitioning to ILEs. It will design strategies to fill perceived gaps, and test this suite of strategies for effectiveness and applicability across the widest possible array of Australasian schools.

The initial stage of this project is to define the research parameters around which subsequent phases of the project will be shaped. It aimed to build evidence of the current state of play in terms of learning spaces—how many of them are in use, the types, as well as the nature of teacher mind frames and student learning occurring in these spaces? This report summarises the data analysis of the ILETC Stage 1 survey disseminated between October and December 2016. The report presents descriptive findings as well as relationships amongst variables. Further statistical analysis and subsequent elaboration will be produced in academically focused scholarly publications.

Haaga-Helia University of Applied Sciences.
Photography: Kari Pasila.

The Survey Framework

The aim of the Space, Design & Use (SDU) survey is to obtain broad baseline data, which responds to a key research question, ***What types of learning spaces, teaching approaches and learning approaches are prevalent in Australian and New Zealand schools?***

The survey is divided into five sections. Each adopts a conceptual and/or analytical framework derived from literature and responds to a subsidiary research question. Two additional sections ask for demographics data, such as the role of respondents, as well as a qualitative open-ended question on respondents' perceptions on how learning environments are being utilised in their schools. The SDU Survey is available in Appendix C.

Learning spaces in schools

Subsidiary research question: *What types of learning spaces do schools have?*

ILEs exist in a confusing array of designs, from huge open spaces to highly flexible arrangements of classrooms that can be reconfigured to create learning spaces such as student retreat spaces, 'maker' spaces and much more. Dovey and Fisher (2014) conducted an international review of more than fifty award winning school designs, summarising their findings into five learning space design genres they labelled 'typologies' (Figure 1). While no hierarchy is suggested, it is clear from Figure 1 that 'openness' increases as one views the types from left to right. ILETC has adopted this concept for its study, noting that while they do not represent the entirety of learning spaces evident in all schools around the world, these categories allow teachers and school leaders a framework for discussion of what would otherwise be a complex, ephemeral phenomenon.

Figure 1: Dovey and Fisher's (2014) learning spaces types, as adapted in Imms, Cleveland, and Fisher (2016).

The survey asked respondents to indicate the percentage of each type of space that is prevalent in their schools across all five types. Visual images (see Figure 1) and text (see Table 1) were used to enhance understanding of each type.

Table 1: The five types of physical learning spaces

Of the five types of leaning spaces illustrated below, please indicate the percentage of each type that is prevalent in your school. Please ensure that your answers total 100 percent.	
1	Type A - Traditional closed classrooms entered by a corridor
2	Type B - Traditional classrooms with breakout space
3	Type C - Traditional classrooms with flexible walls and breakout space
4	Type D - Open plan with the ability for separate classrooms
5	Type E - Open plan with some adjoining spaces

Teaching approaches

Subsidiary research question: *What types of teaching approaches occur within these learning environments*?

Categorising styles of teaching has been criticised of being overly prescriptive, of not accounting for changing practices over a period of time, and of attempting to simplify what is a very complex and fugacious practice (Kolb & Kolb, 2005). For this study, however, the research question required only general perceptions and not detailed nuances of practice; the latter would be examined fully in later stages of the project. Using Dovey and Fisher's typology of teaching and learning practices (2014) as a basis, and drawing on the fundamental spatial settings for learning, this study adopted a typology of six teaching approaches. Figure 2 illustrates a typology determined to be suitable for this goal. It embraces activities ranging from whole-class to individual-student teaching practices, not dissimilar to the spatial typology described earlier, and supported by further research that focused specifically (like this question), on fundamental spatial settings for learning (Cleveland et al., 2016).

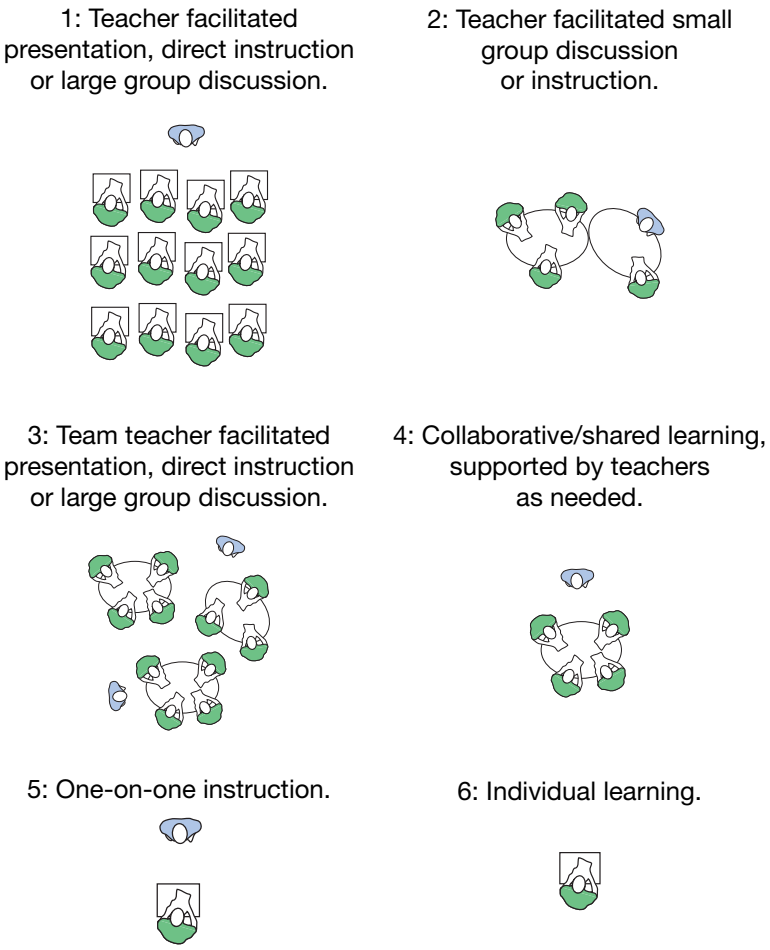


Figure 2: Typology of teaching approaches.

Respondents were asked to indicate the percentage of time devoted to each teaching typology in their school. As per previous section, visual images (see Figure 2) and text (see Table 2) were used to enhance understanding of each typology.

Table 2: The six typologies of teaching and learning approaches.

Of the six teaching approaches illustrated below, please indicate the percentage of time devoted to each approach in your school. Please ensure that your answers total 100 percent.	
1	Typology 1 - Teacher facilitated presentation, direct instruction or large group discussion
2	Typology 2 - Teacher facilitated small group discussion or instruction
3	Typology 3 - Team teacher facilitated presentation, direct instruction or large group discussion
4	Typology 4 - Collaborative/shared learning, supported by teachers as needed
5	Typology 5 - One-on-one instruction
6	Typology 6 - Individual learning

Learning and teaching affordances

Subsidiary research question: *How do the digital, physical and spatial affordances in school spaces facilitate the needs of student learning?*

This section responds to the ILETC focus areas (which will be investigated by graduate researchers on the project) in terms of the availability and use of digital, physical and spatial provisions found in school learning spaces that act as affordances for teaching and learning. In the context of this project, the term 'affordances' means the perceived and actual attributes (Gibson, 1977) and functional properties (Pea, 1993) of an object that could be used to facilitate student learning. This section asks respondents to rate how well teaching and learning affordances (see Table 3) meet the needs of student learning in terms of the school's desired pedagogy on a four-point Likert scale of *Excellent, Good, Satisfactory* and *Poor*.

Teacher mind frames

Subsidiary research question: *What are the teacher mind frames that 'drive' these teaching approaches?*

Hattie (2012) describes a teacher's mind frame as the mediating variable that directs how s/he (and school leaders) thinks and acts when engaged in all aspects of teaching. As such, it provides a framework (but not a measure) for understanding the impact of a teacher's pedagogy on student learning. He presents eight *mind frames*, or ways of thinking, that underpin those actions and decisions of teachers and leaders that are likely to have significant impacts on student learning. The mind frames are drawn from the findings of his synthesis of over 800 meta-analyses (Hattie, 2009) and encapsulate the "belief that we are evaluators, change agents, adaptive learning experts, seekers of feedback about our impact, engaged in dialogue and challenge, and developers of trust with all, and that we see opportunity in error" (Hattie, 2012, p. 159). Participants were asked to respond to each statement (see Table 4), reflecting their opinion on a four-point Likert scale of *Strongly agree, Agree, Disagree* and *Strongly disagree*.

Table 3: Learning and teaching affordances.

How well does the following meet the needs of student learning in your schools in terms of your school desired pedagogy?	
1	Wi-Fi
2	Mobile devices such as laptops, IPads, etc.
3	Display technologies such as interactive whiteboards etc.
4	Display areas for visual media and 2D work such as pin boards
5	Display areas for 3D work such as shelves
6	Hands-on resources such as texts and material objects
7	Furniture for the desired learning activities
8	Floor area for readily reconfiguring the learning space

Table 4: The eight teacher mind frames adapted from Hattie (2012).

In my opinion, teachers at our school:	
1	Believe that their fundamental task is to evaluate the effect of their teaching on students' learning and achievement.
2	Believe that the success of students is based on what teachers do (or don't do).
3	Want to coach and model different ways of learning, rather than teaching.
4	See assessment as feedback about their impact.
5	Engage in dialogue, not monologue.
6	Enjoy a challenge and never retreat to just 'doing their best'.
7	Believe that it is their role to develop positive relationships in learning spaces and staffrooms.
8	Inform parents about the nature of learning.

Student deep learning

Subsidiary research question: *What type of deep learning occurs within these learning spaces?*

Deep and surface learning approaches are established concepts in educational research literature (Beattie, Collins, & Mcinnes, 1997). Surface learning might be loosely described as 'learning for a test', with arguably poor long-term knowledge retention or applicability to other concepts. Deep learning tasks, in comparison, are viewed as converging out of problem solving, learning based in authentic contexts, and accelerated by innovations in digital technologies (Fullan & Langworthy, 2014). The deep learning approach points towards learning for understanding. It is characterised by students who seek to understand the issues and interact critically with the content of particular teaching materials, to relate ideas to previous knowledge and experience, examine the logic of arguments and relate the evidence presented to the conclusions (Beattie et al., 1997). Learners employing the deep approach tend to join concepts, apply them to real life situations, or question conclusions (Lyke & Young, 2006), and are more likely to discuss and reflect upon the content as well as read related materials (Tait, 2009). Studies suggest that these students have better retention of information and apply it better than surface students do (Booth, Luckett, & Mladenovic, 1999; Ramsden, 1992).

The Learning Process Questionnaire (Biggs, 1987; Biggs, Kember, & Leung, 2004) measures deep and surface approaches to learning within the 'systems theory' of student approaches to learning. Ten items from the Deep Approach Scale (see Table 5) were selected for this study based on their relevance to the variables being examined. Because student approaches to learning are reported from the principal's point of view, one item from the scale (Item 19) was not included. For consistency with the teacher mind frame statements in the previous section, a four-point Likert scale of S*trongly agree, Agree, Disagree*, and *Strongly disagree* was used.

Table 5: The ten characteristics of deep learning, adapted from Biggs (1987, 2004).

In my opinion, students at our school	
1	Find that at times studying makes them really happy and satisfied.
2	Try to relate what they have learned in one subject to what they learn in other subjects.
3	Feel that nearly any topic can be highly interesting once they get into it.
4	Like constructing theories to fit odd things together.
5	Work hard at their studies because they find the material interesting.
6	Try to relate new material, as they are reading it, to what they already know on that topic.
7	Spend a lot of their free time finding out more about interesting topics which have been discussed in different classes.
8	Try to understand what the author means when reading a book.
9	Come to most classes with questions in mind that they want answering.
10	Like to do enough work on a topic so that they can form their own conclusions before they are satisfied.

Five questions addressed the survey's independent variables, which were discussed in this section. A summary of those variables with their associated questions are listed in Table 6.

Table 6: Different variables and their associated survey questions.

Variable	Survey question
Type of physical learning spaces	Of the five types of learning spaces illustrated below, please indicate the percentage of each type that is prevalent in your school. Please ensure that your answers total 100 percent.
Teaching in these spaces	Of the six teaching approaches illustrated below, please indicate the percentage of time devoted to each approach in your school. Please ensure that your answers total 100 percent.
Learning and teaching affordances	How well does the following meet the needs of student learning in your school, in terms of your school's desired pedagogy? (8 items: wi-fi, mobile devices, display technologies, physical 2D and 3D displays, hands-on resources, furniture, re-configurable floor space areas).
Teacher mind frames	Please indicate the most appropriate response for each statement, reflecting your personal opinion. (8 items. Four-point Likert scale, from strongly disagree to strongly agree).
Student deep learning	Please indicate the most appropriate response for each statement, reflecting your personal opinion. (10 items. Four-point Likert scale, from strongly disagree to strongly agree).

Anglican Church Grammar School. Brand and Slater Architects.

Methods

Recruitment

The survey was implemented between October and December 2016. Participants were 6,139 principals or their nominated delegate, of primary and secondary schools that fall under the jurisdiction of partner organisations:

- Australian Capital Territory (ACT) Department of Education and Training;
- Catholic Education Diocese of Parramatta;
- New South Wales (NSW) Department of Education;
- Queensland (QLD) Department of Education and Training; and
- NZ Ministry of Education.

A whole-population strategy was deemed appropriate because no existing database (across the state/territory/diocese/national schools organisations) can provide the specialised information required for the sampling framework required by ILETC. Additionally, the time and effort required of participants was relatively minimal and non-intrusive. This component of the project received approval for research activities in schools from the University of Melbourne Humanities and Applied Sciences Human Ethics Sub-Committee and the relevant educational departments.

The survey was publicised prior its release through various channels such as media release, social media, editorials in both state- and nation-wide bulletins such as the Education Gazette in NZ and QLD State Bulletins, as well news articles on the department and other associations (such as Association of Principals) websites. Recruitment of participants varied depending on the different requirements of each education jurisdictions. Table 7 summarises the recruitment methods for each jurisdiction.

Table 7: Methods of participant recruitment from different educational jurisdictions.

Educational Jurisdictions	Recruitment of Participants
Australian Capital Territory	By direct email to principals via the department
New South Wales	Through the education department via a number of dissemination channels: Schoolbiz bulletin, Twitter, Yammer, Futures learning website, emails and phone calls to key schools undergoing rebuilds, emails and presentations through the Public School Executive Group (PSEG) and Principals associations
Queensland	By direct email to principals via the project team
Catholic Education Parramatta	By direct email to principals via the Diocese
New Zealand	By direct email to principals via the project team

Sample

After removing incomplete responses and duplicates, 822 complete responses were received for a response rate of 13.4%. Figure 3 and Table 8 provide a summary of responses for each educational jurisdiction.

In Australia, the sample (*n* = 485) consisted of 391 'State' (wholly government funded) and 94 'Independent' (partial federal funding and typically religious affiliation). While in NZ, the sample (*n* = 337) consisted of 300 'State: Not Integrated' and 32 'State: Integrated' schools. There was a smaller participation of Private: Fully regulated schools, with just five respondents. Respondents were primarily principals (73.2%). The number of primary and secondary schools were almost equal. Table 9 provides a breakdown of participation by types of role and school characteristics.

Table 8: Response rates by educational jurisdictions.

Partner educational jurisdiction	Respondents (n)	Population (N)	% of all responses	% of population
ACT	21	83	2.6%	25.3%
CathEd Parr	45	78	5.5%	57.7%
NSW	263	2213	32.0%	11.9%
QLD	149	1236	18.1%	12.1%
SA and VIC[1]	7	-	0.9%	-
Australia[2]	485	3610	59.0%	13.4%
New Zealand	337	2529	41.0%	13.3%
TOTAL	**822**	**6139**	**100.0%**	**13.4%**

[1] Non-partner responses.
[2] Participating partner jurisdictions.

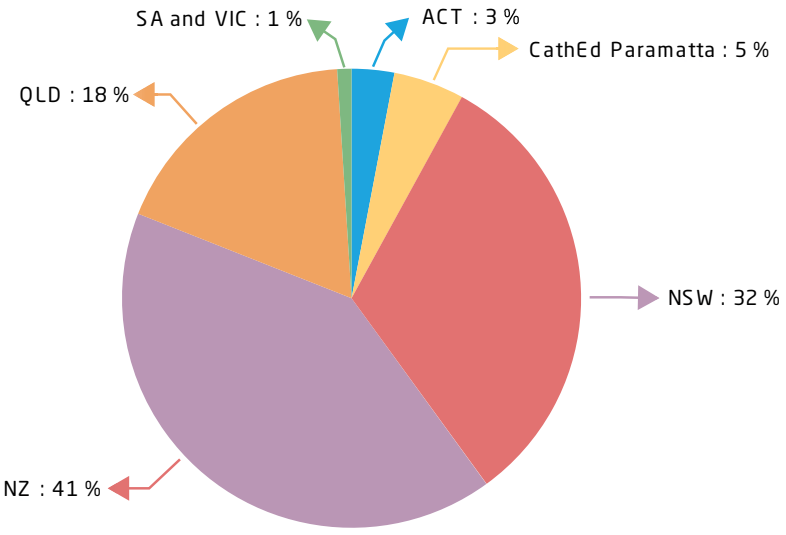


Figure 3: Response rates by educational jurisdictions (% of all responses).

Table 9: Participant and school characteristics.

Participant and school characteristics	Respondents (n)	% of all responses
Role		
Principals	602	73.2%
Leading/Senior teachers	103	12.5%
Others	117	14.2%
Total	**822**	**100.0%**
School Type		
Primary (full)[1]	399	48.6%
Contributing[2]	109	13.2%
Intermediate	20	2.4%
Secondary[3]	230	28.0%
Combined (composite)	44	5.3%
Special	15	1.8%
Other	3	0.4%
Unable to determine	2	0.2%
Total	**822**	**100.0%**
NZ Urban Area Index		
Main urban area	220	65.3%
Minor urban area	37	11.0%
Rural area	59	17.6%
Secondary urban area	19	5.6%
Not applicable	2	0.6%
Total	**337**	**100.0%**
Australian Rurality Index		
Inner regional	109	22.5%
Major cities	314	64.7%
Outer regional	50	10.3%
Remote	6	1.2%
Very remote	6	1.2%
Total	**485**	**100.0%**

[1] Primary (full) – Up to age 12
[2] Contributing – Up to age 10
[3] Secondary refers to a compilation of years 7-10, 7-12 and 9-12 schools

Data Analysis

The primary aim of the survey was to obtain principals' perspectives on the types of learning spaces and teaching approaches that can be found in Australian and NZ schools. The survey also asked these principals to provide their perspectives on their teachers' mind frames and the nature of deep learning occurring in these spaces. The data analysis approach to facilitate these objectives was of a descriptive nature. The intent was to outline broad trends within a relatively large data set, with deeper cluster and multivariate analysis conducted for further academic inquiry.

To present the typology and nature of Australian and NZ learning spaces and teaching approaches, simple averaged measures of the prevalence of each are presented in pie graphs. The intent of this proportionate breakdown is to present a holistic view of the prevalence of both the types of learning spaces and the nature of teaching approaches. Simple trends within the data set based on school demographics (i.e. location, jurisdiction, school type, etc.) will be highlighted.

The eight 'Learning & Teaching affordances' items were grouped into four categories, and the overall means were calculated for each category. As all the items for teacher mind frames and student learning were positively worded on a four-point Likert scale, the mean values of teacher mind frames and student learning were calculated for each school. The relationships between learning environments, teaching approaches, teacher mind frames and student learning were investigated by categorising schools (based on the means of the teacher mind frames and student deep learning) according to the type of learning environment and teaching approaches most prevalent in their schools. Where schools designated two or more of the learning environments as comprising equal largest proportions, the school was allocated to the type with the higher number or more open learning space.

Cluster analysis of response data was carried out to identify whether schools could be grouped on the basis of shared characteristics, that is whether groups of schools existed among the survey with similar levels of certain types of learning environments and classroom teaching approaches, as well as similar mind frames among teachers and deep learning among students. A hierarchical agglomeration was carried out using the squared Euclidean distance measure and Ward's minimum variance linkage method (Everitt, Landau & Leese, 2001; Romesburga, 1984). All analyses were conducted in the Statistical Package for the Social Sciences (SPSS) statistical software and Excel. For the purpose of this report, the analysis of the qualitative data from the open-ended question has not been included.

Woodleigh School. Law Architects. Photography: Drew Echberg.

Marshland School. Stephenson & Turner / Hayball. Photography: Paul McCredie.

Results

Types of learning spaces

The survey provided a proportionate breakdown of learning spaces that are typically present in Australian and NZ schools as described in the survey framework (see Figure 1). The Type A (clusters of traditional closed classrooms entered from a corridor) and Type B (clusters of traditional closed classrooms entered from a street space or commons) accounted for approximately 58% and 12% of the learning spaces identified by respondents (Figure 4). In all educational jurisdictions represented in this sample, excluding the Catholic Education Diocese of Parramatta, these two spatial typologies were the dominant layout. Interestingly, other Independent and State schools from NSW (n = 263), returned the highest proportionate breakdown of Type A spaces, at approximately 67% of all school learning environments. Such a significant discrepancy between different schooling systems, under the same assessment and curriculum conditions, is interesting given how each is thought to embody their approach to teaching and learning.

At the other end of the typology spectrum, respondents indicated a relatively low occurrence of Type D (Open plan with operable walls connecting classroom spaces) and Type E (Open plan with no discernible classroom spaces) spaces at 7% and 14% respectively. These spatial layouts are more in tune with what are considered to be elements of ILEs. In their study, Dovey and Fisher (2014) found that the removal of fixed spatial barriers was thought to enable a far greater range of pedagogies through the affordances of connection with and convertibility between different spatial settings. Schools with a significant proportion of Type D and E spaces were those either recently constructed or part of the Catholic Education Diocese of Parramatta. Even though this grouping of schools contributed a relatively small portion to the total sample, the participants from schools (n = 45) from the Catholic Education Diocese of Parramatta represented a sector participation rate of 57.7%. Participating primary and secondary schools from the Catholic Education Diocese of Parramatta indicated that open plan learning environments (Type D and E) constitute 54% of these spaces (13% and 41% respectively).

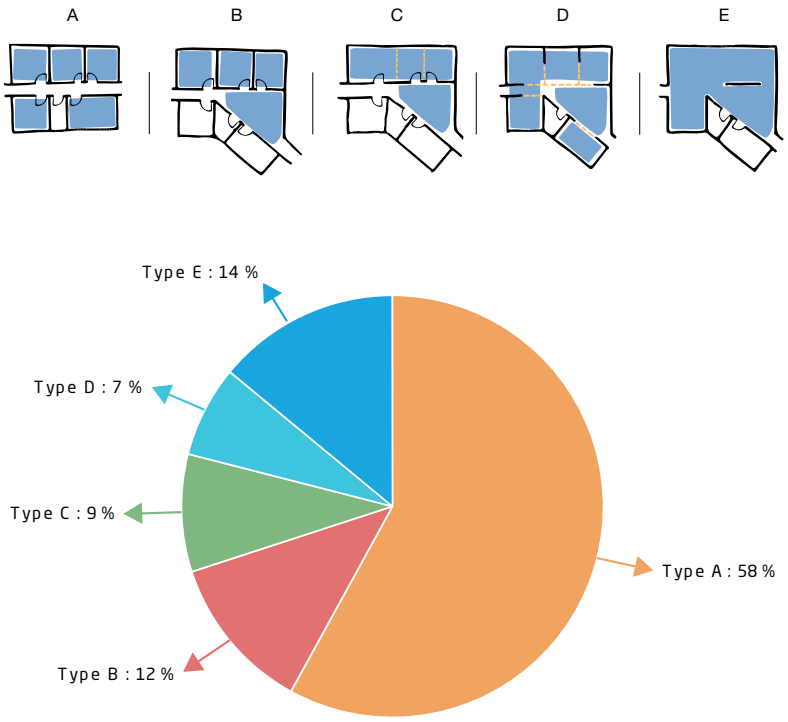


Figure 4: Types of learning spaces (*n=822*).

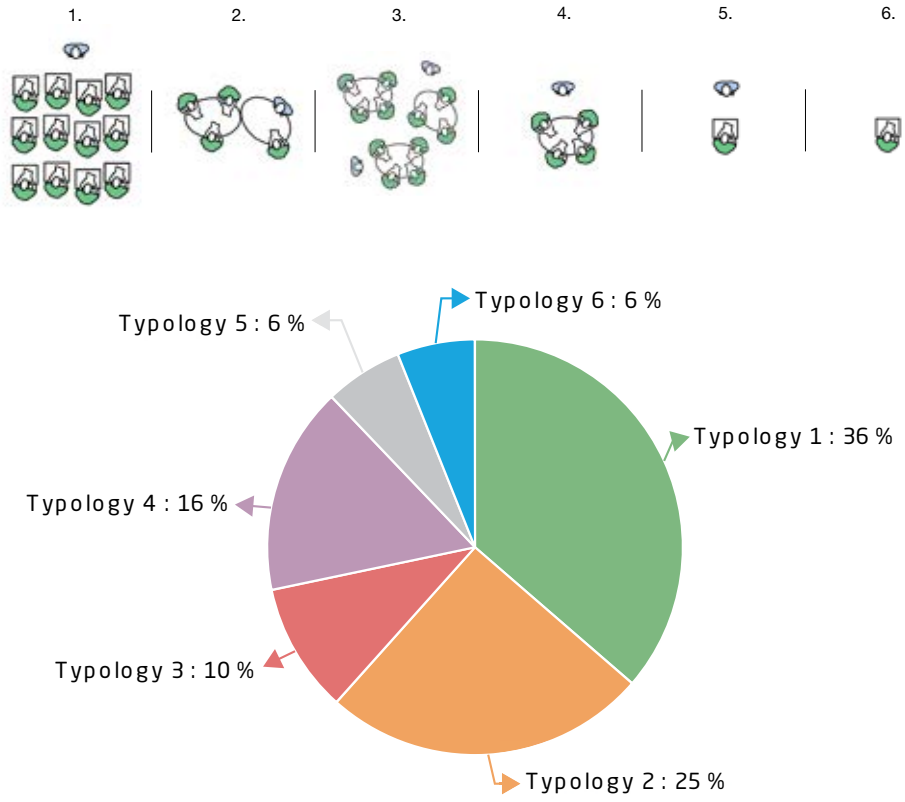


Figure 5: Typology of teaching approaches (*n=822*).

Typology of teaching approaches

The survey respondents provided a breakdown of the types of teaching approaches most prevalent in their schools (Figure 5). The assessment of teaching approaches, like the spatial modalities, began with typically teacher-led explicit instruction (Typology 1) and small group instructional (Typology 2) modalities. The survey instrument included a pedagogical model of team (2 or more teachers) direct instruction (Typology 3). Such a model was devised to encapsulate those instances of a conventional pedagogical approach in a more open ILE spatial setting. Next, the pedagogical spectrum shifted to more student-led approach through collaborative or shared learning (Typology 4), one-to-one (Typology 5) and individual (Typology 6) approach to student learning.

The sample provided responses that mirrored those answers given to the types of learning spaces (Figure 4). Respondents indicated a significant prevalence of those teaching typologies often described as teacher-led. The responses indicated that the teaching approach employed in classes was either an explicit (36%) or small group (25%) instructional mode under the direct control of the teacher, accounting for more than half of the time spent in classes. When the two countries are compared, there is a higher prevalence of these practices in Australian schools employing the explicit instructional mode (46%) than that identified in NZ schools (23%). A deeper investigation revealed a trend in schools with a significant proportion of time (greater than 75%) in the use of Typology 1 and 2, with a high incidence (greater than 85%) in Type A learning spaces. There is a small number of exceptions to this trend. However, these trends do support the assertion made by Dovey and Fisher (2014) that the more 'traditional' spaces are better suited to, or support, a more 'traditional teacher-led' pedagogical approach.

When other teaching approaches were analysed, a high proportion of respondents from NZ schools indicated that the practice of 'team teaching' was a fairly constant and consistent pedagogical mode. This level of consistency was not mirrored in the Australian sample. More than 50% of the NZ sample, indicated that team teaching occurred between 10-30% of the time. Many of these schools had a divergent spatial typology, with many reporting a significant proportion of Type A and B spaces. Deeper analysis revealed a somewhat balanced teaching approach across the full spectrum of these schools. Such a trend is interesting given the perceived dichotomy between teacher- and student-led pedagogies.

Learning and teaching affordances

The eight items were grouped into four categories of Digital technologies (items C1, C2 and C3), Curation (items C4 and C5), Resources (item C6), and Spatial affordances (items C7 and C8). The overall means for the sample for each category (see Figure 6) indicated that respondents were more satisfied about the digital technologies (M=2.88, 95% CI [2.84, 2.93]) and resources (M=2.89, 95% CI [2.73, 2.84] than they were about curation (M=2.3, 95% CI [2.25, 2.35]) and spatial affordances (M=2.32, 95% CI [2.26, 2.38]).

Teacher mind frames

A combination of averaged responses with application of 95% confidence intervals showed an overall mean of 3.06, 95% CI [3.03, 3.09] (see Figure 7), indicating that respondents perceive teacher mind frames as relatively positive in these schools. Respondents from NSW (*n* = 263) and QLD (*n* = 149) reported slightly lower means at 2.98, 95% CI [3.12, 3.21] and 2.97, 95% CI [2.91, 3.03] respectively.

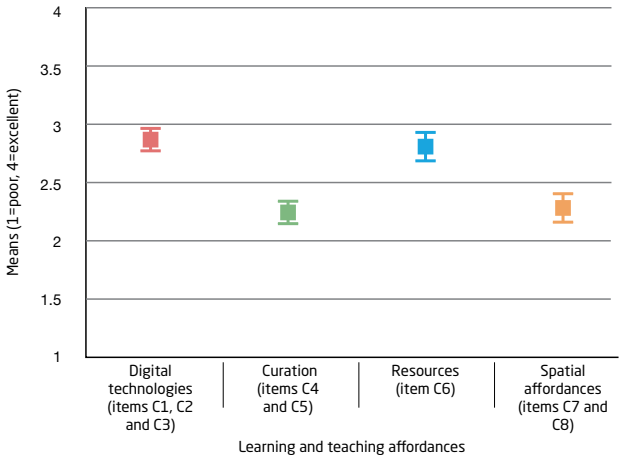


Figure 6: Learning and teaching affordances of these spaces (*n=822*).

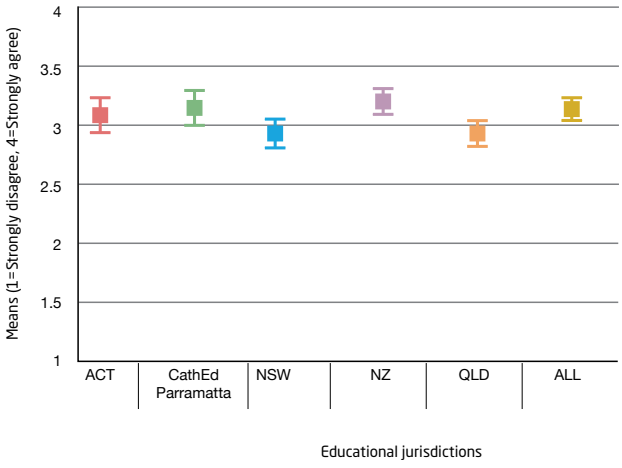


Figure 7: Means of teacher mind frames (*n=822*).

Student deep learning

Across a *Strongly agree* to *Strongly disagree* continuum, respondents perceived a positive prevalence of deep learning characteristics. As with the previous section, the average of all responses, with application of 95% confidence intervals, showed an overall mean of 2.77, 95% CI [2.74, 2.80] (see Figure 8). Respondents from ACT (n = 21), NSW (n = 263) and QLD (n = 149) reported slightly lower means at 2.71, 2.66 and 2.67 respectively.

Relationships between learning environments, teacher mind frames and student deep learning

Scatter distributions for each type of learning environment compiled in Figure 9 indicate participants of schools with a prevalence of traditional classrooms are associated with lower means of teacher mind frames and student deep learning. This pattern is clearly visible when mean values for the categories are plotted (see Figure 10) with open plan learning environments (Types D and E) being associated with higher means of teacher mind frames and student deep learning. Refer to Table 1 for description on learning space type.

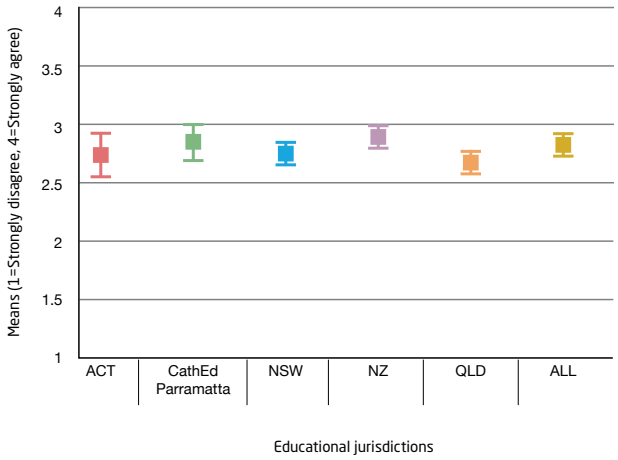


Figure 8: Means of student deep learning (n=822).

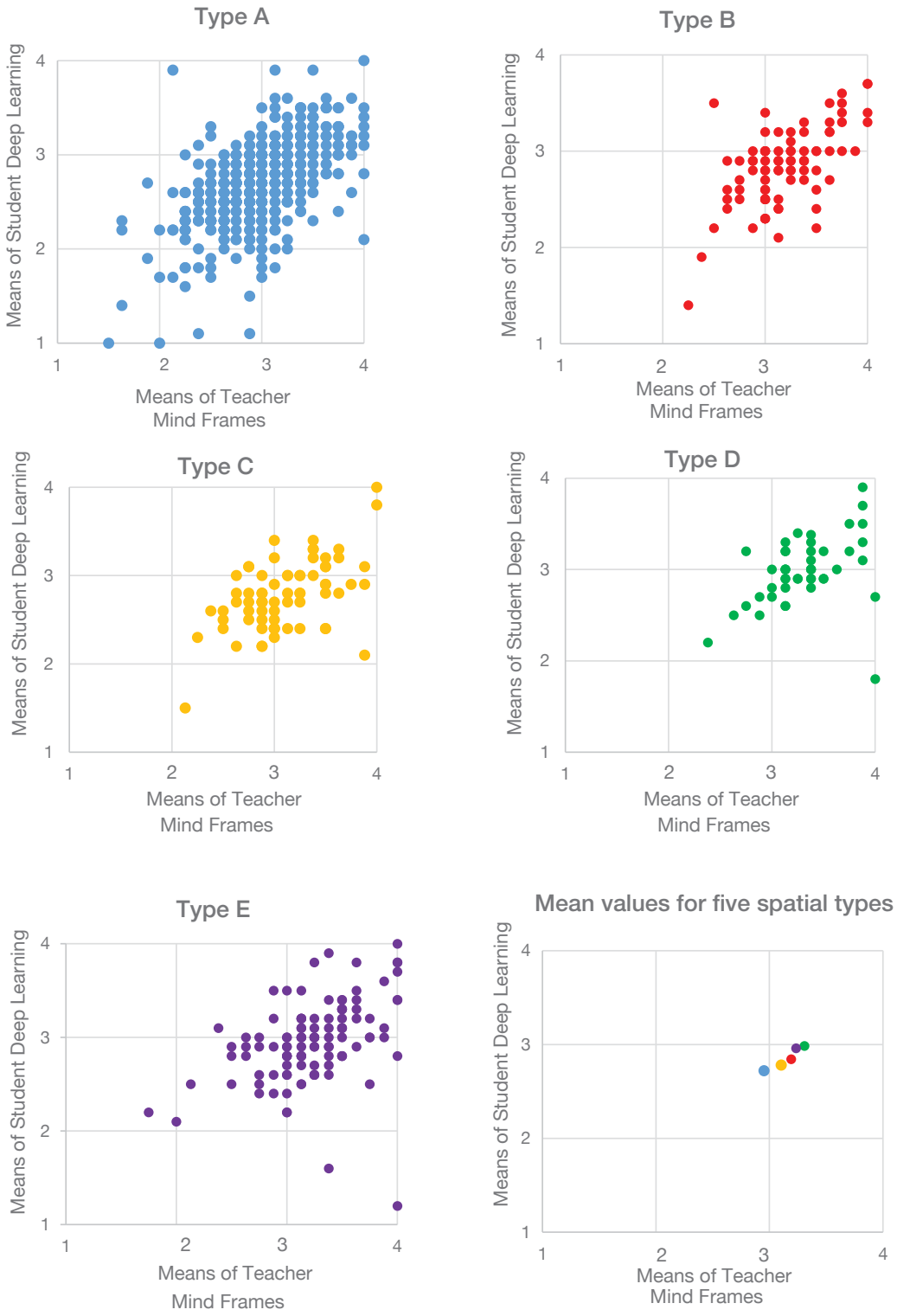


Figure 9: Means of teacher mind frames and student deep learning categorised by most prevalent learning environment type (*n=822*).

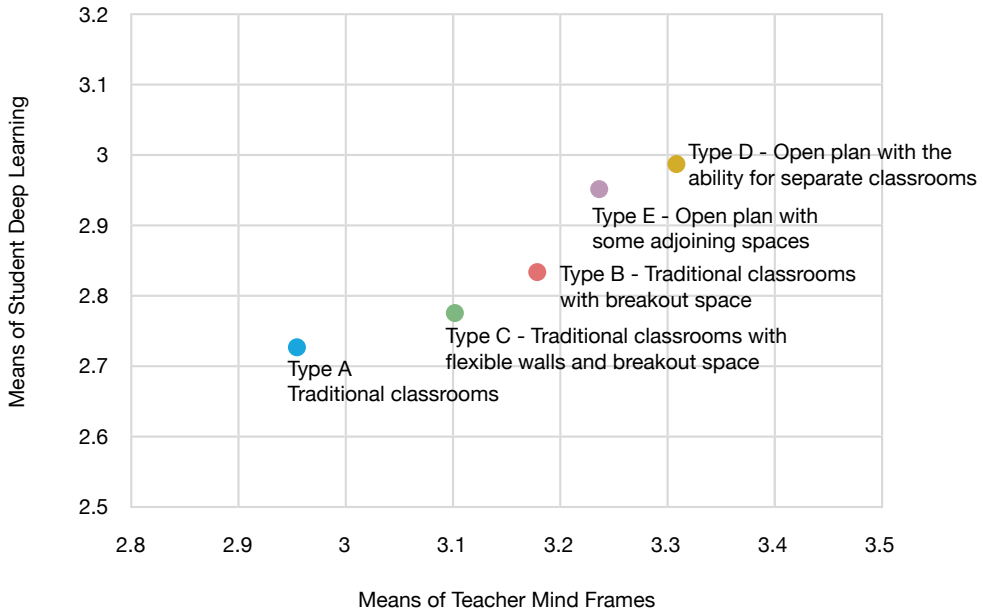


Figure 10: Means of teacher mind frames and student deep learning categorised by most prevalent learning environment type (*n=822*).

Relationships between teaching approaches, teacher mind frames and student deep learning

Plotting the means of teacher mind frames and student deep learning for schools grouped by predominant teaching approach reveals an interesting trend (Figure 11). Overall, more desirable teacher mind frames and more behaviour associated with deeper learning are linked with less teacher-centric classroom dynamics.

Interaction between learning environment and teaching approach

One question the ILETC project will investigate in-depth is how teachers' use of different learning environments relates to student learning. The survey results give some encouragement for this line of inquiry. As established in Figure 10, teacher mind frames and student deep learning are lowest in schools with predominantly traditional classrooms. Among the subset of these schools in which the most teacher-centric teaching approach predominates (Typology 1- Teacher facilitated presentation, direct instruction or large group discussion, red text in Figure 12), the means of teacher mind frames and student deep learning are lower. In schools with predominantly traditional classrooms where other teaching approaches predominate (Typologies 2-6, blue text in Figure 12), the means of teacher mind frames and student deep learning are higher.

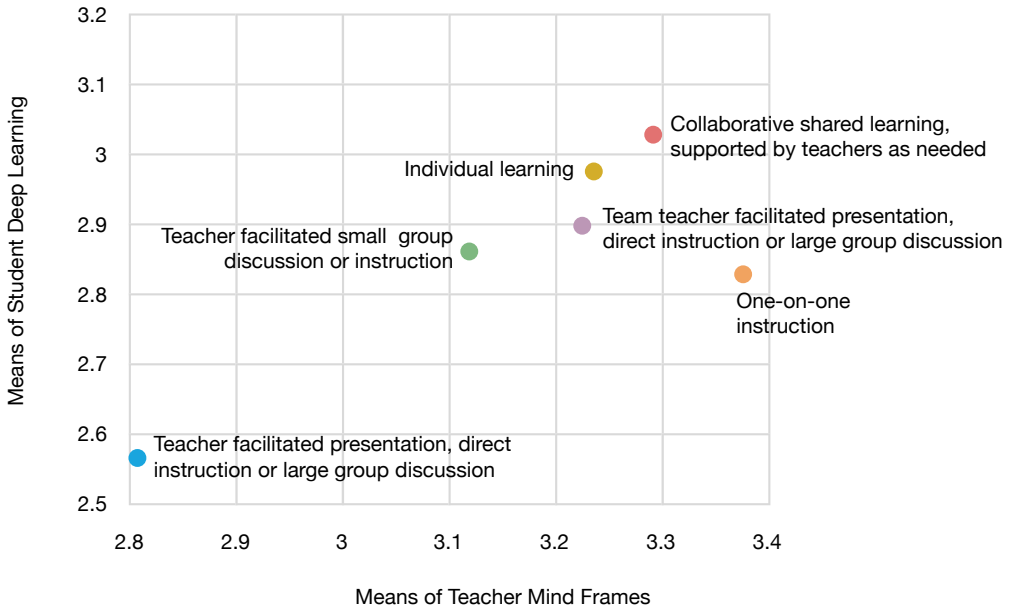


Figure 11: Means of teacher mind frames and student deep learning categorised by most prevalent teaching approaches (*n=822*).

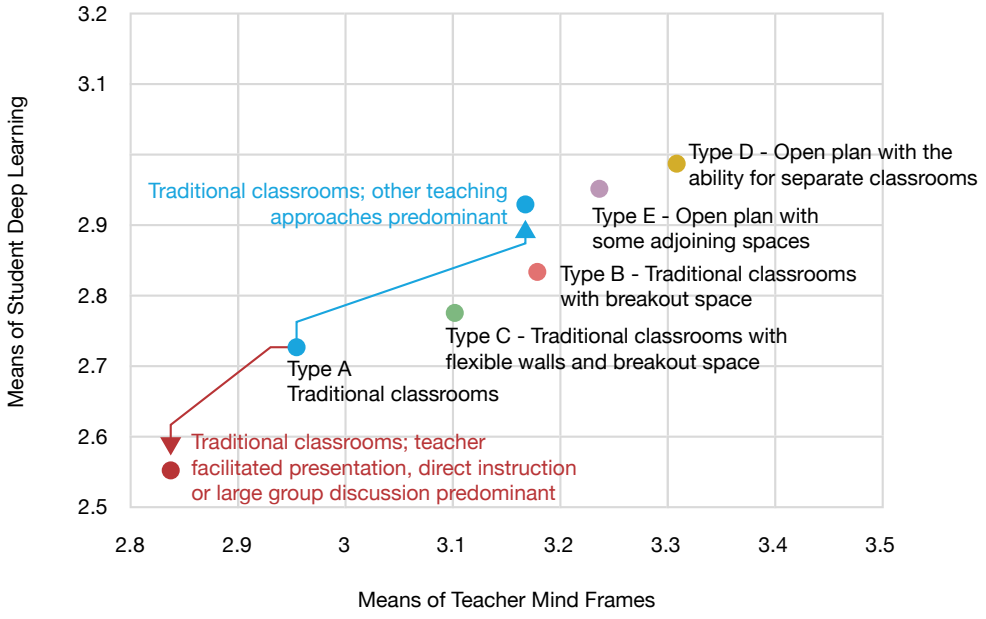


Figure 12: Means of teacher mind frames and student deep learning categorised by most prevalent learning environment type (*n=822*).

Cluster analysis

Four variables were used in the cluster analysis (see Table 10). Investigation of the scree diagram revealed a large increase in distance between clusters after step 813, suggesting 7 clusters (*n=822*). K-means clustering (MacQueen, 1967) was then carried out, achieving convergence after six iterations. The strongest indicator of cluster membership is learning space type. Over 60% of cases are allocated to two clusters, 1 and 3, which have 81% and 89% of traditional classrooms on average. Teaching approaches are more evenly distributed across clusters. Variations in teacher mind frames and student deep learning approaches are observable across clusters.

Table 10: Variables used in cluster analysis

Variable	Value
Learning environment	Proportions of five types (see Table 1)
Teaching approach	Proportions of six typologies (see Table 2)
Teacher mind frames	Mean value of responses to 8 items (see Table 4)
Student learning outcomes	Mean value of responses to 10 items (see Table 5)

The clusters can be characterised as follows. Table 11 provides the mean values for the variables for each of the seven clusters.

- Cluster 1 – Traditional classrooms dominant, teacher facilitated instruction of different group sizes common alongside some collaborative and individual learning and one-on-one instruction, above average teacher mind frames and student deep learning.
- Cluster 2 – Traditional classrooms with breakout space and flexible walls predominant, teacher facilitated presentation with some collaborative and one-on-one and individual learning, slightly above average teacher mind frames and average student deep learning.
- Cluster 3 – Predominantly traditional classrooms and teacher facilitated instruction of large groups, below average teacher mind frames and student deep learning.
- Cluster 4 – Open plan classrooms with the ability for separate classrooms dominant, teacher and team teacher facilitated instruction balanced with collaborative and one-on-one and individual learning, above average teacher mind frames and student deep learning.
- Cluster 5 – Traditional classrooms with breakout space dominant, teacher facilitated instruction types dominant alongside some collaborative and one-on-one and individual learning, above average teacher mind frames and average student deep learning.
- Cluster 6 – Open plan classrooms with some adjoining spaces dominant, collaborative shared learning dominant, above average teacher mind frames and student deep learning.
- Cluster 7 – Open plan classrooms with some adjoining spaces dominant, teacher and team teacher facilitated instruction dominant alongside some collaborative and one-on-one and individual learning, above average teacher mind frames and student deep learning.

Cluster analysis is a convenient method for identifying groups of schools with similar characteristics. Identifying such groups within the sample would be useful in developing understanding of patterns of relations between learning environments, teaching approaches, teacher mind frames and student deep learning. If a number of groups with similar attributes were identified this could inform the selection of schools for case studies in subsequent stages of the project. The development of the sampling frame will be reported in a subsequent report.

Table 11: Mean variables values for clusters.

Variables	Cluster						
	1	2	3	4	5	6	7
Learning environment							
Type A - Traditional classrooms	81.8%	17.3%	88.5%	11.5%	17.8%	6.8%	8.0%
Type B - Traditional classrooms with breakout space	5.0%	9.3%	4.8%	2.3%	73.5%	0.2%	0.8%
Type C - Traditional classrooms with flexible walls and breakout space	4.5%	66.5%	3.2%	1.7%	4.2%	0%	2.2%
Type D - Open plan with the ability for separate classrooms	4.0%	3.5%	1.5%	78.7%	1.7%	6.7%	3.8%
Type E - Open plan with some adjoining spaces	4.7%	3.5%	2.0%	6.0%	3.0%	86.3%	85.0%
Teaching approaches							
Typology 1 - Teacher facilitated presentation, direct instruction or large group discussion	20.0%	29.2%	68.2%	12.2%	28.0%	3.0%	17.5%
Typology 2 - Teacher facilitated small group discussion or instruction	32.2%	27.8%	15.5%	22.3%	28.5%	8.5%	30.2%
Typology 3 - Team teacher facilitated presentation, direct instruction or large group discussion	12.2%	12.0%	5.0%	14.7%	9.5%	14.0%	14.8%
Typology 4 - Collaborative/ shared learning, supported by teachers as needed	19.0%	17.7%	5.8%	30.0%	18.8%	63.0%	18.2%
Typology 5 - One-on-one instruction	8.5%	6.3%	3.0%	8.5%	8.2%	6.2%	8.8%
Typology 6 - Individual learning	8.2%	7.0%	2.5%	12.0%	7.0%	5.3%	10.2%
Teacher mind frames	3.2	3.1	2.8	3.3	3.2	3.4	3.2
Student deep learning	2.9	2.8	2.5	3.0	2.8	3.1	2.9
Number of schools in cluster	242	78	269	43	87	20	83
Percentage of total	**29.5%**	**9.5%**	**32.8%**	**5.2%**	**10.6%**	**2.4%**	**10.1%**

St Francis Xavier College. Hayball Architecture. Photography: Dianna Snape.

Summary

This technical report provides descriptive data and some limited inferential analysis to address the paucity of knowledge concerning the types and distribution of learning spaces across sections of Australia and New Zealand, and corresponding teaching and learning practices within those spaces. Its intent was to develop the data required for a sampling framework for more in-depth research on topics addressing the project's focus. It needs to be understood that Survey 1 was not intended to profile all schools on these issues to a statistically significant level. However, the scale and response rate of the survey, the robustness of its emerging data, and the range of data obtained (as outlined in this report) has allowed findings that are quite unique and inform the project—and the learning environments research field—with unexpectedly useful information.

It does so with some caveats. The data is obtained from one person in each school, a 'school leader'. In the high proportion of cases, this was a principal or a leading teacher. These were, however, the people with arguably the best overall sense of the use of learning spaces in each institution. That it was also data based on these peoples' 'perceptions' is equally valid for the same reason. Response rates to the survey were adequate, providing reasonable distribution of opinion across the myriad variables associated with such institutions such as, for example, types, locations, indigenous, and social economic status (SES) or equivalent classifications. Participation was voluntary, so arguably included schools with pre-dispositions either for, or against ILEs.

The data from the ILETC survey indicated that schools with a higher prevalence of traditional spaces were associated with lower assessment of teacher mind frames and student deep learning. The analysis was based on clustering schools on their dominant space type (a preference was also given to the more open spaces in assigning dominant type) and not an in-depth analysis of traditional vs. ILE. There is obviously a significant amount of teaching conducted in team modes that is taking place in spaces intended for didactic styles—the spaces are not aligned with current practice but some success is evident in their outcomes. Conversely, all the types of ILEs are associated with teacher mind frames and student deep learning characteristics that is being sought by our community to meet the demands of a rapidly changing society.

As Australian and NZ schools continue to move from traditional classrooms to ILEs, evidence of the impact of this transition is required to direct meaningful and sustainable improvements in student learning. With the participation of a significant number of schools in both Australia and NZ, this study should be able to provide specific robust recommendations to enable students in ILEs to better prepare for their futures.

Appendices

Appendix A
List of Tables

Appendix B
List of Figures

Appendix C
Space, Design & Use Survey

This research is supported under Australian Research Council's Linkage Projects funding scheme LP150100022. The views expressed herein are those of the authors and are not necessarily those of the Australian Research Council.

Introduction

You are invited to participate in this survey as part of the Australian Research Council's *Innovative Learning Environments and Teacher Change* (ILETC) linkage project. The project is a four-year, three-phase study that will investigate the potential of innovative learning environments (ILEs) to improve student learning. For further information please visit www.iletc.com.au. This survey has been approved by the University of Melbourne's Human Research Ethics Committee and your Education department. A Plain Language Statement is available here

Purpose of the survey

The aim of the survey is to collect baseline data about the use of innovative learning environments (ILEs) in schools. The survey includes questions about three key issues:

- What types of learning spaces do you have and use?
- What types of teaching approaches are prevalent in your school?
- What types of learning activities occur in your school?

There are no right or wrong answers. The best answers are those that reflect your opinions about each statement.

Participation

The survey is expected to take **5-7 minutes**. The survey will close on **9 December 2016**. Participation in this initial survey will ensure that your school remains a potential site for further research into how teachers can best utilise learning spaces.

We thank you for your time.

Associate Professor Wesley Imms
Lead Chief Investigator
Melbourne Graduate School of Education
The University of Melbourne

Consent to participate

1. I consent to participate in this project, the details of which have been explained to me, and I have been provided with a written plain language statement to keep.
2. I understand that by ticking the check boxes below, I am giving consent to participate in this research.
3. I understand that my participation will involve a short online survey, with the possibility of a follow up telephone interview. I agree that the researcher may use the results as described in the plain language statement.
4. I acknowledge that:
    a. The possible effects of participating in the survey and possible telephone interview have been explained to my satisfaction;
    b. I have been informed that I am free to withdraw from the project at any time without explanation or prejudice and to withdraw any unprocessed data I have provided;
    c. The project is for the purpose of research;
    d. I have been informed that the confidentiality of the information I provide will be safeguarded subject to any legal requirements;
    e. I have been informed that with my consent data from the survey and the possible telephone interview will be stored at University of Melbourne will be destroyed after five years of the completion of the broader ILETC project;
    f. My name or my school's name will be referred to by a pseudonym in any publications arising from the research;
    g. I have been informed that a copy of the research findings will be made available to me should I agree to this.

☐ **I consent to this survey.**

☐ **I consent to a possible follow-up telephone survey/interview.**

Respondent information

Name of school:

Your current role (please select one):

- ○ Principal
- ○ Leading/senior teacher
- ○ Other (Please specify)

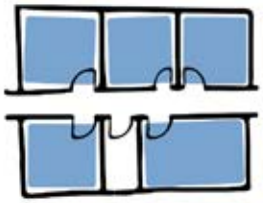
Is your school currently constructing a new or refurbished learning space, or planning one in the next six months?

Yes ○ No ○

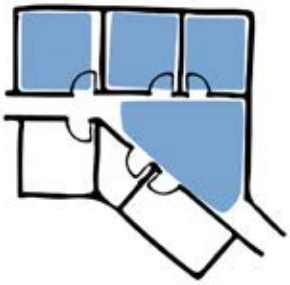
A: Types of physical learning spaces

Of the five types of school learning spaces illustrated below, please indicate the percentage of each type that is prevalent in your school. Please ensure that your answers total 100 percent.

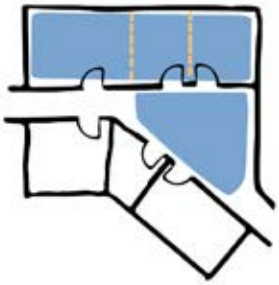
1: Traditional classrooms.



2: Traditional classrooms with breakout space.

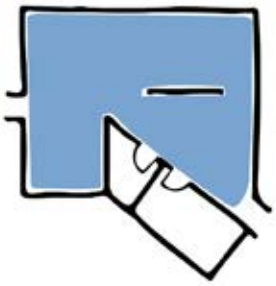


3: Traditional classrooms with flexible walls and breakout space.

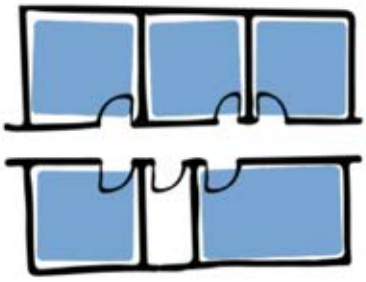


4: Open plan with the ability for separate classrooms.

5: Open plan with some adjoining spaces.

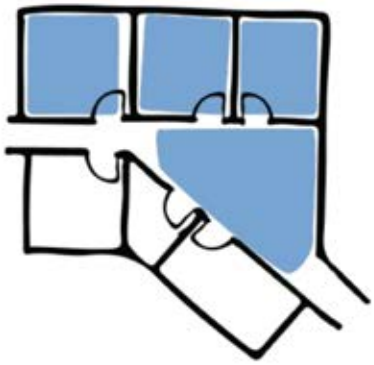


1: Traditional Classrooms



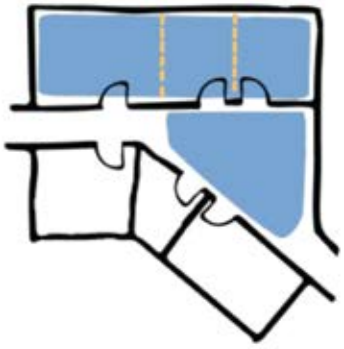
0 %

2: Traditional classrooms with breakout space.



0 %

3: Traditional classrooms with flexible walls and breakout space.

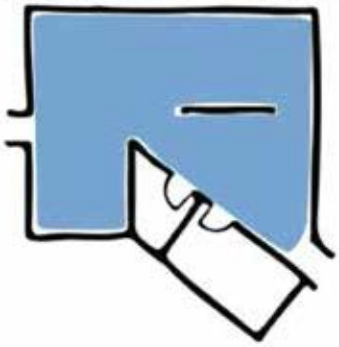


0 %

4: Open plan with the ability for separate classrooms.

0 %

5: Open plan with some adjoining spaces.



0 %

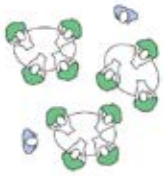
B: Teaching in these spaces

Of the six teaching approaches illustrated below, please indicate the percentage of time devoted to each approach in your school. Please ensure that your answers total 100 percent.

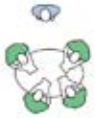
1: Teacher facilitated presentation, direct instruction or large group discussion.

2: Teacher facilitated small group discussion or instruction.

3: Team teacher facilitated presentation, direct instruction or large group discussion.



4: Collaborative/shared learning, supported by teachers as needed.



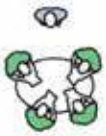
5: One-on-one instruction.

6: Individual learning.

1: Teacher facilitated presentation, direct instruction or large group discussion.

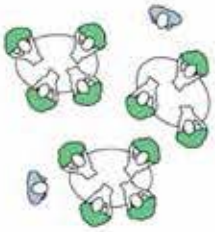
0 %

2: Teacher facilitated small group discussion or instruction.



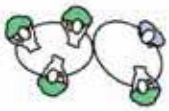
0 %

3: Team teacher facilitated presentation, direct instruction or large group discussion.



0 %

4: Collaborative/shared learning, supported by teachers as needed.



0 %

5: One-on-one instructions.

0 %

6: Individual learning.

0 %

C: Learning potential

How well does the following meet the needs of student learning in your school in terms of your school's desired pedagogy?

	Poor	Satisfactory	Good	Excellent
Wi-Fi	○	○	○	○
Mobile devices such as laptops, IPads etc.	○	○	○	○
Display technologies such as interactive whiteboards etc.	○	○	○	○
Display areas for visual media and 2D work such as pin boards	○	○	○	○
Display areas for 3D work such as shelves	○	○	○	○
Hands-on resources such as texts and material objects	○	○	○	○
Furniture for the desired learning activities	○	○	○	○
Floor area for readily reconfiguring the learning space	○	○	○	○

D: Teacher beliefs

Please indicate the most appropriate response for each statement, reflecting your personal opinion.

In my opinion, teachers at our school:

	Strongly disagree	Disagree	Agree	Strongly agree
Believe that their fundamental task is to evaluate the effect of their teaching on students' learning and achievement.	○	○	○	○
Believe that the success of students is based on what teachers do (or don't do).	○	○	○	○
Want to coach and model different ways of learning, rather than teaching.	○	○	○	○
See assessment as feedback about their impact.	○	○	○	○
Engage in dialogue, not monologue.	○	○	○	○
Enjoy a challenge and never retreat to just 'doing their best'.	○	○	○	○
Believe that it is their role to develop positive relationships in learning spaces and staffrooms.	○	○	○	○
Inform parents about the nature of learning.	○	○	○	○

E: Student learning approaches

Please indicate the most appropriate response for each statement, reflecting your personal opinion.

In my opinion, students at our school:

	Strongly disagree	Disagree	Agree	Strongly agree
Find that at times studying makes them really happy and satisfied.	○	○	○	○
Try to relate what they have learned in one subject to what they learn in other subjects.	○	○	○	○
Feel that nearly any topic can be highly interesting once they get into it.	○	○	○	○
Like constructing theories to fit odd things together.	○	○	○	○
Work hard at their studies because they find the material interesting.	○	○	○	○
Try to relate new material, as they are reading it, to what they already know on that topic.	○	○	○	○
Spend a lot of their free time finding out more about interesting topics which have been discussed in different classes.	○	○	○	○

Try to understand what the author means when reading a book.	○	○	○	○
Come to most classes with questions in mind that they want answering.	○	○	○	○
Like to do enough work on a topic so that they can form their own conclusions before they are satisfied.	○	○	○	○

F: Comments

Do you have any other comments on how learning environments are being utilised in your school?

References

Beattie, V., Collins, B., & Mcinnes, B. (1997). Deep and surface learning: a simple or simplistic dichotomy? *Accounting Education*, *6*(1), 1-12.

Biggs, J. B. (1987). *Student Approaches to Learning and Studying. Research Monograph*. Hawthorn: Australian Council for Educational Research.

Biggs, J. B., Kember, D., & Leung, D. Y. P. (2004). Examining the multidimensionality of approaches to learning through the development of a revised version of the Learning Process Questionnaire. . *British Journal of Educational Psychology*, *74*(2), 261-280.

Booth, P., Luckett, P., & Mladenovic, R. (1999). The quality of learning in accounting education: the impact of approaches to learning on academic performance. *Accounting Education*, *8*(4), 277-300.

Cleveland, B., Newton, C., Fisher, K., Wilks, S., Bower, B., & Robinson, N. (2016). *Review of Standard Entitlement Frameworks for Schools & school site size and outdoor space requirements (including Special Schools & Special Developmental Schools): Department of Education and Training. Study 2 & 4 –Recommendations for an updated facilities framework & proposed School Facility Area Guidelines*. (Unpublished report) Melbourne: LEaRN.

Everitt, B., Landau, S. & Leese, M. (2001). *Cluster analysis (4th ed.)*. London: Arnold.

Dovey, K., & Fisher, K. (2014). Designing for adaptation: the school as socio-spatial assemblage. *The Journal of Architecture*, *19*(1), 43-63.

Fullan, M., & Langworthy, M. (2014). *A rich seam: How new pedagogies find deep learning*. Retrieved from London: http://www.michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf

Gibson, J. (1977). The theory of affordances In R. E. Shaw & J. Branford (Eds.), *Perceiving, Acting, and Knowing* (pp. 67-82). Hillsdale, NJ: Lawrence Erlbaum Associates.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analysis relating to achievement*. Abingdon: Routledge.

Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning*. Abingdon: Routledge.

Imms, W., Cleveland, B., & Fisher, K. E. (2016). *Learning environments evaluation. Snapshots of emerging issues, methods and knowledge*. Rotterdam: Sense Publishing.

Kolb, A., & Kolb, D. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning & Education*, *4*(2), 193-212.

Lyke, J. A., & Young, A. J. K. (2006). Cognition in context: Students' perceptions of classroom goal structures and reported cognitive strategy use in the college classroom. *Research in Higher Education*, *47*(4), 477-490.

MacQueen, J. B. (1967). Some methods for classification and analysis of multivariate observations. *Proceedings of the Fifth Symposium on Math, Statistics, and Probability* (pp. 281–297). Berkeley, CA: University of California Press.

Pea, R. D. (1993). Practices of distributed intelligence and designs for education. In G. Salomon (Ed.), *Distributed cognitions: psychological and educational considerations* (pp. 47-87). New York: Cambridge University Press.

Ramsden, P. (1992). *Learning to teach in higher education*. London: Routledge.

Romesburg, H.C. (1984). *Cluster analysis for researchers*. Belmont, California: Lifetime learning publications.

Tait, K. (2009). Understanding tertiary student learning: Are they independent thinkers or simply consumers and reactors? *International Journal of Teaching and Learning in Higher Education*, *21*(1), 97-207.

Our Partners

THE UNIVERSITY OF MELBOURNE

GRADUATE SCHOOLS

MELBOURNE GRADUATE SCHOOL OF EDUCATION

Shaping minds, shaping the world

msd

Melbourne School of Design

FACULTY OF ARCHITECTURE, BUILDING AND PLANNING

www.msd.unimelb.edu.au

NSW GOVERNMENT Education

ACT Government Education

Catholic Education Diocese of Parramatta

Churchie.

Queensland Government

MARSHALL DAY Acoustics

ASSOCIATION FOR LEARNING ENVIRONMENTS

Enhancing the Educational Experience

Australasia

hayball

Steelcase® EDUCATION

AUSTRALIAN SCIENCE & MATHEMATICS SCHOOL

WOODLEIGH school

A SCHOOL of INDEPENDENT THOUGHT

MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

New Zealand Government

Te Kāwanatanga o Aotearoa

Ecophon® SAINT-GOBAIN

A SOUND EFFECT ON PEOPLE

Museum of Applied Arts & Sciences

IT'S HOW WE CONNECT