Comparative analysis of the impact of traditional versus innovative learning environment on student attitudes and learning outcomes

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ABSTRACT

This study explored the claim that different classroom layouts can affect teaching and learning. At the time of the study, there were few robust evaluative frameworks able to isolate and then measure the impact of different educational layouts. In response, this study employed a quasi-experimental approached facilitated by a Single Subject Research Design (SSRD) to compare two different classroom layouts - a traditional classroom layout and 'Innovative Learning Environment' (ILE) in an Australian secondary schooling context. The study compared students' attitudes to their learning experiences, motivation, engagement and academic outcomes in each layout over a school year. Comparative analyses highlighted how students' attitudes to their learning experiences and engagement differed in the two designs. A correlation was identified between enhanced student attitudes in an ILE and higher English, Humanities and Mathematics academic achievement when compared with cognitively matched peers who occupied a traditional classroom for the same period. This initial empirical evidence, even though restricted to a single site, was able to discern a measurable link between the occupation of different learning spaces and an impact on student learning experiences, engagement and academic outcomes in secondary schooling context.

1. Introduction

The form and function of what constitutes an effective learning environment to meet emerging educational imperatives in many countries have become a highly relevant and topical issue (Benade, 2016; Dovey & Fisher, 2014). There appears to be a rejection of existing conventional or traditional classrooms in favour of more dynamic and responsive *Innovative Learning Environments* (ILEs). The OECD (2013) defines ILEs as multi-modal, technology-infused and flexible learning spaces more responsive to the needs of twenty-first-century learners than a traditional classroom. ILEs can range from adaptive, purposeful spaces through to open-plan environments (Benade, 2016; Tanner, 2008). It is suggested that the affordances of ILEs will better support those pedagogical changes that will facilitate learning experiences that enhance students' engagement and motivation (Ryan & Patrick, 2001) and improve academic achievement (Tanner, 2009). As a consequence, the focus on creating new school learning environments has become a matter of strategic policy in Australia (Mulcahy & Morrison, 2017). The systemic public funding from the Federal Government's *Building the Education Revolution* (BER) saw AUS $16.2 billion invested in delivering 24,382 projects in 9526 schools from 2009 to 2011 (Wall, 2009).

Despite the current interest and investment in school building programs, authors lament the lack evidence outlining exactly how different spatial layouts support, or hinder, the desired evolution of teaching and learning (Brooks, 2011; Chandler, 2009; Gislason, 2010; Higgins, Hall, Wall, Woolner, & McCaughey, 2005; McGregor, 2004). Reviews of the literature around ILEs consistently cite few evaluative frameworks and methods (Painter et al., 2013; Tanner, 2008) able to elicit evidence concerning their pedagogical impact (Blackmore, Bateman, O'Mara, & Loughlin, 2011; Gislason, 2010). Conversations around the potential of these 'new' spaces often rely upon theoretical expositions, case studies, or post-occupancy evaluations of tertiary spaces. In the secondary schooling context, rigorous empirical evaluation in how traditional classrooms or ILEs influence student learning experiences, engagement, motivation and academic achievement is lacking.

The impact of the different classroom layouts – a traditional classroom and a retrofitted ILE – on teaching and learning were evaluated through a year-long study in a secondary schooling context. A quasi-experimental approach facilitated by a Single Subject Research Design (SSRD) investigated the impact of these two layouts on students' attitudes to their learning (learning experiences, motivation, and engagement). The student sample was allocated to three groups (ILE Intervention, ILE Control, and Traditional Control). Between- (ILE

Control and Traditional Controls) and within-group (ILE Intervention) comparative analysis investigated if aspects of learning differed due to the different classroom layout (traditional and ILE) and not some other confounding effects such as assessment, curriculum, class composition, cognitive ability and the teacher. Thereby, any variations in academic achievement could be better correlated to these changes to the classroom layout.

Comparative analysis of student survey and assessment data in English, Humanities, and Mathematics subjects indicated how student attitudes and academic achievement differed in the two layouts. Both between- and within-group analysis indicated that those students who occupied an ILE reported that they experienced a greater incidence of student-centric modalities of learning (i.e., active learning; collaborative learning; independent creativity and personalisation) than their peers experienced in a traditional layout. The relationship was not causal. Statistical analysis highlighted the mediating influence of particular teachers who were more able to exploit the additional affordances of the ILE for pedagogical gain. For these classes, changes to the nature of learning experiences were related to a higher assessment of student cognitive and emotional engagement in learning. Together it is suggested that the changes experienced by students in an ILE compared to their cognitively matched peers in a traditional layout, correlated to improved academic achievement. The findings and general conclusions presented here replicate the evidence presented by earlier spatial interventions at this site (see Byers, 2017; Byers and Imms, 2014; Byers et al., 2014; Byers and Imms, 2016; Imms and Byers, 2016; Imms et al., 2017). A replication across studies using a similar design and methods within the same context, but different student samples, builds a case around the pedagogical impact of different school learning spaces.

2. Literature review

2.1. The deficiency of the traditional classroom layout

The conventional or traditional classroom model, which is still occupied by the vast majority of students on a daily basis, emerged from the modernist architectural period after the Second World War (Dovey & Fisher, 2014). A recent study by Byers et al. (2018) found a correlation with a higher incidence of those teacher-centric pedagogies (i.e. teacher facilitated direct instruction or small group discussion/instruction) in schools where traditional classroom layouts were the dominant archetype. This correlation could be due to the influence of built pedagogy. Reynard (2009) suggested that the built pedagogy of the traditional classroom's layout, established through its fixed instructional setting facing the front teaching 'fireplace' position, makes it natural for the teacher to stand and deliver content transmitted through didactic instruction. Furthermore, as Dovey and Fisher (2014) argued, the rigidity of its layout inhibits the ability of teachers to enact a wider spectrum of pedagogies that are more likely to facilitate student-centric and technology-enhanced learning as favoured in current educational policies. Proponents of ILEs suggest, but with little tangible evidence, that traditional classrooms are more likely to support those pedagogies associated with surface learning experiences and not those processes required for deep learning (Dumont & Istance, 2010; Hattie & Donoghue, 2016).

2.2. How innovative learning environments affect student learning experiences and engagement

In countries such as Australia, New Zealand and the United States of America, the significant investment in the infrastructure of ILEs is perceived as a necessary, or optimal means, to facilitate the twenty-first-century learning and skills (Dovey & Fisher, 2014; Mulcahy & Morrison, 2017). Typically, this view of learning is associated with an approach to learning that is more multiplicitous (or a wide variety), technology-mediated, and student-centric thought to best equip and prepare students for their future working life (Dovey & Fisher, 2014; Mulcahy, 2016). Mulcahy (2016, p. 19) describes how the growing "official policy discourse of twenty-first-century learning, twenty-first-century capabilities and personalised learning" has become intertwined with the current focus on the physical learning environment.

Underpinning the narrative around ILEs is that they are somehow better in supporting the shift from teacher-centric to more student-centred learning (Dumont & Istance, 2010; Mulcahy, 2016). It is suggested that the built pedagogy of the ILEs removes those inherent spatial barriers, such as the teaching fireplace and rigid seating layout, supporting teachers to shift away from overtly didactic pedagogies (Reynard, 2009). Rather than curtail learning to a single pedagogical mode, the affordances typically associated with an ILE are thought to respond to and accommodate a much wider range of learning modalities (Dovey & Fisher, 2014). Dumont and Istance (2010) suggest that an ILE can support those modalities that support a more progressive view of learners as active, collaborative, and constructive in their activities. Ryan and Patrick (2001) proposed that the environments created by these modalities of learning are correlated to improvement in students' engagement and motivation in learning.

2.3. Research designs and methods to evaluate school spaces

Various reviews have found few evaluative approaches available to discern exactly how different school learning environments affect secondary student attitudes to their learning and impact on academic achievement (see Blackmore et al., 2011; Cleveland & Fisher, 2014; Painter et al., 2013; Tanner, 2008). Cleveland and Fisher (2014) note that evaluative methods in the secondary schooling context often rely on student and teacher perceptions to measure the social or psychosocial effect of learning environments (see Aldridge, Fraser, Bell, & Dorman, 2012; Dorman & Fraser, 2009; Fraser, 1982; Zandvliet & Fraser, 2004). Here the concept of the learning environment refers to the ambience, atmosphere, climate, or tone of a setting and its impact on human behaviour (Dorman, Aldridge, & Fraser, 2006) and on the instructional processes (Aldridge et al., 2012). Cleveland and Fisher note that these studies use large-scale attitudinal questionnaires and surveys, often comparing different research sites but rarely do they focus on the spatial impact on academic achievement.

The review by Cleveland and Fisher (2014) identified other approaches and tools outside the domain of the social or psychosocial evaluation of different school learning environments. The *School Building Rating Scale* (Sanoff, 2001) and the *Design Quality Indicators for Schools* (DQIfS) (CABE, 2005) are examples of tools that evaluate the perceptions of the physical features of space itself (Cleveland & Fisher, 2014). They also identified the relatively new domain of *Indoor Environmental Quality* (IEQ). The IEQ process ascertains the 'environmental performance' of space by measuring the desirable physical conditions (i.e., air quality, light, noise, spatial density, temperature, and ventilation) that best support teaching and learning (Barrett, Zhang, Moffat, & Kobbacy, 2013; Soccio, 2014). However, the focus of these measures is on the physical features and performance of the spaces and not how they influence those pedagogies and the learning experiences thought to improve student academic achievement, engagement, and motivation.

2.4. Earlier studies making a case for a change in classroom space

Reviews by Blackmore et al. (2011) and Painter et al. (2013) identified few studies that make an empirically grounded case for changes in classroom space. A small number of empirical studies have sought to isolate the variable of the learning environment on academic outcomes (see Barrett et al., 2013; Brooks, 2011; Tanner, 2008, 2009). Even though in different contexts, their collective findings suggest that the quality and nature of the classroom environment in various schools correlated with differences in student academic achievement. However,