KATE BERTRAM

5. THE CULTURAL ARCHITECTURE OF SCHOOLS

A Study of the Relationship between School Design, the Learning Environment and Learning Communities in New Schools

INTRODUCTION

The literature in the area of educational facilities design and the built environment for schools is both vast and fragmented. Broadly speaking, the literature can be grouped into three types, with the first type using the notion of the classroom as a "Third Teacher" constituting physical space as an active agent in the learning process. This type argues the building is a silent teaching partner and the purpose of good design is to remove hindrances to its voice and influence. The second type focuses on educational facilities planning and approaches design in a more pragmatic manner.

The emphasis is upon isolating specific design elements that are common to all school structures (for example, lighting and passageways), quantifying the impact of these elements upon some aspect of schooling (for example, student levels of achievement), with the aim of making design responses to standard elements more predictable and streamlined.

The third type of literature discusses the educational contexts and agendas that have been observed as having, or are predicted to have, a significant impact on what can be achieved in the overall building project, as well as being the reason for the project in the first place. Educational leadership and administration literature also reflects an increasing interest in understanding and cultivating rich learning environments.

It is evident that the literature in the field of school design is commonly underpinned by a profound belief that design matters (Woolner, 2010) and the influence of design is subtle (Taylor, 2000, 2009). It is also commonly noted that establishing a causal relationship between the physical environment and learning is complex. Literature in the field speculates on possible causal links between building design, pedagogy and student outcomes (Behrenbuch & Bolger, 2006; Design Council, 2004).

There is also a growing body of research in the field of school design that indicates there is a link between educational facilities, student learning and teachers' levels of satisfaction. In the past ten years research studies have been growing in number and give research-based support to the conclusion that physical

environments have an impact. Some research suggests an explanation of the exact causes of the impact of school design is complex and will vary according to context (PricewaterhouseCoopers, 2010).

When reviewing the literature, I did note discussions of the impact of specific designs occurred when one or more of the following circumstances or influences existed. When there is significant financial investment in school stock, especially by centralised authorities such as federal governments; when there is a major innovation or era shift, such as Web2 information technologies; and when there are substantial shifts in educational thinking and pedagogical approaches, such as collaborative learning.

In the light of these circumstances, current facilities can be perceived as inadequate for supporting change and transformational agendas. The turn of the 21st Century is one such time with the concurrent influences of the end of the Industrial Age model for the economy (Hargreaves, 2009), the emergence of new information technologies and substantial school stock investment programmes occurring in the United Kingdom, Australia, New Zealand and parts of the United States.

THE THEORETICAL CONSTRUCTS OF PATTERN LANGUAGES AND LEARNING COMMUNITIES

The constructs of pattern languages and learning communities provided me with part of the conceptual framework for investigating the relationship between the learning environment and the learning culture of the schools. These constructs had a number of characteristics in common, these being: engagement; participatory action; individualised support; collaboration; facilitation of others' learning; focus on community behaviours and an improvement focus.

The literature suggested learning communities share many aspects with learning organisations and communities of practice. However, a point of distinction is the added dimension of being a community that is an open, dynamic system in which individuals collectively learn and learning can be an agent of change and improvement. Learning from this perspective is seen as a collaborative activity and knowledge is jointly constructed through a framework of communal values and practices. It is also suggested that a learning community's pedagogy would involve co-operative learning that relies upon person-to-person interaction (physical or virtual), and group processing.

When I reviewed the literature on learning communities, forty-five key characteristics emerged. I grouped these characteristics into five key categories: scale; relationships; configuration; flexibility and enquiry-based learning (see Table 1). These key aspects formed my criteria for identifying a learning community culture.

My framework also incorporated the concept of pattern languages. In the past ten years, a few pattern languages for the design of school facilities in the 21st Century have been devised and used in school design processes by a number of architects,

Table 1. Key characteristics of learning communities in schools

Key aspect	*Key indicators*
Scale	Human-scale learning environments (physical & virtual) Small communities (less than 150)
Relationships (human)	Participatory Collaborative Learning focused
Configuration	Open systems Adaptive Focus on creating communities not organisations
Flexibility	Environments Pedagogy Modes of learning
Enquiry-based learning	Knowledge construction Learners as teachers/teachers as learners

for example, Nair and Fielding. However, I did not find any one language sufficient for describing the breadth of the features and conditions present in contemporary learning community cultures.

By considering three separate school design patterns, I was able to identify points of agreement between the various patterns. These points of agreement formed the eight key patterns I used in my investigation of the relationship between school architecture and learning (see Table 2). These patterns and principles correlated with key characteristics of learning communities. Therefore, I anticipated architecture designed for learning community cultures would follow these patterns. I also developed a criterion of "features" that would indicate the presence of a pattern or principle, shown in the third column of Table 2.

Whilst the concept of pattern languages established a framework for analysing school design from an architectural perspective and the process of building physical environments, it became evident during the pilot study that school leadership, teachers and students did not specifically use a pattern language when talking about their school environment.

They tended to define space by their personal experience of specific classrooms or examples and the types of work that was possible or not possible in those environments. The stakeholders thought about space in terms of the opportunities it afforded. In the case study schools, leadership did not rely upon a specific design language to determine or define the goals of the school.

The principals were confident the school's learning culture and context was driving the design of the built environment rather than the other way around. The

Table 2. Criteria for analyzing design of school environment [Table based on Bergsagel et. al. (2007), Nair and Fielding (2005) and Lackney (2003)]

Key patterns	*Associated design principles*	*Examples of architectural/design features and indicators of pattern*
Personalised	Site & building organization Character of all spaces	• Human scale • Way-finding • Distributed resources • Welcoming entry • Home base & individual storage • Accessible to all abilities and mobilities
Learning-focused	Site & building organization Site design & outdoor learning spaces	• Signature (organisation's identity) • Display • Transparency (connections visible) • Varied spaces – resource rich • Studios and specialist labs • Presentation areas • Integrated technology • Indoor/outdoor connections • Cave space • Wide range of experiences
Collaborative	Site & building organization	• Clusters of learning • Gathering spaces • Casual eating areas
Community connection	Planning & design process	• Sitting in context • Well located
Adaptable and flexible	Site & building organization	• Multi-use classrooms • Learning support – furniture and storage • Flexible boundaries • Adaptable utilities • Living buildings
Neighbourhoods	Site & building organization	Central open space used in common by the classrooms surrounding this space Rooms installed with a range of operable walls learning spaces can be expanded and linked in a range of combinations
Villages	Site & building organization	• A number of neighbourhoods • Arranged around a larger common area • Circulation spine/zone
Studio communities	Site & building organization	Clusters of flexible teaching spaces Contain a range of learning modes Arranged around a communal space for larger social and learning activities Direct access to outside & common areas Self-contained elements

physical environment was not viewed as a precondition for establishing an effective learning community. Hence, the schools could still pursue their cultural goals even when the physical environment lagged behind.

The framework for my study was also informed by educational leadership theory. By focusing on the processes involved in the process of designing and constructing the physical learning environment, I anticipated the importance a school's principal would play in the process, as well as the role the principal would play in articulating the school's learning culture. There was an emerging perspective in my study that transformational leadership was one way of empowering stakeholders to use the potential of physical resources in their learning spaces to achieve and maximise learning outcomes and experiences.

In summary, four theoretical constructs provided me with a conceptual framework for investigating the relationship between students, teachers, learning and the physical environment in schools. Due to the scope and complexity of the area I was investigating, I felt it appropriate to use a number of concepts and develop a robust theoretical framework by integrating the theoretical links between architecture, learning communities, pattern languages, affordances and leadership in the context of schools.

Figure 1 draws together the different theoretical constructs into one framework. These constructs have a number characteristics in common, these being: engagement;

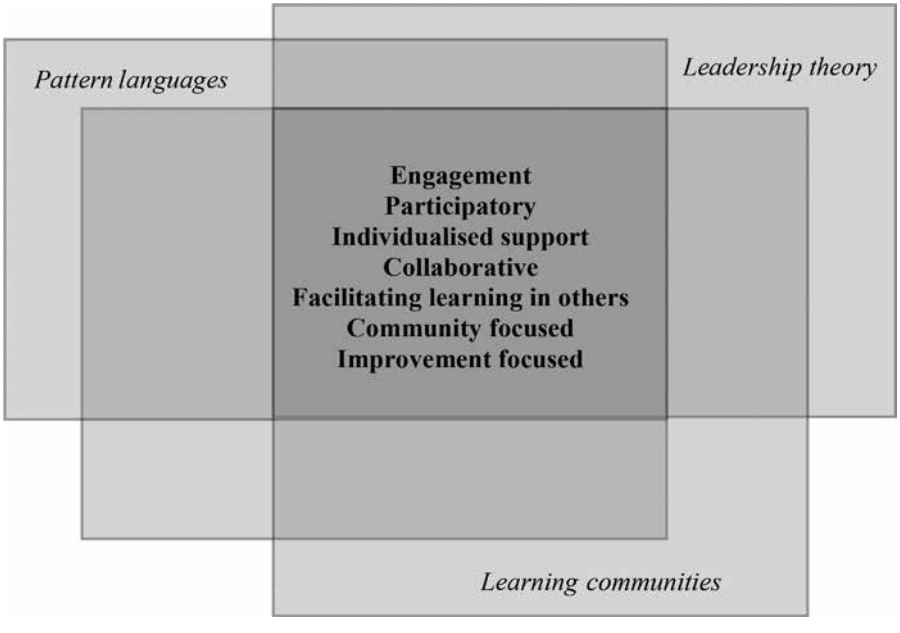

Figure 1. Common characteristics linking four theoretical constructs

participatory; individualised support; collaborative; facilitating learning in others; community focused; and improvement focused. It is through the lens of these common characteristics that I investigated the relationship between the learning environment and the learning culture of a school.

RESEARCH PROJECT DESIGN AND METHODOLOGY

My study posed four key research questions:

- What are the intended outcomes of school design from the perspective of stakeholders and in relation to the specific school contexts? (Stakeholders are educational leaders in the school, teaching staff, students and architects.)
- What are the key influences on the design of school architecture and use of educational facilities?
- What is the relationship between architectural and design factors and the development of an effective learning environment?
- How does the leadership in schools influence the design of physical learning environments?

I adopted a case study methodology and comprised a dataset of three cases, the first of which was also treated as a pilot study. Case selection was purposeful. The criteria for selection of each case was:

- The school must be new, which means established or "relaunched" during the past 10 years;
- The school leadership team was directly responsible or was substantially involved in the design and construction of the new school.

Leadership claims a vision for the school in line with the definition of a learning community and an innovative learning culture.

From the multiple cases I was also able to draw an additional single set of cross-case conclusions. I chose a qualitative research approach to enable me to capture the values, attitudes and preferences of participants from three different but similar contexts with the aim of permeating the "how" and "why" underlying the believed impact of architecture on the learning culture of a school.

The study used six constructed data collection activities in three cases. In the first study school (Jacaranda College), I made two sets of observations, one whole school and one focusing on a specific building project. With Grevillea College, I made two sets of observations, one whole school and one of Years 5 and 6 in the Middle School. For Acacia College, I also made two sets of observations, one whole school and one of the Year 6.

Data collection began with the participants were the staff who had the positional authority to initiate and contribute directly to the design of the college's educational facilities. Schedules of participation and the data collection visits and activities are shown in Tables 3 and 4.

Table 3. Schedule of data collection

Case study school	*Documentation sent to college*	*Site visits and researcher observations*	*Interviews*	*Questionnaire or participant generated photographs*
Jacaranda College	June 2007	Term 4, 2007 (November – December) Term 1, 2008	November 2007 – Principal, Head of Campus, Property Manager, Architect, two senior students, one teacher	November 2007
Grevillea College	July 2008	Term 4, 2008 (November – December)	27 & 28 November 2008 – Principal, Head of Middle School, Bursar, four Middle School teachers	27 November 2008
Acacia College	August 2007	August 2007 May 2008 May 2009 August 2009 September 2009	June 2009 – architect. September 2009 – Principal, Head of Junior School, College Manager, one Year 6 teacher. August 2010 – educational expert	August 2009

Table 4. Participation in each data collection activity

Data collection	*Jacaranda college*	*Grevillea college*	*Acacia college*	*Total*
Interviews	5	7	7 #	19
Questionnaire or Participant Generated Photographs	7 teachers & 5 students	32	40	84
Researcher Generated Photographs	109	106	116	331

THE CASE STUDIES: JACARANDA, GREVILLEA AND ACACIA COLLEGES

All three colleges were fully accredited and registered Kindergarten to Year 12, co-educational schools in New South Wales. Jacaranda College was situated on an 8 hectare site in a semi-rural urban area outside a major city. This college had grown

in stages according to demand from the local area. Grevillea College was situated on a single 11.4 hectare site in a semi-rural urban area.

This college had established an organisational structure that divided the students into three sections or departments called schools. Originally the plan had been for a small college with two departments called Junior School (Kindergarten to Year 4) and Middle School (Year 5 through to Year 7). As the college enrolments grew, the curriculum developed and facilities expanded to accommodate the new classes and programmes. Acacia College was situated in metropolitan New South Wales on a single 9.7 hectare site in a suburban growth area. Whilst it grew in stages, this growth had been planned.

A key aspect of my research technique was the use of a number of different lenses to observe the colleges. I employed four lenses: the visual lens of the researcher; the interview lens of the educational leadership team; the interview lens of the teachers and the interview/questionnaire lens of the students.

On my visits to the colleges, I recorded my observations of the environment in a series of photographs. These photographs allowed me to look at what was actually there from an architectural point of view. At Grevillea College, I walked through the learning spaces, at times guided by two students or the Head of School and at other times alone, recording visual aspects of the built environment through 114 photographs.

Twenty photographs displaying the greatest number of design features or the images were then selected for the questionnaire activity. The photographic data at Acacia College revealed growth that was leading the college towards a village configuration, with a number of cohort defined neighbourhoods arranged around common areas. Analysis of the 126 photographs taken in ten different areas of Acacia College revealed the use of five architectural patterns for learning: personalised, learning-focused, collaborative, community connection and adaptable/flexible. The design features most evident in Grevillea College's built environment were; human-scale, indoor/outdoor connections, campfire and watering hole spaces, gathering spaces, casual eating areas, contextual connection with local community, adaptable utilities and a limited number of multi-use classrooms. The most common patterns were personalised and learning-focused.

The educational leaders' and teachers' lenses were provided through interviews with principals, senior executives, class teachers and business staff. At Jacaranda College, two main themes emerged from these interviews. The first theme was the role of leadership in the design process and the second theme was financial factors or procurement. Leadership was explained in two ways: individual leadership and shared leadership.

The principal made the distinction between involvement that was linked to his senior leadership role and involvement that was part of a collaborative process that included other members of the staff. This point of view points to the existence of both individual and collaborative leadership roles and responsibilities in the process of designing educational facilities. At Grevillea, a number of themes emerged in the

leadership interviews, foremost being the role of relationships and access to a variety of spaces and resources.

The principal at Acacia College raised a number of factors that were echoed by other leaders in the study. He argued that the key factors with the most significant effect on design were those of leadership and the collaborative nature of the design process. The Head of Junior School emphasised a number of design features that she believed had a direct impact upon the delivery of teaching programmes, the most significant being: the amount of storage and floor space available for use within a classroom; movable walls for introducing variety into the configuration of spaces; a range of spaces for different modes of learning and delivery; and Information Technology resources.

According to Acacia's principal, leadership was at the heart of encouraging staff to use the facilities to support their teaching practices. The principal conveyed the belief that it was his role to constantly find ways of explaining the broader role of the teacher in the process of using spaces to support learning. In all three colleges, leaders were aware of their responsibility for providing effective facilities, on budget, on time and in line with strategic and master planning.

The teachers emphasised the importance of having control over working and teaching spaces. One teacher described all the modifications he had made to the classroom and concluded "It makes me feel 'in control' of my work life". Space to work and reliability of Information Technology were also factors that affected the effectiveness of teacher work areas according to some teachers. Themes of physical comfort, difficulties of sharing spaces and places to work alone by choice were common to most teachers' responses. The most extensive and complex response came from one teacher, who had recently been relocated to a larger communal staffroom in a temporary building on the campus. She photographed her current work/preparation area and placed it beside a second photograph of a closed door.

Behind the closed door was her old workspace, which she described as a "cosy office area". What she liked about the old office area was its location in relationship to the busy areas of the college and how it had provided "spontaneous rich incidental contact with exchanges of ideas and sharing of work". She now felt lonely and isolated. For her work as a teacher, relationships were vital and having control over her workspace was also important for maintaining the type of contact she needed. She reflected on the notion that hubs of collaboration do not always develop in official or designated places.

At Grevillea, class teachers emphasised the themes of space and belonging to a place and the role relationships play in the learning process. Physical comfort, flexibility and variety in spaces were emphasized as being crucial to the learning environment. However, the single most frequently mentioned issue in the teacher interviews was access, and in particular, distribution of integrated Information Technology resources. At Acacia College, teachers were particularly concerned with creating inclusive, flexible, autonomous learning spaces.

For students the factors that had the most influence on the relationship between the physical environment and learning were physical comfort, access and inclusion. Having enough space to remove distractions and having choices in the place where you work were also underlying factors. Commonly mentioned negative factors were related to insufficient space, storage and physical comfort. There was no gender difference for these factors.

At Jacaranda College, outdoor areas were photographed as choices for learning environments that could provide relaxing, calm work areas or room to move. In contrast, feeling cramped inside was something a number of students raised as a negative. Photographs showed chairs squeezed between fixed rows of desks, carpet caught around chair legs and rooms crowded with furniture.

Students at Grevillea College emphasised a homeroom or the library's lounging area as the most preferred places for talking quietly with a teacher about work. According to the questionnaire, one of the most frequent reasons for students choosing a particular place was related to physical comfort. Factors like uncomfortable furniture, climate control, distractions and overcrowding were named as making it difficult to learn in the classroom. Relationships and different types of belonging, such as my own desk or our classroom, mattered from the student perspective.

One significant difference between the student and teacher perspectives was the narrow range of factors mentioned by students compared to their teachers. Students used fewer thematic categories and emphasised features relating physical comfort, space and personal belonging. Teachers used multiple thematic categories and emphasised information technology, belonging to a community, flexibility and space. I would argue this difference related to the role each participant played in the learning relationship. In all of the colleges, it was recognised that some of the effectiveness of the learning places was actually achieved by teachers modifying and adapting spaces with whatever resources were available. In all three colleges, the most intensely areas were those that provided flexibility, adaptability, access and space for storage and movement.

KEY FINDINGS AND IMPLICATIONS FOR RESEARCH

This study found learning environments are affected by affordability, time constraints, master planning, the inclusiveness of the design process, the roles the various stakeholders take in the design process and how space is interpreted and valued by each stakeholder. The key findings are summarised in the following table:

The study found the intended outcomes of school design from the perspective of stakeholders and in specific school contexts were:

- Comfort and wellbeing (teachers and students in particular)
- Community relationships
- Supports and reflects school culture
- Facilitate curriculum

Table 5. Main findings of study

Key question	*Main findings*	*Source of findings*
1. What are the intended outcomes of school design from the perspective of stakeholders and in relation to the specific school contexts?	Comfort and wellbeing (teachers and students in particular) Community relationships Support/reflect school culture Facilitate curriculum Space to carry out teaching and learning activities (teachers in particular) Flexibility and adaptability (school leadership and designers in particular) Affordability (school leadership in particular)	Document reviews Interviews (educational leaders, teachers, students) Architect's interview Researcher observations Questionnaire
2. What are the key influences on the design of school architecture and use of educational facilities?	Change agendas Embedded school culture Curriculum Constraints, compromise and processes for negotiations School context Affordability School growth (time and urgency) Approaches to master planning Structural organisation of school	Document reviews Interviews (educational leaders, property managers, teachers) Educational consultant's interview Architect's interview Participant Generated Photographs
3. What is the relationship between architectural and design factors and the development of an effective learning environment?	Relationship does not cause development of an effective learning environment. Design and architectural factors more likely to operate as preconditions for developing the learning environment. Creating learning communities was affected by scale, existing or envisioned learning culture, cultural emphasis upon community relationships, opportunities to create communal and personal space within a classroom and access to a variety of learning spaces. Factors identified as being influential in developing effective learning environments: People who use the spaces have control over the environment Access to resources (especially I.T. Flexibility Sufficient physical space to deliver the planned curriculum Site/master planning	Document reviews Interviews (educational leaders, property managers, teachers) Field observations, site visits, photographs Questionnaire Participant Generated Photographs

(Continued)

Table 5. (Continued)

Key question	*Main findings*	*Source of findings*
4. How does the leadership in schools influence the design of physical learning environments?	Principal identified as central to the entire process of building the physical learning environment. Principal identified as playing key role in embedding learning culture and leading change. Collaborative processes involving stakeholders identified as crucial for achieving best design.	Site visits Interviews (educational leaders, property managers, architect, educational consultant, teachers)

- Space to carry out teaching and learning activities (teachers in particular)
- Flexibility and adaptability (school leadership and designers in particular)
- Affordability (school leadership in particular).

The key influences on the design of school architecture and use of educational facilities were:

- Change agendas
- Embedded school culture
- Curriculum
- Constraints, compromise and processes for negotiations
- School context
- Affordability
- School growth (time and urgency)
- Approaches to master planning
- Structural organisation of school.

Design and architectural factors were more likely to operate as preconditions for developing the learning environment. The creation of learning communities was affected by scale, existing or envisioned learning culture, cultural emphasis upon community relationships, opportunities to create communal and personal space within a classroom and access to a variety of learning spaces.

Factors identified as being influential in developing effective learning environments were:

- people who use the spaces have control over the environment
- culture that built relationships
- access to resources (especially I.T.)
- flexibility
- sufficient physical space to deliver the planned curriculum
- site/master planning.

Both students and teachers identified space and Information Technology resources as being important. Students emphasised features that created physical comfort and access to outdoor areas, and many students described comfort as being free from distractions, especially distractions created by other peoples' behaviour.

Students emphasised access to outdoor areas because these environments offered solitude, fresh air, a pleasant ambience, variety, room to be physical and an opportunity to engage in informal activities. These features agreed with characteristics the design literature identifies as what matters the most in terms of adequacy and post-occupancy satisfaction.

The key factors that contributed to building communities were control and a culture that valued relationships and fostered a sense of belonging to a community. The staff and students at the case study schools valued personal relationships as a foundational principle of their school culture. What followed was a belief that learning was based upon positive relationships, especially between the teacher and learner. Consequently, factors that had an impact on this relationship became significant in the process of designing effective learning environments.

Leadership in schools influenced the design of physical learning environments. As anticipated, the principal was identified as central to the entire process of building the physical learning environment. The principal was also identified as playing key role in embedding learning culture and leading change. The principals' interviews indicated they were optimistic about the potential for their schools to grow and change in the years to come. Collaborative processes involving stakeholders were identified as crucial for achieving best design, even if they were not necessarily followed in the case study schools.

An unexpected finding was the need to understand the relationship between learning environments and those who use those environments (in particular, the teachers and students) in terms other than the language of architectural design. This led me to consider the articulation of the relationship between the environment and learning from the central perspective of the student (see Figure 2) that places the learner at the centre of a dynamic relationship with the learning environments using the notion of affordances rather than pattern languages.

This theoretical model is a way of understanding how potential affordances can be designed into that environment and how the affordances can be perceived and then actualised by the student within the context of a learning community. The model also shows how pattern languages and affordances can work together. I came to the conclusion that the concept of pattern language provides a language for the construction of the physical space and the theory of affordances can explain how students and teachers see and use the spaces after construction. Both describe a person-environment system and are relational concepts.

The pattern language articulates what is present in the human-environment relationship as a result of design and affordances are situated between the individual and the environment without being a characteristic of either of them alone. Finally,

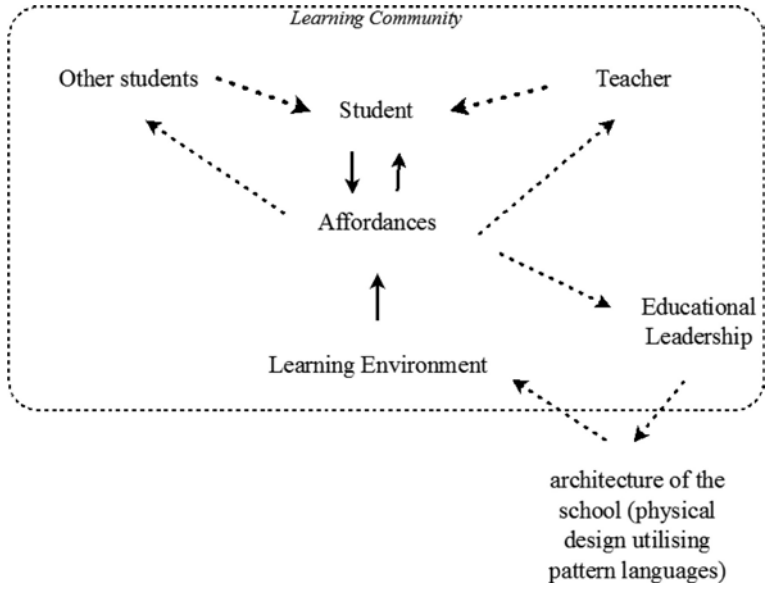

Figure 2. The student's relationship with the affordances of the learning environment

the model shows the student's daily interaction with the environment taking place within the culture of a learning community.

The findings of this study lead me to make a number of recommendations for practice, policy and further research. Key recommendations for current practice and policy are:

- to ensure more master planning of the design of a school takes place from the outset;
- greater flexibility in the design of facilities in response to a school's context;
- increased teacher professional development in the area of using space as a part of pedagogy.

A significant recommendation for both policy-makers and practice is to allow a school's context and key stakeholders to play a significant role in the design of the physical environment. This study's findings lead to the conclusion that greater flexibility when responding to contexts will improve the fit between the physical environment and learning culture within each school. Improving each school's approach to master planning could provide the opportunity of constructing the physical environment in stages whilst still achieving a cohesive design for the entire school.

The findings of this study also point towards a need for increased research into school design within the Australian context. Since context is influential in the design of a school, it is reasonable to argue that the national context would have an influence on school design and current studies of Australian schools are not numerous. Understandings of the relationship between the physical and learning environments would be enhanced by longitudinal studies that could investigate the long-term impact of early 21st Century designs on school learning culture, learning outcomes and the establishment of learning communities within schools.

CONCLUSION

In conclusion, this study confirmed the belief that school design matters in a profound way to all the stakeholders, and in particular, to the teachers and students. The relationship between the physical and learning environment is complex and at times chaotic. The context of a school has a significant effect upon the design process and the development of the physical environment. The school culture also has an impact on the way in which community is built.

The issue of compromise, the impact of master planning, the nature of educational leadership and the constraints of affordability and time had a profound impact upon the design of schools. The study identified a number of features within the learning environment that were seen as contributing to learning communities and effective spaces.

This study also found the most enduring influences upon the relationship between the built environment and learning are dynamic in nature. The relationship could also be understood as a constant dialogue or interaction between the people, the purpose of schools and the places where this purpose is achieved. The relationship between leadership, the built environment and learning focuses on the classroom and what happens between teachers and their students.

It is a problematic relationship since each group involved in the process of constructing educational facilities, as well as those for whom the facilities are built, look at physical spaces from different perspectives. These perspectives are framed by the different functions these groups see the physical spaces as fulfilling. These groups may even frame their perceptions using different languages. The relationship is both affective and physical, it involves both the practical function a space fulfills as well as its symbolic role.

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