Aligning pedagogy and space: An Australian evidence-based approach

Wesley Imms

Chris Bradbeer, Terry Byers, Ben Cleveland, Kenn Fisher, Tom Kvan, Marian Mahat, Clare Newton, Pippa Soccio

Learning Environments Applied Research Network (LEaRN)
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A multi-disciplinary centre for researching the development of effective learning environments across all educational sectors.

- Faculties of Architecture, Education and Medicine
- Multiple (>30) national and international industry partners
- Vibrant
  - Teaching program (Masters subjects)
  - PhD program (currently >20 theses in progress)
- Consultancies, Research Partnerships, Federal Research Grants (currently >Euro4M)

Australian Research Council Grants (Category 1)

- 2008 – 2010 **Smart Green Schools** (Newton, Hes, Wilks, Dovey & Fisher)

- 2010 – 2013 **Future Proofing Schools** (Newton, Kvan, Hes, Grose & Fisher)


- 2016 -2019 **Innovative Learning Environments and Teacher Change** (Imms, Hattie, Clarke, Kvan, Fisher, Newton & Cleveland)
Aligning pedagogy and space: An Australian evidence-based approach

LEaRN recently released books

The Translational Design of Schools
An Evidence-Based Approach to Aligning Pedagogy and Learning Environments
Kenn Fisher (Ed.)

Evaluating Learning Environments
Snapshots of Emerging Issues, Methods and Knowledge
Wesley Imms, Benjamin Cleveland and Kenn Fisher (Eds.)
Aligning pedagogy and space: An Australian evidence-based approach

LEaRN annual PhD Symposia

SNAPSHOTS 2014:
Current and emerging postgraduate research into learning environments

VIEW!
An International Symposium for Higher Degree Students

PROCEEDINGS

SNAPSHOTS 2014:
Current and emerging postgraduate research into learning environments

TERRAINS 2015
Mapping learning environment evaluation across the design and education landscape: Towards the evidence-based design of educational facilities

WHAT’S WORKING?
Informing education theory, design and practice through learning environment evaluation

TRANSITIONS
INHABITING INNOVATIVE LEARNING ENVIRONMENTS
NOTICE OF UPCOMING EVENT
Friday, 2nd June 2017
University of Melbourne, Australia
Friday, 9th September 2017
Xerox, Grand Rapids, USA

LEaRN International Graduate Research Symposium
Transitions: Inhabiting Innovative Learning Environments

Upcoming - Transitions:
Melbourne June 3rd 2017
Europe, September 2017 (date and venue TBC)
USA, September 2017 (date and venue TBC)
Evaluating innovative learning environments: How do we know if what works is working?

St Francis De Sales Catholic Primary School, Baldasso Cortese © Peter Clarke
Evaluating innovative learning environments: How do we know if what works is working?
Evaluating innovative learning environments: How do we know if what works is working?
Evaluating innovative learning environments: How do we know if what works is working?
What are our problems?

- Resistance, scepticism, poor spatial awareness.
- Poor teacher involvement in conceptualisation of designs.
- Vision + design of spaces are outstripping teachers’ capacity to use them.
- Need for good evidence to support change.
Evaluating 21st Century Learning Environments (Australian Research Council)

- 3 years
- 5 Partner Organisations (Research-oriented schools, industry partners)
- 3 PhDs
Issues? Learning environments and…

- ‘Whole project’ & longitudinal evaluations
- Measuring impact
  - Learning outcomes
  - Engagement
  - Use of ICT
  - Pedagogy
- Inclusivity
- Teacher collaboration
- Leadership and ‘change’
Issues (cont.)? Learning environments and…

• Architect as an ‘agent of change’
• Meeting future curriculum needs
• Educator-relevant POE data
• ‘Alternative’ learning environments (Museums, etc.)
• Evaluating blended learning environments
• The ‘Educational Space Planner’ as an evaluator
• Systemic models of evaluation (innovative spaces, innovative pedagogies)
Methods.

• School Spaces Evaluation Instrument (Cleveland)
• SSEI Future Curriculum Profile tool (Imms)
• SSRD (summed means) (Byers)
• SSRD (withdrawal) (Byers)
• Classroom observation metric (Byers)
• Expert Elicitation (Oliver)
• Learning Environment Analytical Tool (Sala-Oviedo)
Methods (cont.).

• Building Performance Tool: IEQ (Soccio)
• Architect tool (Dane)
• Case Study (Bradbeer)
• Hearing Acuity tool (Rose-Munro)
Future Curriculum Profile analysis, LEaRN, 2013

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Subject, teacher, date: Design & Technology, Max, May 7th 2013.

School educational philosophy: underpinning future practices (from SSII Survey)

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Textual analysis.

Bernhard Huber: Text Analysis of the primary data indicates 'students' (2.9%), 'space' (2.2%), 'design' (1.5%), 'equipment' (1.3%), 'timetable' (1%), and 'specialisation' (1%) to be the six most used terms in the data. The first three logically reflect the focus of this instrument. The latter group draws attention to leading teachers' interest in three key facets of future Hayward-Midson curriculum: equipment (as opposed to materials), time-based and specialisation of tasks and spaces.

Table 1: Text frequency analysis (Bernhard Huber)

<table>
<thead>
<tr>
<th>Word</th>
<th>Occurrences</th>
<th>Frequency</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>students</td>
<td>15</td>
<td>2.2%</td>
<td>1</td>
</tr>
<tr>
<td>design</td>
<td>10</td>
<td>2.2%</td>
<td>2</td>
</tr>
<tr>
<td>equipment</td>
<td>11</td>
<td>1.3%</td>
<td>3</td>
</tr>
<tr>
<td>timetable</td>
<td>14</td>
<td>1.1%</td>
<td>4</td>
</tr>
<tr>
<td>specialist</td>
<td>18</td>
<td>0.4%</td>
<td>5</td>
</tr>
<tr>
<td>teachers</td>
<td>15</td>
<td>0.4%</td>
<td>6</td>
</tr>
</tbody>
</table>

Lexalytics Salience Sentiment: Text Analysis was conducted on primary data specific to leading teachers' beliefs of present and future Hayward-Midson curriculum. Comments relevant to the present curriculum provided a +158 document sentiment. Topics and themes relevant to the present situation are summarised in Table 2.

Table 2: Lexalytics salience and sentiment analysis (present curriculum)

<table>
<thead>
<tr>
<th>Themes</th>
<th>Lexalytics Salience</th>
<th>Lexalytics Sentiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>commercial arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>restrict room design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open studio</td>
<td>-19</td>
<td></td>
</tr>
<tr>
<td>computer game design</td>
<td>-44</td>
<td></td>
</tr>
<tr>
<td>discipline specific study</td>
<td>-54</td>
<td></td>
</tr>
<tr>
<td>specific ops</td>
<td>-31</td>
<td></td>
</tr>
<tr>
<td>creative careers</td>
<td>-26</td>
<td></td>
</tr>
<tr>
<td>creative occupations</td>
<td>-30</td>
<td></td>
</tr>
<tr>
<td>future careers</td>
<td>-34</td>
<td></td>
</tr>
<tr>
<td>product design</td>
<td>-16</td>
<td></td>
</tr>
<tr>
<td>graphic design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>product</td>
<td></td>
<td>-16</td>
</tr>
</tbody>
</table>

Legacies: Now | 30 Years

What natural 'groupings' (teach) occur as part of using this space?

- 

Future Curriculum Profile analysis, LEaRN, 2013
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**Figure 1**

Example of a Single-Subject Reversal Design Demonstrating Experimental Control

- **Baseline**
- **Intervention**
- **Baseline**
- **Intervention**

**Note.** Arrows indicate the three points in the study where an experimental effect is confirmed.
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Single-subject Research Design adapted for LEaRN (Byers and Imms), 2013
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Cohen’s $d$ effect size

<table>
<thead>
<tr>
<th>Class</th>
<th>Visual analysis</th>
<th>Cohen’s $d$ effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Significant</td>
<td>1.50 (very large)</td>
</tr>
<tr>
<td>7.2</td>
<td>Non-significant</td>
<td>1.04 (large)</td>
</tr>
<tr>
<td>8.1</td>
<td>Significant</td>
<td>1.01 (large)</td>
</tr>
<tr>
<td>8.2</td>
<td>Significant</td>
<td>1.31 (very large)</td>
</tr>
<tr>
<td>8.3</td>
<td>Significant</td>
<td>1.35 (very large)</td>
</tr>
<tr>
<td>8.4</td>
<td>Significant</td>
<td>2.01 (very large)</td>
</tr>
</tbody>
</table>

Class means & 95% CI

Student learning experiences
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Observation metric, Byers, 2015
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The Arts

Design Technology

Observation metric, Byers, 2015
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Noise level descriptors

Each ‘dot’ represents the $L_{eq}$ over a 15 minute period.

The $L_{eq}$ is defined as where the graph area is the same above the line as below the line, and is often referred to as the Average.

$L_{max}$

The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.

$L_{Aeq}$

The A-weighted maximum noise level. The highest noise level which occurs during the measurement period. (In the context of a school, this could be a loud squeal near the microphone, or someone dropping something – it is unlikely to be teacher voice)

$L_{Aeq}(T)$

The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the ‘average’ noise level.

The suffix ‘T’ represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.

Sound varies over time. The $L_{eq}$ is effectively defined as a notional steady sound level, which over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (in our case 15 mins).

Table 5: Learning 6 Receiver 3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>63</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1k</th>
<th>2k</th>
<th>4k</th>
</tr>
</thead>
<tbody>
<tr>
<td>T65%</td>
<td>1.1</td>
<td>0.7</td>
<td>0.4</td>
<td>0.8</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>$L_{eq}$ (unoccupied)</td>
<td>25dB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Octave Band Centre Frequency (Hz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Matrix of Learning Environment Evaluations, Imms 2014 (after Mark, Henry and Julnes, 1999)

### Aligning pedagogy and space: An Australian evidence-based approach

<table>
<thead>
<tr>
<th>To describe</th>
<th>To classify</th>
<th>To identify causality</th>
<th>To determine value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Aim)</td>
<td>(Through)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To improve</th>
<th>Formative analysis (judgment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To audit</td>
<td>Summative analysis (appraisal)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To generate theory</th>
<th>Predictive analysis (analysis)</th>
</tr>
</thead>
</table>

**Meeting the needs of those who wish...**
Innovative Learning Environments and Teacher Change (Australian Research Council)

- 4 years
- Australia and New Zealand
- 15 Partner Organisations (State Education Departments, research-oriented schools, industry partners)
- 6 PhDs, 3 Research Fellows
- Sample pool of 6100 schools

https://youtu.be/inzssGYi6MM
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Phase 1
Are teachers using ILEs? What is being done well, what needs addressing?

- Assumption testing
- Base line data on core variables
- Measurement tool development and trial

<table>
<thead>
<tr>
<th>EVENTS</th>
<th>2016</th>
<th>2017</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHD Symposium</td>
<td>Q3</td>
<td>Q4</td>
<td></td>
</tr>
<tr>
<td>Regional Workshops</td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
</tr>
<tr>
<td>Conferences</td>
<td></td>
<td></td>
<td>Q4</td>
</tr>
</tbody>
</table>
Phase 2
What strategies are needed? Are they ‘workable’?

- Development of strategies to assist teachers utilise ILEs
- Trial of strategies
Phase 3
Do these strategies work? Is student deep learning improved?

- Quasi-experimental testing of strategies across 1000 schools
Summary

• Australian school design is arguably outstripping teachers’ capacity to use them well.
Summary

- Australian school design is arguably outstripping teachers’ capacity to use them well.
- Teachers are resisting change – mind frames.
Summary

• Australian school design is arguably outstripping teachers’ capacity to use them well.
• Teachers are resisting change – mind frames.
• In this field there is a history of poor collection and use of evidence.
Summary

• In Australia, school design is arguably outstripping teachers’ capacity to use them well.
• Teachers are resisting change – mind frames.
• In this field there is a history of poor collection and use of evidence.
• The critical focus must be gathering and using evidence to assist teachers align pedagogies with innovative learning space design.
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