

# *The Finished Beginning*

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**Empirical retrospective of the impact of different learning environments on teaching and learning from the 2010 to 2018 New Generation Learning Spaces project.**

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**Churchie.**

Anglican Church Grammar School  
The University of Melbourne LEaRN group  
Evaluating 21st Century Learning Environments  
Brand + Slater Architects  
Innovative Learning Environments and Teacher Change



# Executive *summary*

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**A resurgence of interest in physical learning environments has highlighted how little we know about its impact on pedagogies and learning outcomes.**

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## **New approach needed**

Historically, the literature has focused on the design of the building and not its actual use. Furthermore, there has been a lack of research methods capable of controlling those complex variables inherent to both education and space.

The longitudinal New Generation Learning Spaces (NGLS) project focused on providing an approach, and suite of tools to measure the pedagogical impact of different learning environments.

This novel approach isolated the impact of different learning environments to then examine how they influence student and teacher activity and behaviour.

The evidence suggests that when considering the impact of the physical learning environment on learning, how it is inhabited, is at least as important as its design.

Across the five studies, it is clear that the environmental competency of the teacher, is a clear predictor on any spatial design to facilitate its intended pedagogical function.

## **What we found**

Keeping this in mind the empirical evidence does suggest that the learning environment can:

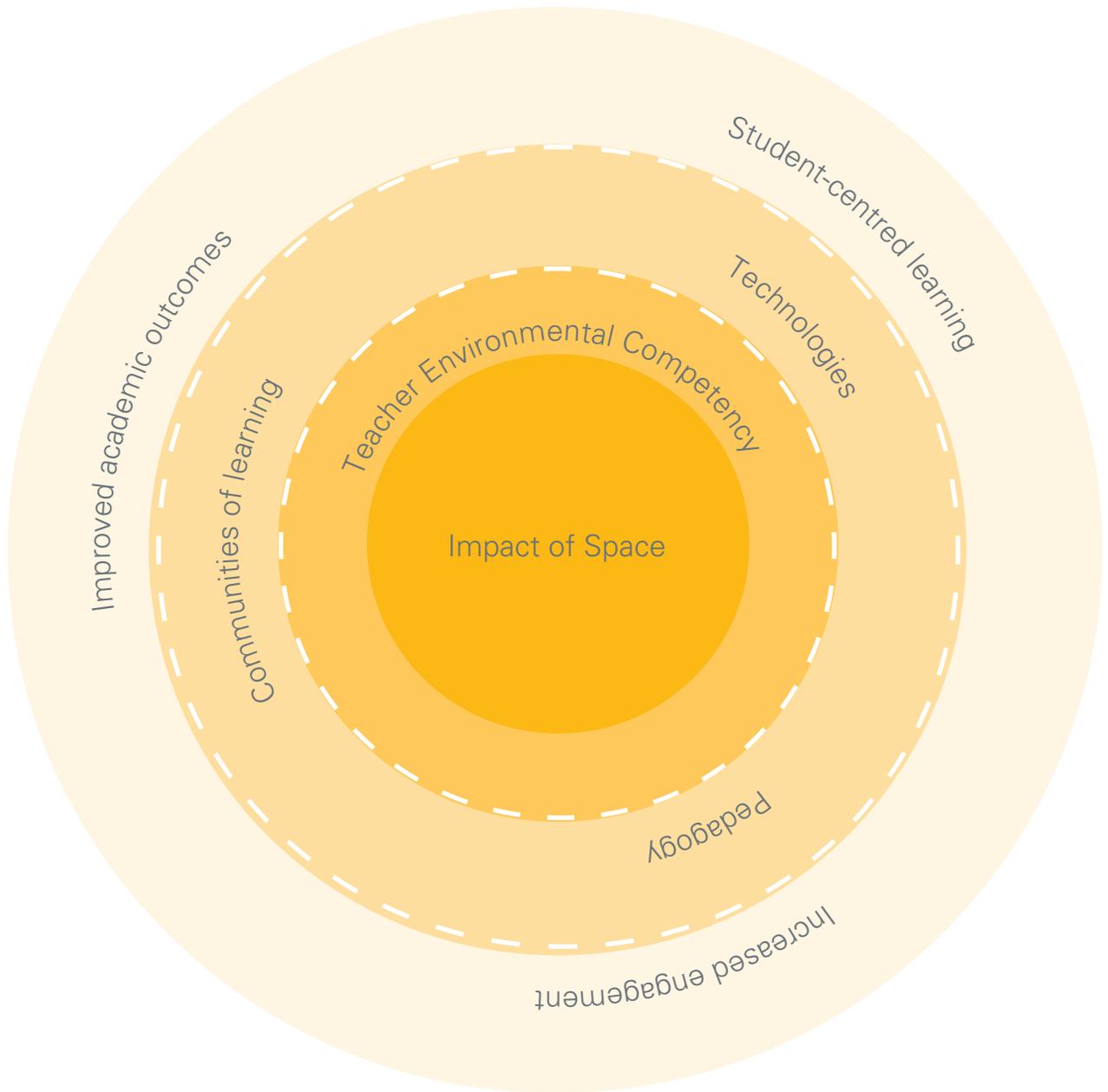
- Significantly influence how technologies (both digital and physical) are used, and therefore, are perceived by students.

- Increase the instance of active, collaborative, and multiplicitious nature of student-centred learning experiences.
- Affect a statistically significant enhancement of student engagement in their learning.
- On average, different classroom layout explains 7 per cent of the variation in academic outcomes in each study.
- On average, when students transition from a conventional classroom to an innovative learning environment (ILE), their academic achievement increases by 15 per cent.
- Facilitate significant pedagogical change while working within the existing 'rules of schools'.

**7**  
*Years*

**5**  
*Studies*

*Suite of  
empirical  
metrics*



# Introduction

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**Anglican Church Grammar School, in partnership with the University of Melbourne’s Learning Environments Applied Research Network (LEaRN) and Brand + Slater Architects, evaluated the impact of different learning environments on teaching and learning. The partnership has used a novel approach to ascertain the effect on academic outcomes.**

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This partnership has devised new approaches, methods, and tools to measure how different learning spaces influence the activity and behaviour of students and teachers.

At the beginning of the partnership, the very nature of what constitutes an ‘effective’ learning environment was undergoing substantial re-imagination. Underpinning this process was the growing influence of digital technologies within education. At the time, its hypothesized potential could revolutionize how, where and with whom students learn.

As a consequence, what was considered as quality teaching and learning was challenged by shifts in pedagogies and practices to support better the multiplicitous nature of student-centred learning. However, given these significant drivers, there was scant attention in the literature regarding if, and to what extent, these re-imagined learning environments could facilitate this transformation in teaching and learning to occur.

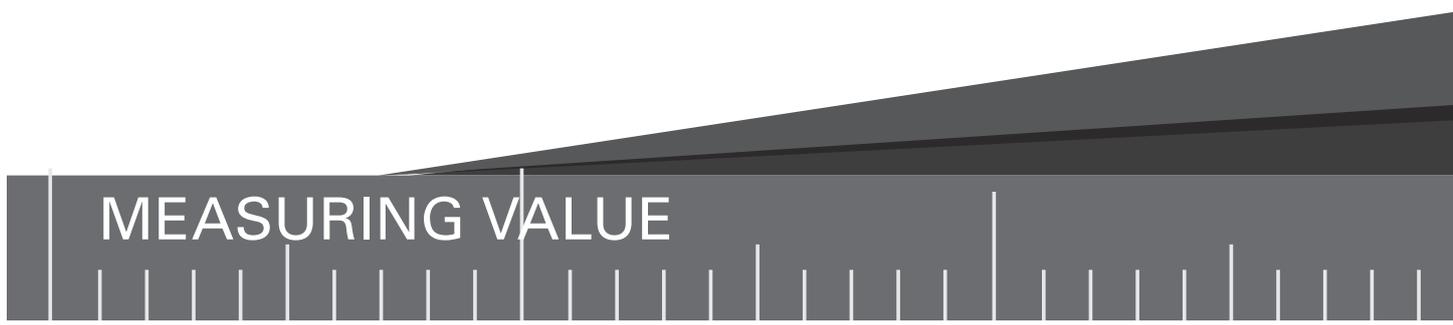
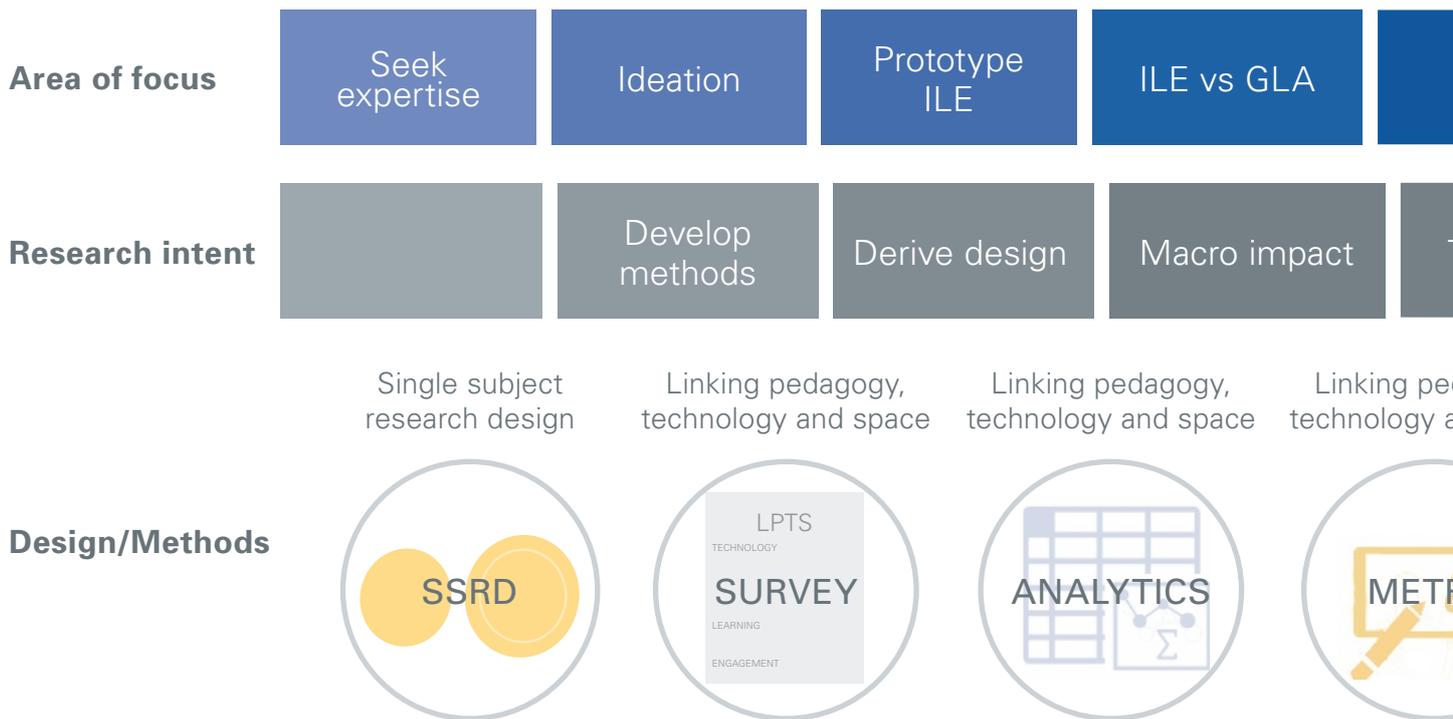
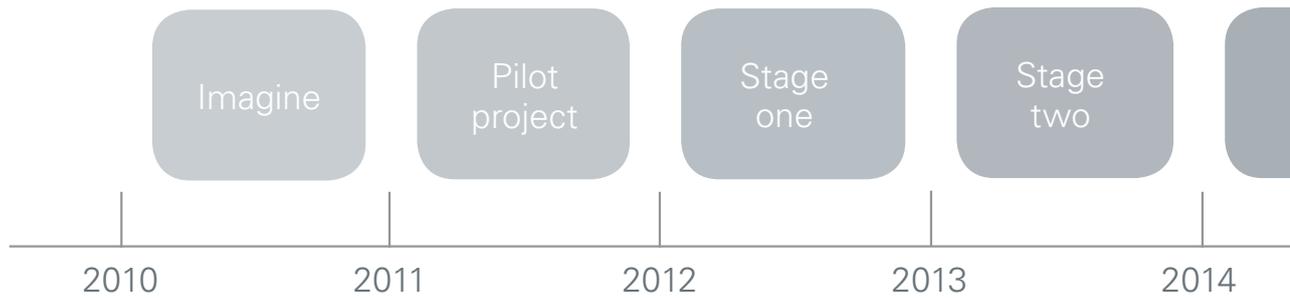
The partnership focused on providing empirical evidence to determine if the interest and investment in contemporary or innovative learning environments actually had a positive and measurable impact on teaching and learning.

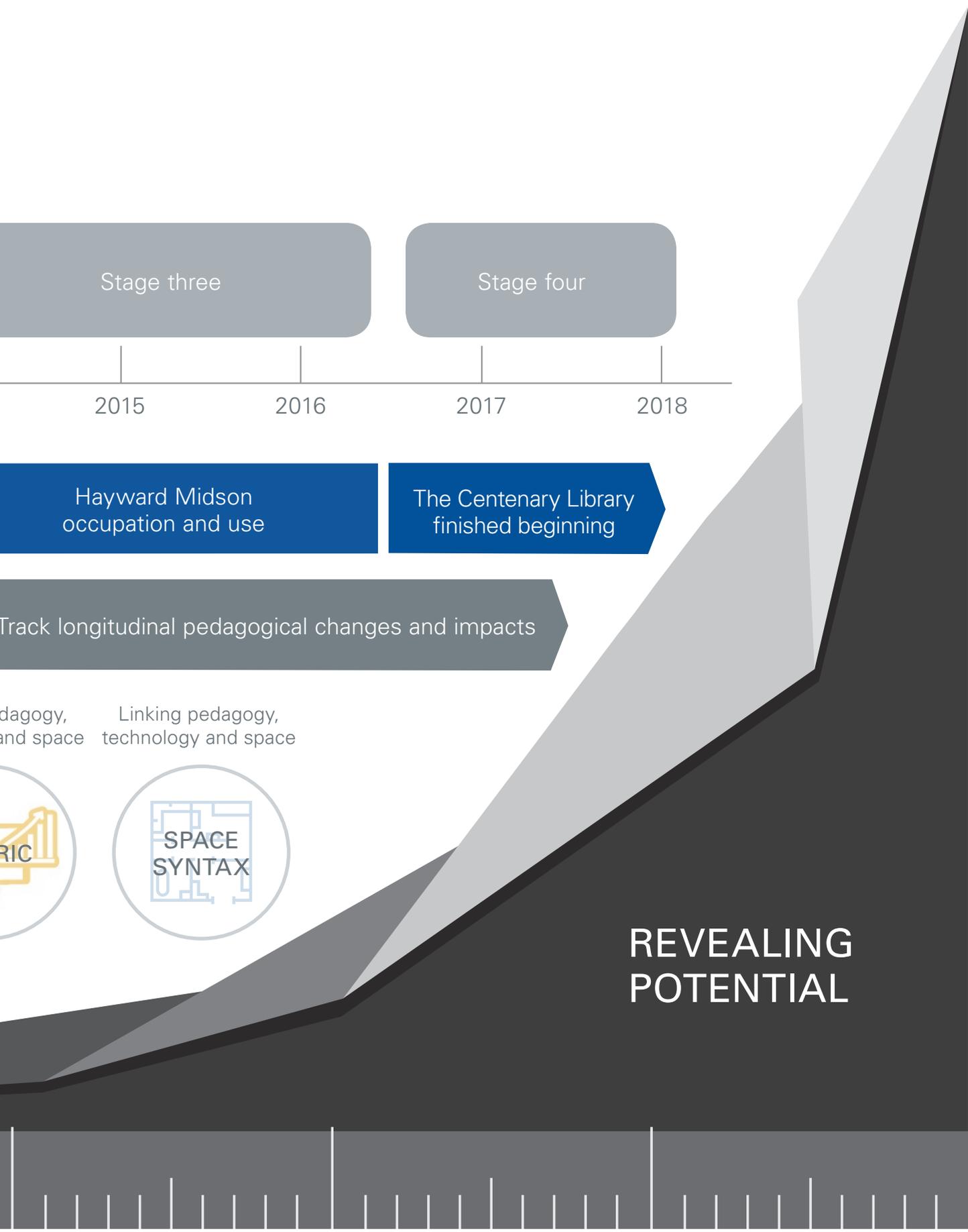
The long-term relationship between Churchie, LEaRN and Brand + Slater has provided the evidence to substantiate impetus to challenge the form and function of school learning spaces.

At the same time, the partnership integrated the current spatial trends, such as open plan and flexible future fit outs, to find they are not a viable solution. The key to the success of the partnership is the process of collective design, trial and evaluation, which showed what worked in the Churchie context.



# Process and *timeline*







## Research *question*

*‘What are the macro and micro **effects** of different learning spaces on student perceptions of their usage of technology and learning experiences, and **how** does this affect their engagement and academic outcomes?’*

# Pilot study

## YEAR

2011

## BUILDING

Lanskey

## SUBJECTS

Mathematics

## SAMPLE

3 classes, 52 students (65% participation) and 3 teachers

## RESEARCH DESIGN

Single-subject research design

## METHODS

Repeated measures survey + learning outcomes

## STUDY SUMMARY

A unique study that overcame the methodological issue of controlling the complex variables inherent to space and education. Borrowing an approach from the applied health sciences, the study focused on devising a design that moderated a number of confounding variables to focus on a spatial intervention.

The intervention consisted of the retrofit of existing classrooms spaces to pilot a cost-effective ILE layout.

The Churchie ILE layout combines furniture design and the integration of digital and visual technologies to create a polycentric or 360° learning environment within a singular space.

## Can you evaluate the impact of different spaces?

### Macro effects

#### Summary of changes in student attitudes to their learning

		
<b>Use of technology</b>	<b>Learning experiences</b>	<b>Engagement in learning</b>
<b>Statistically significant increase:</b> <ul style="list-style-type: none"><li>Effectiveness</li><li>Flexibility</li><li>Incidence of use</li></ul>	<b>Significant impact on:</b> <ul style="list-style-type: none"><li>Critical thinking</li><li>Self-regulation</li><li>Teacher ownership</li></ul>	<b>Measurable increase in:</b> <ul style="list-style-type: none"><li>Positive attitude towards learning</li><li>Willingness to be challenged</li></ul>

#### Summary of impact on academic results

Results in Mathematics improved by



# Stage 1 *study*

## YEAR

2012

## BUILDINGS

Arnott, Fisher and Lanskey

## SUBJECT

English and Mathematics

## SAMPLE

6 classes, 164 students  
(94% participation) and 17 teachers

## RESEARCH DESIGN

Quasi-experimental + single-subject  
research design

## METHODS

Repeated Measures LPTS Survey +  
Learning Outcomes

## STUDY SUMMARY

This exploratory study focused on refining a design and method to measure the empirical impact of different classroom layouts on student perceptions of their learning and academic outcomes. The design removed the key barriers to the empirical evaluation of educational spaces, through the control of those complex confounding variables inherent in schools.

The study produced evidence that advanced the knowledge of learning spaces in a school setting, finding that space does matter and served to validate a robust method for exploring this topic.

## Making the case for space: the impact on students

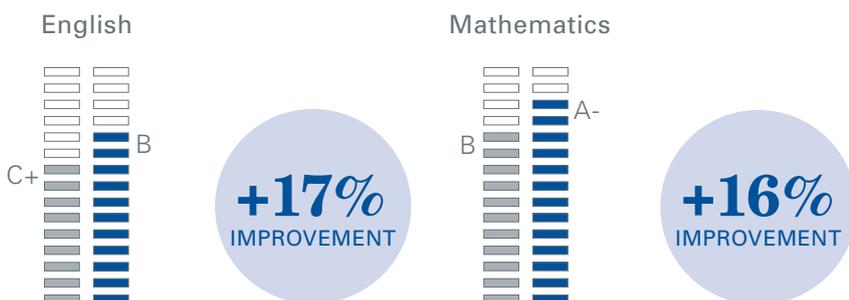
### Macro effects

Summary of changes in student attitudes to their learning



### Summary of impact on academic results

— Conventional classroom    ■ ILE



# Stage 2 study

## YEAR

2013

## BUILDINGS

Arnott, Fisher and Lanskey

## SUBJECTS

English, Humanities and Mathematics

## SAMPLE

22 classes, 385 students (68% participation) and 21 teachers

## RESEARCH DESIGN

Quasi-experimental + single-subject research design

## METHODS

Repeated measures LPTS survey + learning analytics

## STUDY SUMMARY

This confirmatory study focused on the longitudinal pedagogic impact of space on teaching and learning.

The design incorporated the use of control groups, to conduct a comprehensive and robust evaluation to determine if, and to what extent, different learning spaces affected the nuances of teaching and learning.

It was found that the affordances of the ILE design acted as a conduit to better support teachers in facilitating a wider array of pedagogical practices and active and collaborative learning modalities than those experienced in a conventional layout.

## Evaluating the longer term impact of space on students

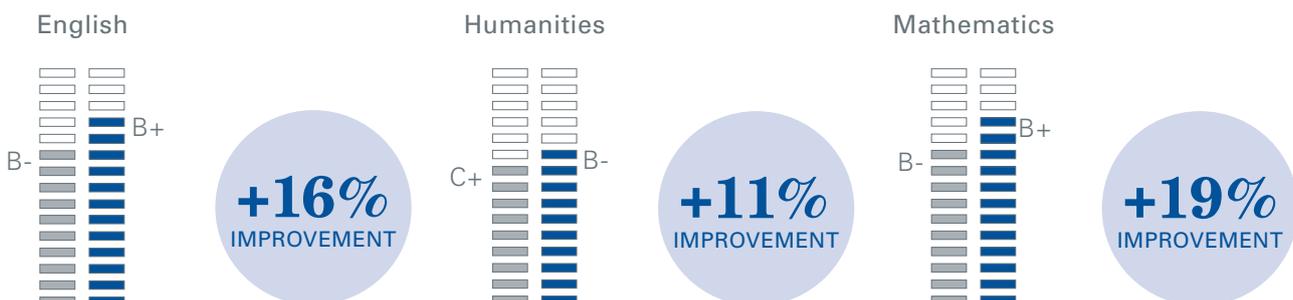
### Macro effects

Compared to students in a conventional space, ILE classes



### Summary of impact on academic results

— Conventional classroom — ILE



# Stage 3 *study*

## YEAR

2014 to 2016

## BUILDINGS

Hayward Midson Creative Precinct

## SUBJECTS

Film and Television, Design and Technology, Drama, Engineering Technology, Technology Studies, and Visual Art

## SAMPLE

126 observations of 11 teachers and 14 classes

## RESEARCH DESIGN

Quasi-experimental + single-subject research design

## METHODS

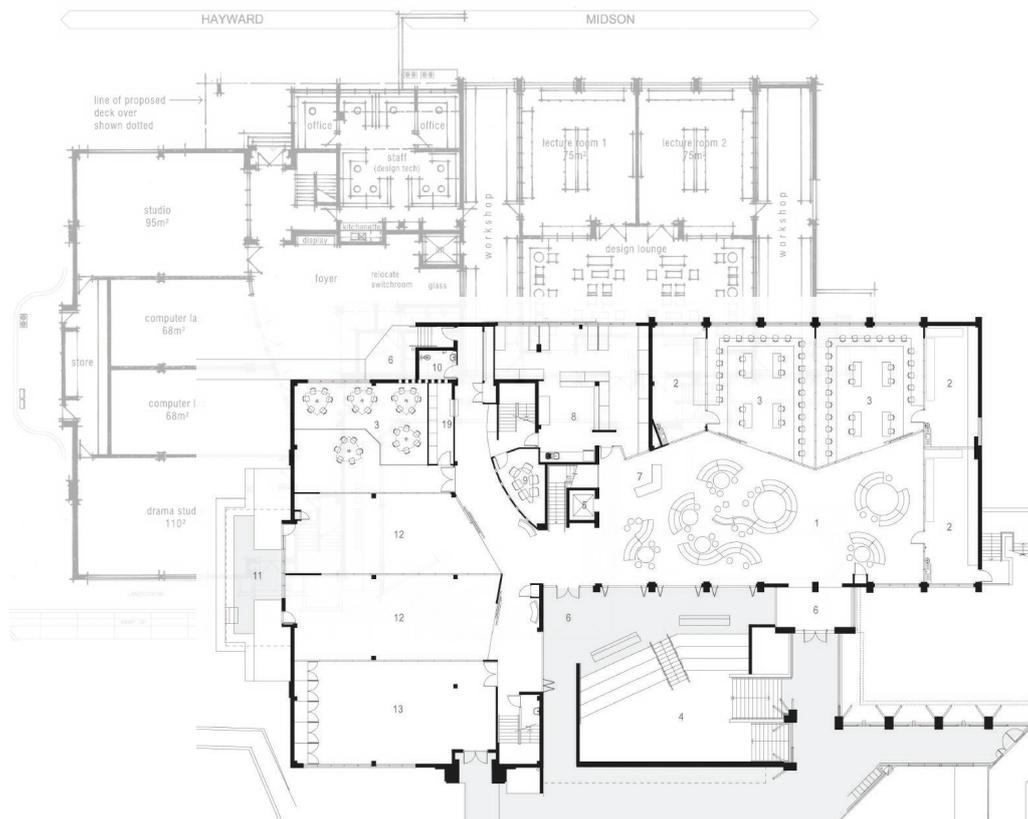
LPTS observational metric + learning analytics

## STUDY SUMMARY

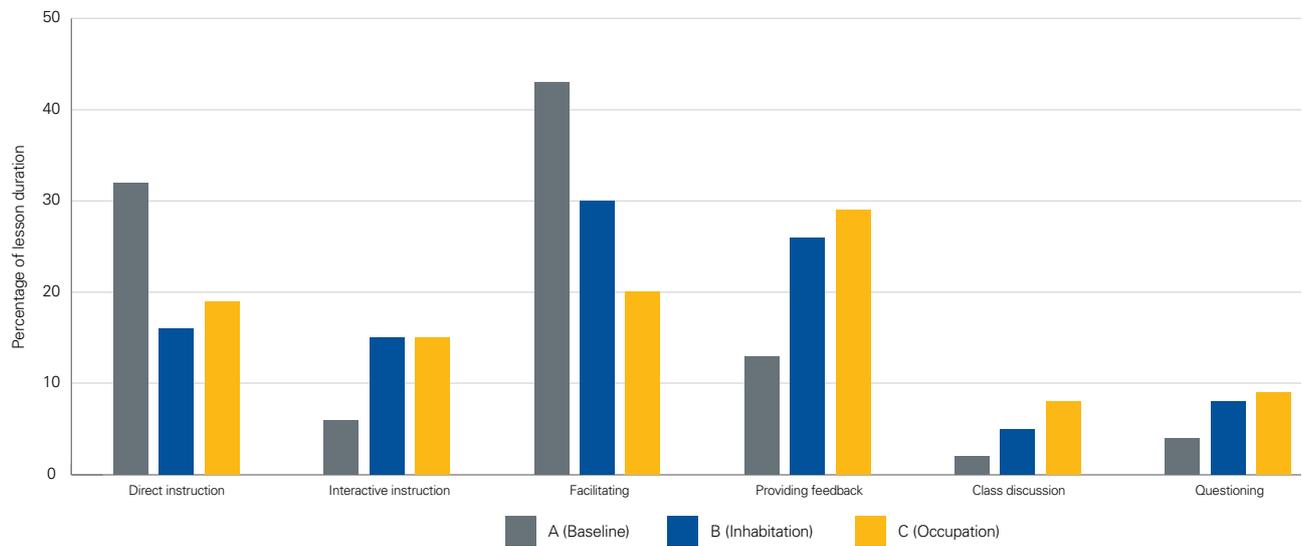
The literature has previously focused on the design and the impact of physical characteristics of learning spaces. What exactly happens once these new spaces are in use has been largely overlooked.

Furthermore, there is little known of the best way to support teachers, and students, as they navigate the spatial transition. In response to this gap, this study assessed the micro changes by students and teachers as they transitioned from their conventional studios/workshops (baseline) to a new creative precinct (inhabitation) as well as a year beyond the move (occupation).

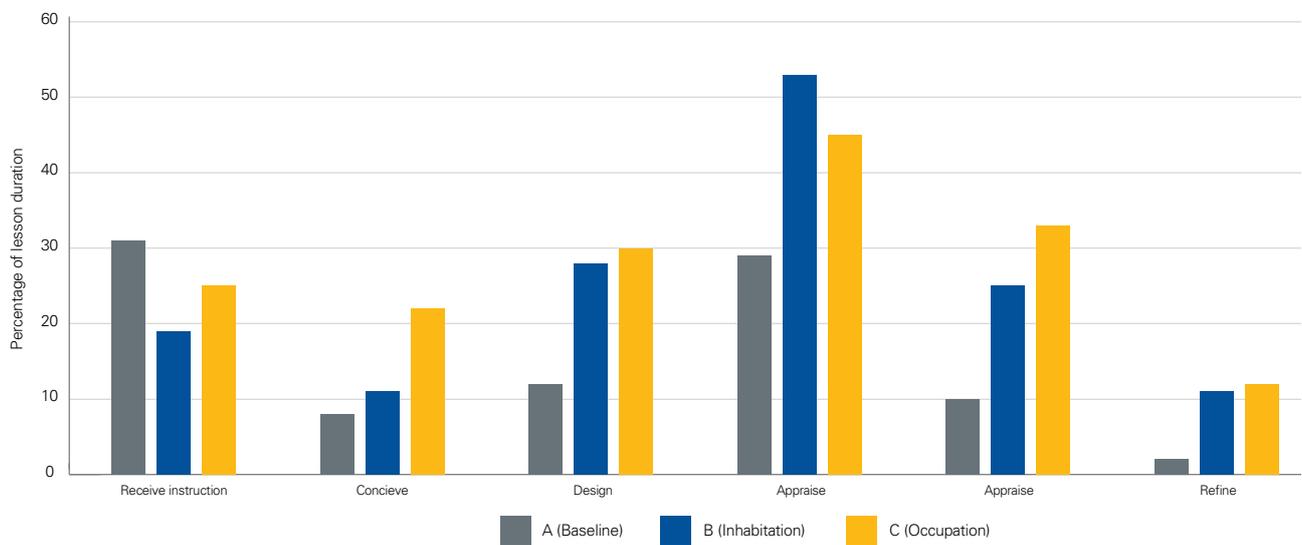
## Evaluating the micro pedagogical changes in the spatial transition



## Evaluating the spatial transition on pedagogies



## Changes to the student learning experiences



# Stage 4 *study*

## **YEAR**

2017 to present

## **BUILDINGS**

The Centenary Library

## **SUBJECTS**

All subjects

## **SAMPLE**

18 days of hourly observations and  
n = 249 Year 7, 9 and 12 students  
(participation rate of 37.1%)

## **RESEARCH DESIGN**

Quasi-experimental + repeated  
measures design

## **METHODS**

LPTS spatial syntax metric +  
Student Engagement Index© survey

## **STUDY SUMMARY**

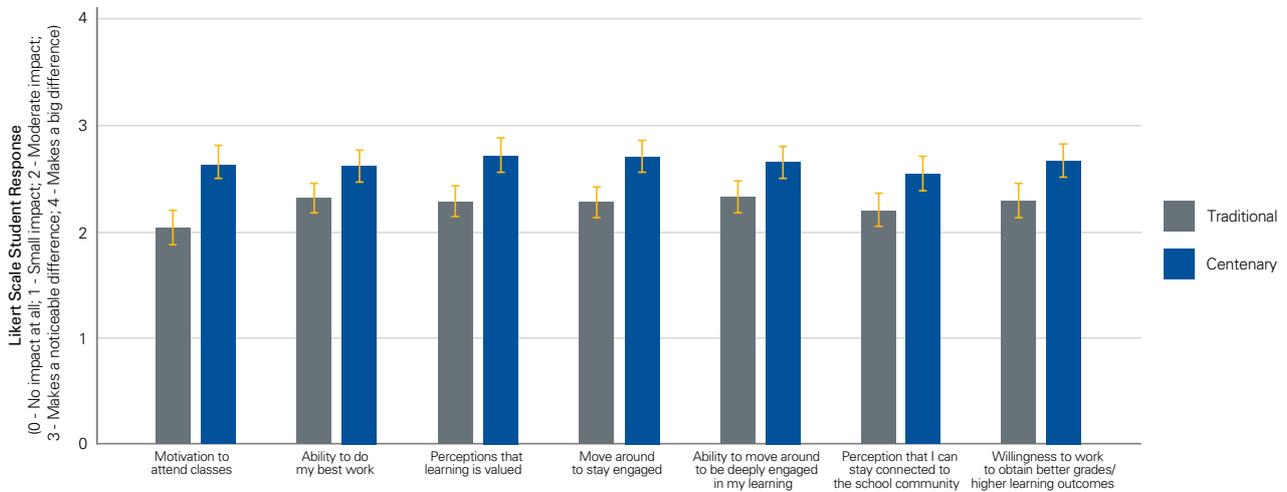
The Centenary Library brings together a range of key academic and pastoral services into a single space: student services (careers, chaplain, school psychologist and community service), information services and ICT services and along with gifted education and learning support. Modelling the function of a tertiary library environment, the collation of services seeks to nurture aspects of Churchie's four tenets. The synergy of expertise seeks to permeate a service orientation throughout the building, with the potential to become the central space of a boy's daily life at Churchie. Boys are able to learn and work in the building, through the responsive provision of academic and information services that extend beyond the standard school day.

The post-occupancy evaluation determined if, and to what extent, The Centenary Library facilitated a more active, responsive and personalised approach to learning. The LPTS spatial syntax metric was used to analyse the longitudinal occupation and use of the Library to ascertain how learning stretched beyond the walls of the conventional school space and, with the proliferation of mobile technologies, beyond the school day. It evaluated the nature of the occupation and learning and how the blend of formal and informal spaces shaped both activity and communities of learning.

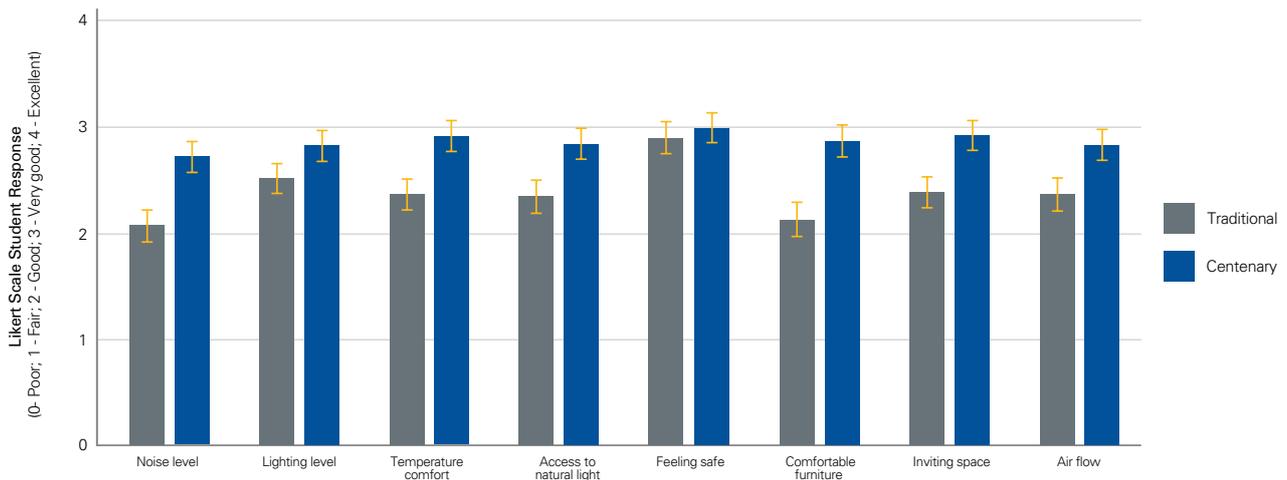
The corroboration of student voice, ascertained through the Student Engagement Index® (SEI) survey (developed by the DLR Group and INSYNC: Education Research + Design), highlighted how the design and function of The Centenary Library impacted their engagement in learning.

The analysis from the post-occupancy evaluation suggested that the occupation and pedagogical use of The Centenary Library exceeded the expectations. The array of spaces promoted creativity, effective approaches to thinking and flexibility by allowing for multiple purposes concurrently, with student able to undertake a range of activities and that extends from an individual through to mixed class and age. At the same time, these bespoke and responsive learning spaces provided teachers from all subject areas with greater pedagogical freedom. Collectively, this translated to a relatively high (maximum of 78%) and consistent (average of 59%) student occupation of the library that extended well beyond the typical school day. A correlation between the design and nature of utilisation showed how learning was more active, collaborative and engaged higher-order cognitions, challenging the prevailing view of the subjects that libraries support.

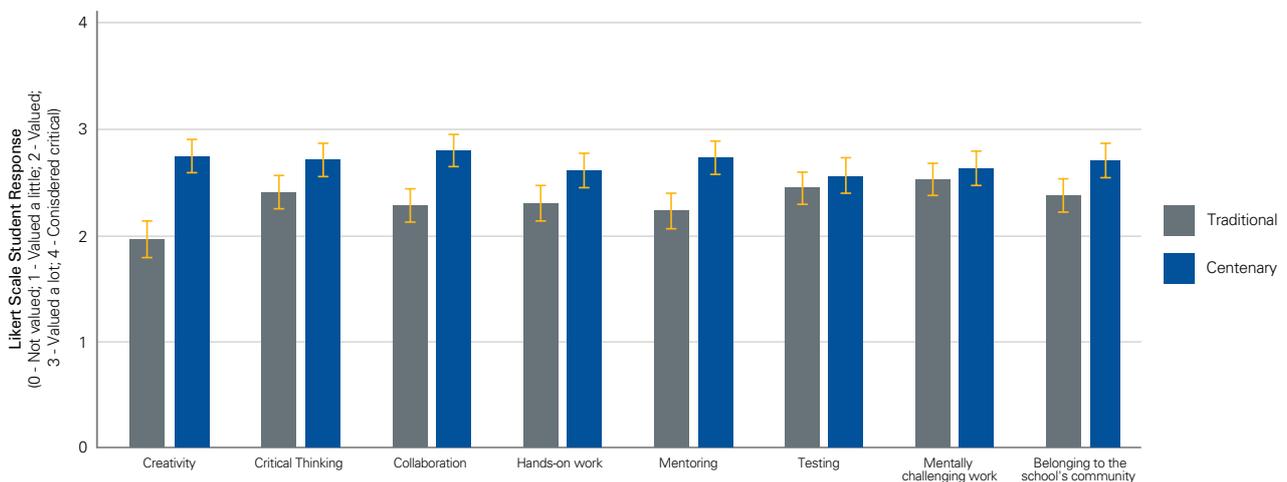
## Impact on student attitudes to their learning



## Impact of bespoke design, layout and furniture



## Effect on learning outcomes





**Prep School**

**Boarding School**

# Heart of *the school*

The Centenary Library has activated the heart of the school and has become a vibrant learning and community hub that links precincts, staff, students and the broader Churchie community across the campus and beyond the traditional school day.



Science, Music, The Arts

Senior School

The Centenary Library

Sports

# Post occupancy *evaluation*

## The Centenary Library Ground Floor

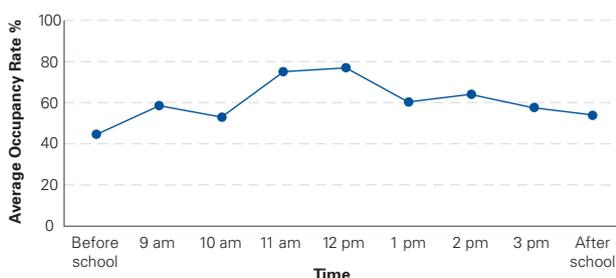


- |                          |   |                           |
|--------------------------|---|---------------------------|
| <b>1</b> lobby           | <b>11</b> flexible learning areas                     | <b>20</b> print pod       |
| <b>2</b> deck            | <b>12</b> service desk                                | <b>21</b> main stair      |
| <b>3</b> café            | <b>13</b> help lounge                                 | <b>22</b> arcade          |
| <b>4</b> café dining     | <b>14</b> book return                                 | <b>23</b> forecourt plaza |
| <b>5</b> café arcade     | <b>15</b> amenities                                   | <b>24</b> terraces        |
| <b>6</b> lounge          | <b>16</b> meeting                                     | <b>25</b> service riser   |
| <b>7</b> break out space | <b>17</b> Director of The Centenary<br>Library office | <b>26</b> lift            |
| <b>8</b> IT help zone    | <b>18</b> Head of Gifted Education office             |                           |
| <b>9</b> IT workshop     | <b>19</b> Learning Support pod                        |                           |
| <b>10</b> IT store       |   |                           |

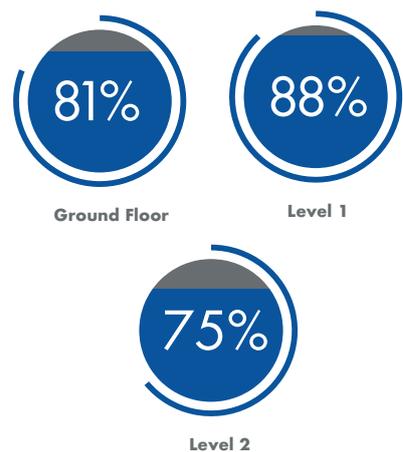
The Centenary Library post occupancy evaluation consisted of hourly walk-throughs from 8 am to 4 pm for 18 days over a six-month period. Data was collected and analysed through the Linking Pedagogy, Technology and Space (LPTS) observational metric.

### Occupancy during the school day

Occupancy rate ranging from **43% to a peak 78%** indicates the substantial inhabitation **by students** throughout the school day

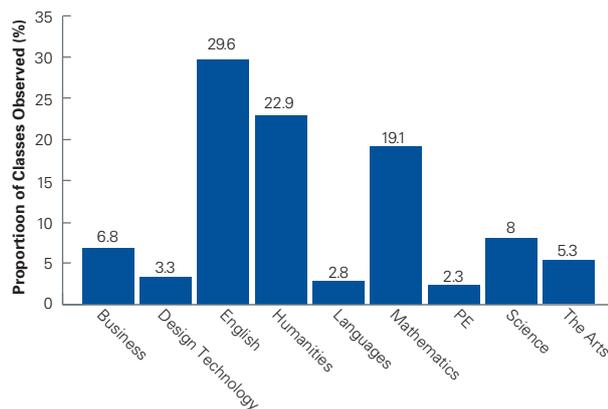


### Flexible learning area utilisation



### Subject use in the Centenary Library

This **breakdown** of subject **utilisation** of the Centenary Library **challenges** the **prevailing view** of the **subjects** that libraries **support**

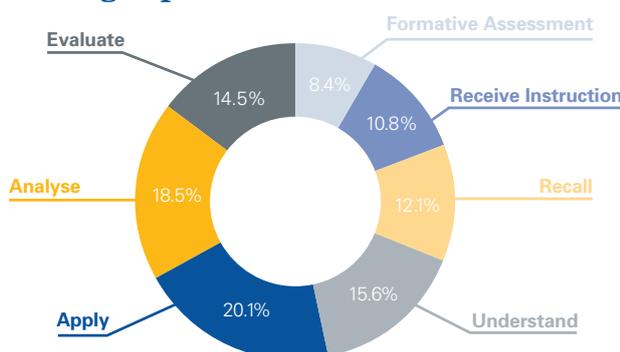


### Infusion of digital technology

Rather than use technology as a direct substitute, there was a tendency for its use to facilitate functional change and improved efficiency in the nature of learning experiences and supported teachers to redesign tasks

### Incidence of learning experiences

During the **hourly walk-throughs** of the library over **18 days** the **proportionate breakdown** of student **learning experiences** consisted of



- Substitution**  
Technology as a direct tool substitute
- Augmentation**  
Tool substitute with functional change
- Modification**  
Technology aids significant task redesign
- Redefinition**  
Technology used in creation of new tasks

# The Centenary Library

## *Information Services*

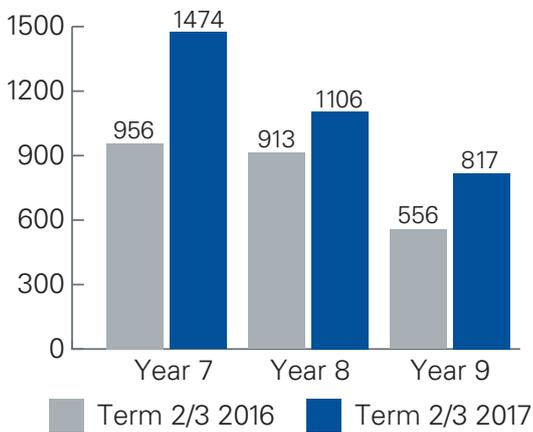
### The Centenary Library Level 1



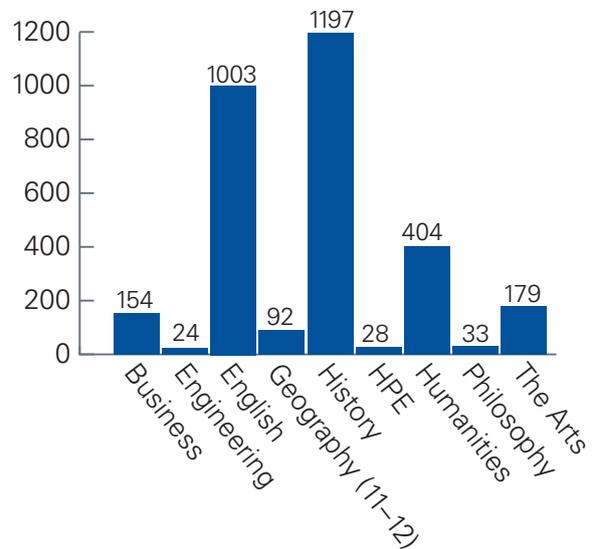
- |                        |                  |                             |
|------------------------|------------------|-----------------------------|
| 1 fiction              | 8 group study    | 15 meeting                  |
| 2 reading lounge       | 9 void           | 16 library BOH              |
| 3 Learning Support pod | 10 media lounge  | 17 lift                     |
| 4 study zone           | 11 idea pods     | 18 flexible learning spaces |
| 5 heritage books       | 12 print pod     | 19 main stair               |
| 6 help zone            | 13 self checkout | 20 quiet study              |
| 7 non fiction          | 14 lobby         | 21 service riser            |

**Churchie Reads! The impact of The Centenary Library on school reading and research culture. Data collected Term 2 and Term 3 of 2017.**

**Fiction (print & eBook loans)**

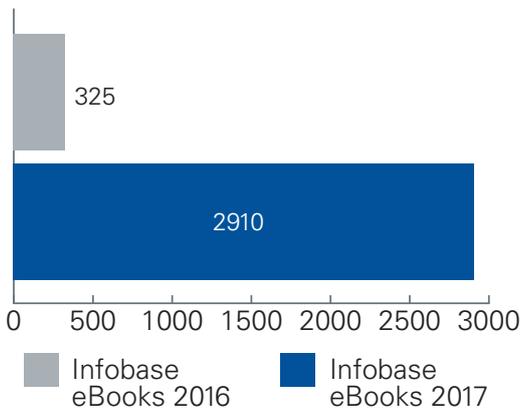


**Assignment guides hits**

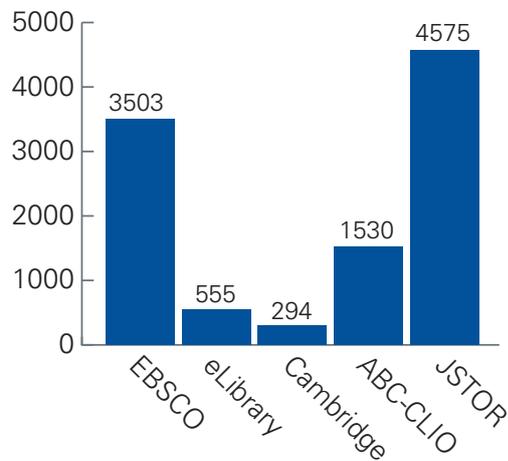


**3689 Fiction loans**

**Non-fiction eBook loans**



**Database searches 2017**



**2136 Reading resilience tests delivered**



# Effective *partnerships*

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**From 2010 to 2018 The University of Melbourne and Churchie enjoyed a highly effective collaborative research partnership.**

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During that period, the school produced a body of work that assisted it to slowly and deliberately re-conceptualise its teaching and learning programme. In addition, the partnership showcased Churchie as a national and international leader in learning environments research in the highly challenging and rarely accomplished area of effective assessment of the impact of space on student learning. That collaboration continues, but now with Churchie acting more as a senior partner in ongoing research projects. It has gone from being the recipient of good research to being an instigator. This is, undoubtedly, an outcome to which many progressive schools aspire.

What is it then that we can unpack from this unique relationship that might guide other equally successful university/school research partnerships? We believe there are ten characteristics.

1. **Good research partnerships take time.** Outcomes do not happen quickly. They must be nurtured, built, supported and provided with room to fail, succeed and be celebrated.
2. **They should embrace an iterative approach to research.** Small successes should be used to build slightly larger projects. With this process, valuable school-specific knowledge is gained and used to design and implement further critical work.
3. **The partnership must focus on capacity building.** People come and go, taking with them hard-earned knowledge and skills. Teams of researchers must be built to ensure important work continues despite change.
4. **The partnership must focus on building useable evidence.** This is the core to success. The sustainability of good education is underpinned by a solid evidence base, and that must have direct implications for good teaching and learning.
5. **Findings from the partnership must be quickly and effectively disseminated.** Research that has no audience is research that never happened. Good research in schools is immediately fed to teachers and students in order to inform better practices.
6. **Good research partnerships of this kind exhibit exemplary patience.** Universities and schools work at different speeds and are driven by differing deadlines and needs. Both must be addressed. This requires lengthy, patient negotiation.
7. **Partnerships of this type require respect for each other's research needs.** Schools require outcomes for the research that often differ from the university's.
8. **The partnership must provide tangible benefits to both partners.** Schools have often been left relatively empty handed when university research teams move on at the end of a project. Both partners must feel they have achieved equal (and often differing) benefits for their labour.
9. **Good research collaboration comes from having clear, explicit goals.** There exists little benefit for anyone from collaborations that exist simply for their own sake.
10. **Good research collaborations know when to end.** The research needs of university and school partners must over time diverge. Knowing when to dissolve a previously successful collaboration ensures the possibility of future partnerships.

The driving force behind the Churchie/University of Melbourne collaboration was mutual benefits and needs. This was supported by quality of input, both from the school, in terms of funding and the supply of energetic and skilled school-researchers, and from the university, in terms of research expertise, networking and knowledge of research protocols.

# Additional *benefits*

BUILT FOUNDATION FOR ESTABLISHMENT OF THE CHURCHIE RESEARCH CENTRE

EXTENDED THE UTILISATION OF BUILDINGS BEYOND THE CONVENTIONAL SCHOOL DAY

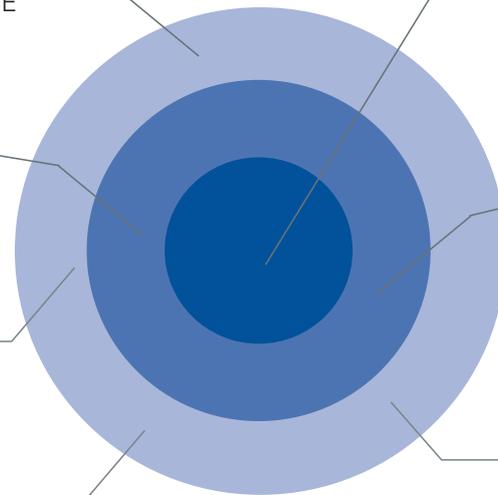
DEVELOPED CHURCHIE LEARNING ANALYTIC PROGRAMME

PATHWAYS FOR TEACHERS TO ENGAGE IN FURTHER STUDY AT THE UNIVERSITY OF MELBOURNE

IMPROVEMENTS TO LEARNING AND TEACHING

DEVELOPED TEACHER ENVIRONMENTAL COMPETENCY

DEVELOPED LPTS OBSERVATIONAL METRIC



## *Conclusion*

The aim of the New Generations Learning Spaces project study was to derive empirical evidence to test the assumption that different spaces can have different effects on teaching and learning. It sought to test, refine and validate a novel methodology approach through its extended replication. This study has presented a set of empirical methods that can evaluate the impact of different learning spaces on teaching and learning. In this process, this study has provided empirical evidence that goes some way to reinforce the broad set of assumptions underlying the relationship between the physical space and its potential impact on teaching and learning.

The synthesised quasi-experimental and single-subject research design isolated the link between different learning spaces and student perceptions related to key aspects of their learning. The positive, and at times, statistically significant effects suggest that the teachers did alter their pedagogies in different spatial layouts. While in an innovative learning environment (ILE), many teachers were able to facilitate a wider array of active pedagogical practices and collaborative learning modalities. This often correlated to significant improvements in both student engagement and academic outcomes.

However, it is clear that the ILEs by themselves are not the agents of change. The long-term success of the learning spaces movement lies in the hands of the classroom teacher. It is clear that a teacher's environmental competency is a clear predictor of any spaces impact to facilitate its intended pedagogical function.

# About the *authors*

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## **Terry Byers is Director of The Centenary Library at Anglican Church Grammar School.**

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Dr Terry Byers is interested in the effective integration of technology to best increase students' engagement and academic outcomes. At the same time, he is uncovering ground-breaking insights into the critical role that the classroom environment plays in this equation. Together, these developments have led to the creation of dynamic and responsive tools that provide teachers with data-rich visualisations. These visualisations enable teachers to better understand their pedagogical practice in technology-enabled, contemporary learning environments and how this affects student learning outcomes and gains.

Mr Byers received his PhD through his involvement in the 2013–2016 Australian Research Council (ARC) Linkage project 'Evaluating 21st Century Learning Environments' (E21LE). E21LE is a research project developing multidisciplinary evaluation strategies for the new generation of learning environments. In addition, to his current work in the E21LE project, Terry is a Research Fellow in the 2016–2019 ARC Linkage Project, Innovative Learning Environments and Teacher Change (ILE+TC).

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## **Wes Imms is an Associate Professor at the University of Melbourne Graduate School of Education.**

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Associate Professor Imms is the school's Head of Visual Art and Design Education and its Research Higher Degree Coordinator for Curriculum and Teaching.

He was the lead chief investigator in the E21LE ARC Linkage Project, which ran from 2013 to 2016. Further to this, Associate Professor Imms is also the

lead chief investigator in the ILE+TC ARC Linkage Project. The nature of this project is such that it will bring together the expertise from industry and leading schools, with the University of Melbourne's School of Design and Graduate School of Education. It will be run in six Australian states and New Zealand from 2016 to 2019.

## **Credits**

### **Researchers and Writers**

Terry Byers  
Anglican Church Grammar School  
Wes Imms  
The University of Melbourne

### **Architects**

Brand + Slater Architects

### **Contributors**

Elizabeth Hartnell-Young  
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Victoria Leighton

### **Acknowledgement**

The authors acknowledge the support of the administration and classroom teachers from Anglican Church Grammar School. Without the professionalism and support of those who were involved, this study would not have been able to occur. We also acknowledge the support of the University of Melbourne's Learning Environment Applied Research Network, who have provided feedback and support throughout the duration of this study.

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