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Project Title

The connections between learning spaces and learning outcomes: people and learning places?

Literature Review

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Background and context
The focus on better understanding the connections between built learning environments and student learning outcomes has emerged out of a concern as to whether the pedagogies, curriculum, assessment and organisational forms necessary to develop the capacities in students for the 21st century require different built environments and usage. Issues of environmental sustainability, the integration of ICT to enhance learning, industry and university partnerships, educational inequality and neighbourhood regeneration as well as the restructuring of school organisation and governance to broaden curriculum provision and provide integrated services have foregrounded how the built and natural environments relate to community, student engagement and learning outcomes.

The key question, the focus of this review, is whether new learning spaces are a catalyst, and/or merely one element in a range of school and systemic reform imperatives, that change teaching practices and student responses in ways that improve learning outcomes.

Review Methodology

This literature review identifies

- Theoretical and empirical connections made between learning spaces and student learning outcomes
- Gaps in extant research
- Future research trajectories theoretically and methodologically

A critical desktop review identified close to 700 primary sources from a wide range of sources including peer-reviewed periodicals, magazines, reports (governmental, non-governmental and advocate groups), books (both printed and in digital formats), conference proceedings, national newspapers, dissertations and websites.

As a 'best evidence synthesis' (Alton-Lee 2002), quantitative and qualitative studies are included as are case studies that indicate further research. Whereas quantitative studies tended to focus on direct links between outcomes and learning spaces, recent qualitative research provides greater understanding as to how this has occurred and why. The search was initially broad as learning outcomes were often a passing reference rather than the focus of a particular study. What counted as evidence of impact on learning outcomes was sometimes unreliable and often not systematically evaluated or analysed.

The research approaches are varied and overall quality variable. To gain greater breadth, searches were based on different criteria (significance/quality of journal, case study/quantitative study). We mapped these onto the conceptual framework outlined in Table 1 that became the organiser of this review. A graphical representation of this table is in Appendix 1.

	Practitioners		Learners		Spaces	
Design	Consultation in design	26	Personalised needs	74	Principles and philosophical aspects of design (includes physical environment and influences on well-being)	312
	1st generation users	6	Voice through consultation	50	Specialist use of space	135
	Preparation for pedagogical change	30	Access/availability to resources	44	Contemporary approaches and trends within education broadly	97
	Availability of resources	14	Social	60	Policy	77
			Achievement	101	Infrastructure	35
					Furniture	52
					Time	13
Transition	Orientation to space	44	Needs of different learners	41	Governance	7
	Rethinking practices for teaching	50	Gendered spaces	9	Community-shared spaces	9
	Professional learning	22	Reorienting/positioning as learner within space	34	Access	5
	Adoption of space	42	Privacy and safety	18	Security	19
	Challenges of space	38				
Consolidation	Changes in pedagogy	41	Engagement in learning	57	Management	7
	Responses to space	35	Quality in learning experiences	33	Maintenance	6
	Collaborative planning and teaching	33	Collaborative learning experiences	42	Flexibility	9
	Enacted curriculum	20	Personalised learning	26	Fitness of purpose	12
	Privacy and ethics	19				
Sustainability/ Re-evaluation phase	Creativity and learning design	5	Creativity and problem-solving	7	Possibilities of redesign	10
					Virtual within the virtual	4
					Innovations	7
					Sustainability	16

Table 1.

A wide range of **data sources** were searched using search terms and combinations of search terms against learning outcomes/achievement/ academic performance/social outcomes as the primary variables (See Appendix 2). The review targeted the most recent literature (2000-10) that made some reference to learning space and outcomes, relying on recent systematic reviews for the period pre-2000 where possible, but including frequently cited key references in the bibliography.

Theoretical position

This literature review is premised upon the perspective that space (natural and built environments) 'shapes' social relations and practices (Lefebvre 1991, Massey 1994). Social practices, formal instruction and informal social interactions, change the nature, use and experience of space. Learning spaces mediate the relationship and social practices of teaching and learning, and are only one factor among many in the complex relationships of teaching that inform learning outcomes (Oblinger 2006). Nor is there a linear relationship between learning spaces, their use, and student learning outcomes.

But learning spaces can produce conditions and mediate relationships that can improve student learning along a range of indicators (physical and mental wellbeing as well as cognitive) and relationships made more complex by the blurring of real and virtual space.

There is also a temporal dimension to the production, use and effect of learning spaces. Changes in the use of physical spaces are often related pedagogically and organisationally to changes in time organisation and use. For example, personalised learning, individual pathway planning, team teaching, inquiry approaches, teamwork, problem solving, rich tasks community based service learning as well as organising multipurpose, open and flexible spaces often requires longer instructional time 'blocks' than teacher-centred transmission pedagogies (Arnot and Reay 2007). Education systems have spatial and temporal orders (Nespor 2004). Temporality is a key factor in how organisations, teachers and students respond to new learning spaces over time (Bruckner 1997). Organisational and pedagogical change takes time, and education has long and short-term effects (Paechter 2004).

Therefore, we consider that the school environment includes social, cultural, temporal, physical (built and natural) aspects, as well as real and virtual environments (McGregor 2004).

Learning outcomes

Difficulties arise in particular around learning spaces and built environment in determining the factors that actually contribute to student learning. Physical wellbeing, affective, cognitive, and behavioural characteristics of individuals are pre-conditions that can impede or enhance learning. They are also desirable learning outcomes. Built environment is one factor in many impacting on student learning outcomes. Hattie's systematic review (2003) of school effects indicates that after family and ses background, teacher student interactions are the greatest predictor of learning outcomes in standardised tests, with peer influences, prior learning, and social mix having some influence particularly in the post-compulsory years (Woolley and Grogan-Taylor 2005 cited in Bowen 2008, Alton-Lee 2002, Bowen et al 2008). School leadership indirectly contributes by providing conducive conditions to learning — resources and teacher professional development (Mulford 2005). School effect studies can neglect context and school characteristics as well as relying on limited measures of outcome.

Increasing evidence indicates learning is affected if students are disengaged, alienated, absent or feel excluded. Disengagement results from multiple factors, many of them out of the schools' control— familial violence, poor health and wellbeing, discrimination, or bullying (Blackmore and Kamp 2008, Bandura 1997). Parental involvement in students' learning is now seen to impact on early literacy (Bowen et al 2008). Coinciding with managing new built environments, teachers and principals manage multiple curriculum and assessment reforms that claim to focus on student learning, but that can have contradictory demands on time and space. Poorly designed and maintained schools, often found in areas of lowest educational achievement, can also have a detrimental impact on teacher and student morale and engagement, and impact negatively on aggregate student outcomes (Filardo 2008). Collectively, these factors impact on teachers' work, attitudes and behaviours, and have flow on effects on student learning. (See Appendix 3: Diagrams A and B).

Learning outcome indicators are dealt with variously throughout the literature as

- *attainment* as measured by standardised test scores (e.g. Iowa Basic Skills Tests) and teacher observations
- *pedagogical* effects as indicated by improved engagement in learning (proxies such as time on task, self management)

- *social* in terms of perceptions of improved quality of student/teacher, teacher/teacher and student interactions, evidence of increased levels of student interpersonal competencies and team work
- *affective* as indicated by individuals perceptions as to a sense of belonging and inclusion, self esteem and self confidence
- *wellbeing :* physical comfort and health
- *behavioural* changes related to retention, vandalism, absenteeism, suspensions, expulsions, disciplinary incidents, violence, disruption in class, lateness, racial incidents, smoking.

The connection between learning outcomes and built environment and use of learning spaces is thus mediated by tangibles (e.g. quality of air, light, spatial density) and intangibles (school and classroom culture, sense of belonging and self-efficacy).

Overview

The extant research focuses on the tangibles connecting learning spaces and outcomes rather than the intangibles or how teachers and students respond to and use space pedagogically in ways that improve learning.

The literature on learning spaces was primarily US, UK as well as Australian. US research tended to be quantitative that sought direct causal links, but the sample sizes vary as do levels of correlation. European, UK and Australian research, while qualitative, indicated the complexity of indirect links between learning spaces and outcomes but provide greater depth of understanding about what happens in learning spaces (Fisher 2002).

The learning spaces literature drew from the fields of sociology, environmental studies, psychology, health, architecture and design and within-field specialisms—educational philosophy, curriculum and learning theory (including brain science), occupational health, health and wellbeing, indoor and furniture design, landscaping, ergonomics, environmental psychology and environmental sustainability.

Findings

Overall, there are many sweeping claims about the possible effects of various aspects of learning spaces on student learning that are not substantiated empirically (Tanner 2000). In many articles, the methodology used to gather data is unclear. Specific instruments tend to measure student and teacher responses to learning spaces rather than academic outcomes.

This review therefore is as much about what is missing from the research as it is about evidence to support connections between learning spaces and student outcomes.

The conceptual framework (Table 1) indicates four overlapping temporal phases with respect to learning spaces: design, transition, consolidation, and sustainability/evaluation as well as the uneven distribution of the research literature. The coding indicates that most literature is located in the design phase, a little on transitioning into new spaces, more on consolidation; and little on Issues of evaluation and sustainability. There is an overall paucity of empirical evidence associating any phase with specific regard to student learning outcomes. Much of the literature focuses on the quality of conditions and not educational practices or how space is used, and with what effect.

Phase 1: Design of new learning spaces

The design phase indicates a focus upon sound architectural principles and/or contemporary educational philosophies and principles that have taken as best practice from other fields of research e.g. learning theory, identity theory, and environmental sustainability. From this, design principles have been developed as exemplars of the redesign process. Particular elements of design are linked to desirable student outcomes and teacher pedagogies, leading to claims that some spaces can be more conducive to intellectual, physical and emotional wellbeing and therefore with flow on-effects to student learning.

Design principles

Three assumptions underpin the design principles:-

- educational objectives and practices have fundamentally changed from the teacher-centred 20th century factory model and therefore learning spaces must address the educational needs of learners in the 21st century (Chism, 2006; Fisher, 2002; Temple, 2007). The relationship between space and identity formation is embedded historically in environmental psychology principles (e.g. Good and Adams 2008, Carter 2006, Ferrer-Wreder et al 2008), and more recently around issues and notions of personalisation.
- design principles are open to re-interpretation according to the cultural context as typical school buildings and classroom layouts symbolise culturally specific understandings and philosophies of education as well as to resource distribution (Bateman, 2009), for example, the Reggio Emilia notion of the 'environment as the third teacher'(New, 2007; Rinaldi, 2006).
- changing learning spaces based on the above principles will have subsequent effects in influencing teacher pedagogies and therefore student learning (Oblinger, 2006; Sanoff, 1995; DEECD, 2009; Flutter, 2006). That is, good design leads to good teaching practises and improved learning because the quality of the building design has flow on effects on teacher and student behaviours, morale and practices and therefore learning outcomes.

These are largely anticipated rather than empirically justified claims

The focus of the design phase literature is on built environment and space oriented to perceived student needs rather than on teachers, as reflected in the following outline:

The design of individual spaces within an educational building needs to be: • Flexible-to accommodate current and evolving pedagogies • future proofed-to enable space to be re-allocated and reconfigured • look beyond tried and tested technologies and pedagogies • creative-to energise and inspire learners and tutors • supportive-to develop the potential of all lenders • enterprising-to make each space capable of supporting different purposes (JISC, 2006)	A more focused and learner-centred approach to the design of facilities include: • designing learning spaces around people • supporting multiple types of learning activities • enabling connections, inside and out • accommodating information technology • comfort, safety and functionality • reflect institutional values (Oblinger, 2005)
Seven guiding principles to augment rather than replace existing design principles are: • design space for multiple use concurrently and consecutively	

• design to maximise the inherent flexibility within each space • design to make use of the vertical dimension of facilities • design to integrate previously discrete campus functions • design features and functions to maximise teacher and student control • design to maximise the alignment of different curricula activities • design to maximise student access to and use/ownership of the learning environment (Jamieson et al, 2000)	

The dominant theme is that learning spaces need to be flexible, pedagogically and physically, in ways that reflect the nuances of different knowledge areas and specialisms (e.g. Butin 2000). Much of the literature on furniture design and classroom settings focuses on ideal patterns and designs characterised by flexibility and mobility of structures, grouping of desks, computer pods, display boards in order to facilitate multimodal pedagogies that accommodate individual learner's needs and personalisation of space. Multiple exemplars exist as to ideal classroom settings (Fisher 2005) and enacted designs (DEECD 2009, JISC 2006; Bateman, in press), but with little evidence as to impact on learning. Appendix 4 shows Fisher's (2005) typology of learning spaces.

The processes of design

An emergent theme is the significance of the design process (Jamieson et al. 2000, Morgan 2000, Radcliffe 2008, Higgins et al 2005, Fisher 2005). Traditionally, learning spaces have been designed by architects, interior designers and usually not teacher-practitioners, mirroring contemporary architectural but not educational imaginaries, often leading to the reproduction of the industrial model of classrooms, with notable exceptions e.g. Montessori, Dewey (Jamieson et al 2000, Abbasi 2009).

Elements of design and student outcomes

Across the design literature, there is emerging an interest in the specific aspects of design that may impact on teacher practice and student learning outcomes. These claims can be organised into a number of key themes:

Environmental impacts

Temple (2007) and Higgins et al (2005) refer to a number of sources that describe the ways in which specific environmental conditions impact upon student learning. The environmental conditions described are factors such as noise, temperature, air quality, ventilation and lighting (Keep 2002; Higgins et al 2005; Lackney & Jacobs 2004; Earthman 2004; Sundstrom 1987; McNamara & Waugh 1993; Weinstein 1979). Generally, these conditions are considered as basic yet optimal conditions in which students are best able to perform. However, there is much debate over the relative significance of specific elements such as air quality, colour, aesthetics, furniture. Colour and physical presentation of space are highly contested elements (Sundstrom 1987, Temple, 2007; Higgins et al, 2005). Good (2008) and Rinaldi (2003) argue that aesthetics, access to resources and opportunities can work in different ways to accentuate student learning outcomes, differing from Fisher (2002, 2005) and JISC (2006). The issue of additional resources that may enhance learning spaces is not addressed e.g. furniture, plants, presentation devices and audio systems are often not factored into costs. While arguably part of design, there is little evidence to indicate whether the effect is more related to comfort than learning (Heluish, 2009; Lomas, 2005; Nair, 2005). By increasing comfort for students and

teachers, it is assumed that teachers and students will be able to 'concentrate on the task at hand' (Bateman, in press).

A large proportion of the design literature in early years and primary (e.g Bullard 2010) is based on design possibilities in Higher Education with regard to ICT and flexibility. Simon et al (2007) conclude that much research linking school building quality to child development suffers from conceptual and methodological problems because it ignores both the quality of old and new buildings and children's response to new buildings.

Design process
More recent design literature suggests that a *participatory* or '*generative design'* process will improve teacher practices and in turn will benefit students' learning experiences (Temple 2007; Higgins et al 2005; DEECD 2008; Fisher 2002). The trend is towards user-friendly spaces and personalised learning (Chism 2005). Design takes up the insider, practitioner, student or pedagogical perspective as they are 'able to articulate a distinctive vision for their school and then working with designers and architects to create integrated solutions' (Higgins et al 2005 p. 3, Fisher 2002; Morgan 2000; JISC, 2007).

Equally, the input of teachers in design is critical (Temple 2007, Higgins et al 2005, Sanoff, 1995) because staff morale (Higgins et al 2005) and teacher attitudes and behaviours effect the use made of space. Their lack of involvement could lead to a negative orientation to new spaces (Temple 2007; Fisher 2002; Wolff 2008). Participation in the design process and investment in their environment, Loi (2006) argues, indicates to teachers that they are valued. Moreover, the prospect of a new environment heightened through participation will motivate teachers (Morgan 2000, Oblinger 2005, Temple 2007). In providing a flexible facility, it is anticipated that teachers will increase and refine their repertoire of teaching strategies (Radcliffe et al 2008).

Anticipated effects and design processes
In conclusion, much of the design phase literature is aspirational: that is, it assumes or anticipates changes in teaching and learning will occur as a result of learning space design. There is limited empirical evidence provided to support claims connecting the design process to learning outcomes.

Gaps in the Design Phase Literature

- Dominated by philosophical positions without empirical evidence
- Little recognition of significance of context of school
- Lack of use of primary sources as to use and effect (student/teacher/parent/community interview or other data) that can be replicated
- study of student perceptions of relationship between neighbourhood social disorganisation, safety, school buildings and neighbourhood culture (Bowen et al. 2008).

Phase 2: Transition phase: "the finished beginning"

The focus in this phase is on transitioning into the new school buildings, organising services, resources and space, system supports, and developing new organisational arrangements as well as establishing rules and protocols of use that in turn impact on school cultures, teachers' work and pedagogical practices most likely to affect learning outcomes in the short term. (Barrett and Zhang (2009, p. 4) state:

> Every effort should therefore be made in the design stage to create the ideal conditions for learning to take place. However, a variety of teachers with specific and very different groups of pupils will subsequently inhabit and inherit these spaces. Each teacher and each group of pupils is different, and teachers must develop the generalized environment for specific purposes and groups. When a

> new building is complete and is handed over to the teachers, the school can only be a "finished beginning" in which adaptations will occur. Only when spaces are seen to support learning and create a positive experience, can we say it was designed successfully.

This assumes first, that students and staff move into *'finished buildings'* rather than being phased into occupancy over months if not years, which is often the norm (Blackmore et al 2010). There is little research on immediate effects of occupancy on student learning other than a few case studies (US) (Buckley et al 2003) that indicate positive effects on aggregate student assessments once installed, except in a strictly regulated school environment where school culture intervened.

The transition phase raises specific issues.

Security and access
Unfinished building sites produce unexpected (and uncosted) problems—no power or water; lack of security; safety issues with builders on site; frequent movements of staff and students; transport costs between new and old sites; building faults, furniture etc.) Emerging evidence suggests these impact on initial interactions with communities in shared spaces e.g. libraries. Blackmore et al (2007-10) identified teacher and community anxiety over shared facilities with regard to potentially fraught interactions between different age cohorts and loss of community facilities. Shared spaces (e.g. sport facilities) can require relocation i.e. the process of design extends into occupancy.

Temporary accommodation
While school systems see combinations of temporary and permanent buildings as providing systemwide flexibility, permanent school buildings are linked positively to shaping community growth patterns eg. enrolments (Taylor, Vasu and Vasu 1999). Chan (2009) found no significant impact on teacher perception, morale, job satisfaction, student achievement and behaviour with the use of portables. Negative correlations between portables, health and safety are no worse than with inadequate permanent buildings—the issue is quality not permanence. Portables may impact more on community perceptions than student learning and raise management and resource issues around implementation strategies, maintenance schedules, relocation and replacement plans.

Changing perceptions
A few US studies indicate that location and appearance of schools in addition to environmental sustainability attract particular student cohorts, as schools are central to wider patterns of spatial residential segregation and educational outcomes (Baker and Foote 2006). Some evidence indicates new schools can attract and retain good teachers and a different social and academic mix of students that tends to benefit lower achievers most (Darling-Hammond 2002).

Qualitative evidence from Flutter's (2006) projects indicates intangible effects. Students like a 'good working environment', resources and buildings that are 'inspiring' and 'exciting', with little noise or distracting behaviour. Many students with low expectations of schooling see their relationship with schooling as an 'exchange relationship' in which schools have to offer something tangibly better in terms of relationships and environment (such as the quality of buildings) to indicate to students that they are valued. Bullock (2007) found a positive relationship between new and renovated buildings and student academic achievement based on academic tests in Virginia.

Appearance is important in terms of the negative or positive messages that students receive about themselves as they internalise any reflections on the buildings or school, similarly, their teachers identify with their school, its image and reputation. Parental and local community participation have positive but intangible outcomes as the physical environment of the school reflects the culture and aspirations of the community and indicates it is respected and valued (p. 189 Flutter 2006). Therefore,

being in a new building in itself could be expected to have an immediate effect in terms of local perception and positive student responses.

Adaptation

There is a possible dissonance between how teachers and students anticipate and then experience these new spaces. Literature indicates teachers enjoy novel spaces, and are usually encouraged to experiment pedagogically (e.g. individual, groups, whole class) within specific types of physical spaces. Yet there is little recognition of the preparation required for teachers and students to effectively transition into using new learning spaces in terms of pedagogies, as well as setting realistic expectations and contingency planning. If teachers are not well prepared and given leeway for risk taking and failure, particularly if disruption is ongoing, they may revert to 'default pedagogies' or 'the way we used to do things' rather than explore innovative pedagogies (Thomson 2009). Furthermore, some schools have traditional and refurbished or new buildings, yet innovative curriculum and pedagogy is expected of teachers in traditional spaces as well as in the redesigned spaces. The issue remains as to how to use a non-ideal space for contemporary pedagogies (Montgomery 2008). 'Design failures' where spaces just do not work as intended also need to be redesigned.

Managing transition

While there is some research on the benefits of *participatory* or *generative design* (Sanoff 1995) premised upon sound architectural and educational principles in the design phase, there is little research on whether participation in decision making continues to inform processes and structures established to *manage the transition* into occupancy. Limited literature exists on teacher and student anxiety (Cotterell 1984) or the type of preparation and strategies required for teachers and leaders as to pedagogical strategies suited to new spatial configurations.

School size and learning communities

There are few articles considering *school organisation and governance.* New learning spaces are often a consequence of school restructuring and closures that require new modes of governance e.g. multi campus, senior/junior etc, K-12.

The trend is for new schools to be smaller (particularly in the early years), or when schools are merged to increase curriculum provision, towards 'schools within schools' in order to develop distinctive learning communities. These are often spatially separated in different buildings, organisationally separated into houses with teams of teachers, or across different campuses (Darling Hammond and Ancess 2002). Shared resources, mergers or multi-campus formations require new governance arrangements. Darling Hammond and Ancess (2002) found small schools benefit aspects of achievement of low income and minority students (e.g. Coalition Campus Schools Project in New York), indicated by better attendance, lower incident rates, better performance on reading and writing assessments, higher gradation rates and higher college ongoing rates than in the previous large school despite serving largely socially disadvantaged students. But small schools in themselves are not enough to have an effect on achievement. Other essential conditions include proper resources in terms of staffing, capacity for personalized units such as mini schools, buildings, redesigned school districts such as reduced bureaucracy, greater autonomy to schools and planning time.

Organisationally, changes in *class size* become an issue in open learning spaces where multimodal approaches to pedagogy are required e.g. small tutorials, individual learning, mass lectures etc. Graue and Hatch (2007) in the US found team teaching and class size were linked. A school had to change staffing patterns, programs and space allocation to reduce teacher student ratios to 1:15 or 2:30. Partner classes used tag–team teaching, with one teacher leading and other assisting, but without any professional development, most teachers reverted to solo practice.

Curriculum, organisational culture and space

There was little research considering the relations between facilities design, curriculum delivery and school ethos, with the exception of a study in a senior public school specialising in environmental studies (Gislason 2009). The school was organised around houses and teams of teachers who the worked in shared open spaces. The 'culture' of the classroom or mini-school gave students a sense of belonging and ownership due to student teacher interactions within the shared space and not teacher oriented in separate classrooms. Therefore they felt socially accepted and enjoyed school more than other high schools they had attended. The qualification was that this school comprised of already well-motivated students with good work habits and academic aspirations. A house setting could be different with less motivated students as noise and traffic could become a distraction.

Gislason (2009) argues that school culture is the scaffold for practice (see also *change theory* literature in the review by Thomson 2009). Overall, it was the alignment between interdisciplinary curriculum, team teaching and the design and use of learning spaces that facilitated multimodal pedagogies:- combinations of formal lectures, group work and individual work. An essential condition was block scheduling, which allowed for flexible use of space, extensive teacher collaboration and sequencing of instruction. Bruckner et al (1997) indicate that teachers have to change with block scheduling or they fall back on lengthy lectures or multiple lessons strung together. Often new spaces involve block scheduling. Arnold (2002) found little difference in learning outcomes after the initial year of implementation.

Collaboration and team teaching is, from the professional learning literature, likely to lead to improved student outcomes (e.g. Darling Hammond 2002), but only with significant teacher professional development and supportive school cultures. Collaboration is not without issues—loss of autonomy, tension over work allocation, greater communication and interdependence among teachers and responsibility to others (York-Barr, Ghere and Sommerness 2007). Overall, the teachers felt that the advantages of team teaching outweighed the disadvantages, citing inter-disciplinarity, opportunity to pool insights about individual students learning and personal qualities gained from longer periods of contact as significant positive factors.

Group work

Group work is also not contingent on space. Blatchford et al's study (2006) in primary schools indicated that group work for 10-11 year olds led to more active and sustained engagement, more connectedness and more higher order inferential joint reasoning. Likewise smaller class sizes (less than 25) were seen to facilitate activities that were task related and increased teacher student interactions (Blatchford et al 2005).

Overall, our review supports Higgins, Hall et al's. (2005) conclusion:

> The first thing that will strike you … is the relative paucity of research on effective learning environments. Not only is the evidence incomplete, particularly in areas such as the systems and processes and communication approaches that schools need to underpin their physical environment, but the research that has been done seems to be largely predicated on a traditional view of 'chalk and talk' learning in standardised 'one size fits all' institutions.

Gaps within the Transition Phase

- Little empirical research that considers how students and teachers as well as communities negotiate and create new relationships, organisational structures and processes in the use of new learning spaces (Jamieson et al 2000, Barret and Zhang 2009) i.e. creating decision making structures and processes for ongoing ownership of change

- Failure to address management of transition such as unexpected costs, dysfunctional spaces, mix of old/new/temporary buildings
- Failure to explore the significant relationships between organisational planning, school culture and leadership, the use and meaning of learning spaces, and student academic outcomes (standardised test scores). Architectural and EP literature ignores empirical research from effective schools, school improvement, leadership and educational change (ESIL) (Burch and Theoharis 2010).) that culture, resources and leadership are critical conditions indirectly influencing student learning. The ESIL literature ignores the built environment (See review by Thomson 2009).
- Does not address the importance stressed in critical pedagogy and ESIL literature of need to prepare teacher's through ongoing professional learning for use of new learning spaces
- Affective dimension in the literature equates "feelings" as a response to the quality of physical conditions and not "feelings" about the need to change and find new ways of working. Ignores change literature about addressing the affective dimensions of change, teacher and student anxiety (Leithwood and Beatty 2008, Cotterell 1984).

Phase 3: Consolidation in practice

Consolidation is what happens in practice as buildings are used by teachers and students for the purposes of teaching and learning. There is a paucity of literature on what practices become institutionalized over time with regard to the use of space and time and their impact on teaching and learning. Instead, this largely US based sets of quantitative controlled sampling studies focus on post-occupancy evaluations (POEs) designed by the building industry and largely completed by architects, principals and head teachers. They take little account of the complexities of teaching and learning or the lived experience of living and working in these buildings. In these evaluations, students and teachers are at best 'respondents" (Comber, Nixon et al. 2006). The notion of "occupancies" takes away ownership from the schools and their communities (Compare DEECD 2009).

Our conceptual framework sought to move beyond teacher and student responses to identify practices or what is enacted.

Teacher practice

Changes in pedagogy

As noted by Higgins, Hall et al. (2005),

> the relationship between people and their environments must be complex, and therefore any outcomes from a change in setting are likely to be produced through an involved chain of events. It is the defining and understanding of these mediating chains that is the key (p. 35).

There are few studies that focus on pedagogical change and if so were highly general using aggregated outcomes. The DEECD (2009) research on 162 schools, although with a strong ICT focus, outlines the ways in which these schools have used resources for time, space and ICT to change teacher practice. Lippincott (2009) found that while 'New—and newly renovated—classroom buildings, libraries, and computing labs were highlights of campus tours for prospective students", the buildings themselves did not result in changes to pedagogical practices or to student learning unless teachers and students were involved in their design. The few observational studies, such as Sztejnberg and Finch (2006) in a multi-method study in which trainee teachers spatially mapped classrooms, merely confirmed that if traditional seating in rows dominate, so do teacher-centred approaches.

Collaborative planning and teaching

There are a considerable number of studies that focus on increased collaboration when spaces and curriculum are specifically designed for collaborative teaching and learning, (Blatchford, Baines et al.

2006; Tolmie, Topping et al. 2010). Gislasen (2009) found that physical design facilitates collaborative, multidisciplinary teaching practices and that the open-plan environment contributed to the creation of social capital. Thorne (2002), in examining schools in Western Australia, found that there were a wide variety of factors that contributed to collaboration including space. This study emphasized the key role principals take in leading their schools and the necessity for multiple leaders (often senior teachers or other members of staff) to be fostered in schools undertaking significant curriculum and pedagogy change.

Ability to change space/flexibility
Often spaces need to change their usage over time and a good design initially enables this "without burdening the taxpayer" (Locker and Olsnen; Locker 2007). The requirements placed on a space may vary throughout the school day or year to year with changing demographics and student needs. Herman Miller Inc (2009) explored how space can be adapted to multiple functions in support of the learning experience but no investigation was made to whether improved satisfaction was connected to improved learning outcomes.

Students

The OECD (2005) argued that governments have a responsibility to invest in quality educational spaces because of the important role of quality spaces in increasing access and equity for all in education, improving educational effectiveness and promoting acquisition of key competencies, as well as optimising building performance and operation. Again, little empirical research was cited in this report.

Engagement in learning
Considerable evidence correlates poor conditions with negative outcomes on students and teachers(Price Waterhouse 2003, Fisher 2002, Filardo 2008). Rudd, Reed et al. (2008) found that student engagement increased in newer, well-designed buildings. Greene, Miller et al's (2004) research noted that student perceptions of classroom structures are important for their motivation, particularly if current class work was instrumental for future success, which included how the curriculum was reshaped in the new buildings. Of the few studies of outside school spaces. Black's studies (a,b,c)of the City as a classroom was a learning experience that makes education a public activity outside schools with positive sense of engagement.

Quality Learning

Collaborative learning experiences
There is a reasonable body of literature on the facilitation of collaboration through appropriately designed physical spaces. Numerous studies argue for the particular role of libraries in collaborative learning (Bridgland and Blanchard 2001; Keating and Gabb 2005; Folkestad and Banning 2009). Wolff's (2002) systematic analysis of how physical environments support and encourage collaborative, project-based learning found that it was extremely difficult to determine the essence of what was important in terms of the design, concluding that it was the interrelationship among the design elements that was significant. Dahey (1994) found that putting students into groups does not necessarily lead to co-operative learning unless there is a shared and common goal leading to positive interdependence, face to face interaction, individual responsibility, social skills and group processing that had a clear pedagogical focus. He cites Slavin's study that 63% of groups in cooperative learning increased achievement scores. This has implications for use of space in terms of class size, group size, space, personalisation, comfort, safety and classroom furniture.

Personalisation

Personalisation has various meanings. In the architectural paradigm, personalisation is about making a space feel like home, familiar, a place of one's own, a sense of ownership, implying safety and /or privacy as achieved through photos, art, physical dividers etc. Much of the literature on personalisation focuses on non-educational workplaces and need to personalise the space rather than school. Wells and Thele (2002) found that while psychological studies tend to suggest personalities that are creative have high need for affiliation and low need for privacy, not linked to personalisation of space. Status and type of workspace are more likely to impact on level of personalisation. Open staffrooms raise issues of privacy, confidentiality and security for teachers.

In the educational paradigm, personalisation is about developing good personal relationships with students; about social inclusion by recognising student diversity (gender, race, class, religion, ability); and addressing individual learning needs and preferences. A pedagogical repertoire based on personalisation ranges from individual computer based instruction to facilitate basic skill acquisition through to individual learning plans and mapping pathways, e-portfolios (Jenkins and Keefe 2001). Strategies of personalised learning include multimodal approaches to teaching and flexibility in classroom settings conducive to learner-centred and project-based interdisciplinary pedagogies. Some examples of this include individual computer assisted skills learning, style based instruction, self paced learning, contract learning, guided practice through coaching, co-operative learning in small groups and project based or topic study. Multiple activity centres are created to facilitate individual, group and whole-of-class and lecture-style learning. Personalisation is sometimes linked to small classes to facilitate teachers as coaches and advisers able to diagnose student learning characteristics as well as to a school culture of collegiality, flexible scheduling and pacing (Jenkins and Keefe 2001). Again, it is implied but not addressed that each strategy requires different types and use of space and time. There is some discussion around early childhood, personalisation and safety (Dahey 1994). Killeen et al (2003) examined how the permanent display of student artwork in educational spaces provided a sense of from the ownership arising from personalisation, sense of control, territoriality and involvement.

Privacy and ethics

Using "booths" set up for privacy in the classroom, Ahrentzen and Evans(1984) seek to examine the environmental features of elementary school in relation to distraction and privacy. They found that when they wanted to be alone, children prefer to be in secluded study areas or corners, rather then the total privacy of the booth, while maintaining visual contact with others. Visually open and accessible teacher staffrooms also mean changes in 'staffroom talk' about student progress (Gordon and Lahelma 1996).

Spaces

Maintenance

Buckley, Schneider et al. (2004), in a study that focused on teacher retention observed school conditions—facility conditions and maintenance variables including conditions of lockers, visible graffiti, and frequency of cleaned classrooms—in LA and Milwaukee while controlling for public and neighborhood socio- economic characteristics, school size and student reported motivation levels. They found 'higher reading scores among elementary and high schools students in better–maintained schools (p. 65). Poor school buildings had negative affect on teacher retention.

Assessment of effectiveness

A Canadian study by Roberts (2009) found that engineering assessments of facilities are unrelated to the Quality Teaching Learning Environments in schools but that the educators' assessments of school facilities are systematically related to the QTLE in schools. Research on measurement tools as to the educational relevance of school facilities.

Intangibles

Abdul-Samad and Macmillan (2005) argue for improved understanding of the impact of design on a range of outcomes and new valuation methods (e.g. measures of affect, visual methodologies) for capturing the "intangible" outcomes—engagement, social cohesion and feelings of wellbeing- as a major measure of design quality and desirable outcomes.
Eclipse Research Consultants (2005) evaluations could be improved if measurements of intangibles as "an adjunct bundles of value" are included . Comber, Nixon et al's. (2006) study *Urban Renewal From The Inside Out* examined the redesign of an outdoor area in a low SES South Australian community "being improved for someone else and someone else's children" due to gentrification (p. 232). Teachers and children were repositioned from being "responders" to architectural designs to being the designers of new spaces. Children through collaborative projects were the negotiators, designers, and imaginers of new inclusive spaces promoting identity, while providing tangible material outcomes for the school community. Researchers were repositioned from being novices to learning new architectural concepts, vocabularies and practices. Architects had to learn "how to consult with children as clients, informants" (p.233).

Environmental sustainability: Green schools
A key aspect of new school design is modelling environmental sustainability, as with the UK Sustainable Schools initiative, yet the link between participation in designing schools and sustainable behaviour is complex (Wheeler 2008). The design of outdoor spaces is informed by a number of factors such as site and location which impacts on scale and type of outdoor area, natural resources of the school as well as the commitment to environmental sustainability and outdoor learning. In some instances, the principles of environmental sustainability have been integrated into the school design and expected to be sustained by having children involved not only in the design but in care and use of the outdoor space in teaching and learning e.g. UK Future Labs projects such as Fountaineering and Super Sleuths encourage teams to be involved in problem solving, which was then integrated into classroom work (Lee 2007). That is, young people have to discuss what it means for community relations and social cohesion and reconcile with their own consumption and that of friends and embed issues of sustainability in and through pedagogies.

Gislason (2009) found that in a senior environmental college, the schools design was a scaffold for the curriculum and interdisciplinary pedagogies. An outdoor pond and outdoor classroom were springboards to curricular units and nurtured a pro-environmental attitude. The students indicated preference for 'natural environment' (which included facilities) as against confines of classroom and applied learning had positive psychological effects. In a large US quantitative study, Tanner (2000) identified design patterns that significantly predict academic achievement on standardised tests:

- *Technology for teachers.* Accessibility was the critical features and teachers need well-defined convenient office clusters with telephone, internet, fax etc with computers located in various spaces…internet access not fully available across sample.
- *Pathways:* clearly defined areas externally for freedom of movement and flexible movement internally. Lack of pathways often means high spatial density and interactions that are counterproductive, often leading to behavioural problems
- *Overall impression*: positive climate sends subtle messages to students and teachers.
- *Positive outdoor spaces*: those with poorly designed outdoor space had lower ITBS scores.
- *Light* did not emerge as often windows were covered, and the safe location was violated because of busy streets and location.

Tanner & Lackney (2006) concluded that schools in harmony with nature had higher scores and with a curriculum focused on environment. No low scoring schools on above factors had high scores.

ICT

Much of the most recent literature is driven by the need to incorporate technologies of various forms within learning spaces and how this demands both new teaching practices and creates new possibilities. In 2001, there was little systematic research on how the integration of ICT facilitated or enhanced learning outcomes, the focus being on technical expertise rather than pedagogical use, on technical pre-requisites in use of space (Morton 1999). Contemporary computing or other technology education is more ubiquitous, integrated across and into the curriculum. Computer use due to mobility of laptops, netbooks and wireless is pervasive and connectivity means blurring between school/leisure/work/home spaces. Spatially, design has moved from enclosed computer labs, to computer pods integrated into classroom layouts and now mobile laptops or netbooks as one of many pedagogical tools producing interactivity and connectivity with other learning technologies such as whiteboards. The issue now is how to facilitate the use of mobile technologies throughout schools, in transition spaces, in internet cafes where educational and social interactions can be encouraged while privacy and safety are addressed (Cilesiz 2009). Again the focus is on different configurations that facilitate easy access to ICT and use by individuals and groups, integration of ICT into curriculum (e.g Moulds and Harper 2008) with less focus on outcomes.

Libraries as Community Spaces

Australian research on libraries and space less systematic and national, and also focused on primary school, with some indication that library effects reduce into upper secondary as they go to play games, read, research, do leisure reading, and for privacy (Lonsdale 2003). Mobile technologies and wireless connectivity has now changed the design of libraries to make them more learner rather than equipment centred, requiring basic infrastructure (power points, storage, broadband). The issue is how these facilities are used interactively (Lonsdale 2003, Brook 2009). Libraries have been remodeled to be sensitive to student behaviour, independent work and problem solving. Lonsdale's (2003) review of literature argues that the changing nature and use of libraries means a librarian's work is characterised by teaching information literacy, using shared facilities, telecommunications, and multimedia, managing digital resources, and being web managers. Yet there are fewer qualified librarians and reduced funding of libraries. Lonsdale (2003) concludes that a strong well-resourced library program with a strong computer network, a high quality collection, and collaborative relationships between teachers and librarians in planning units, supported by professional development for teachers can lead to higher student achievement regardless of the socio-economic or educational levels of the adults. Test scores correlate with higher use of library.

Outdoor spaces, physical activity and nutrition

Also with the incorporation of early childhood into schools (K-12), the importance of play as pedagogy is fore-grounded as important in acquiring social cognitive and physical skills. There is also a desire for the school to reflect the culture and social mix of the student body, 'place as a form of knowledge' (Bingler cited in Meek and Landfried 1995). Critical to outdoor design is student safety and security as well as privacy. Other issues around physicality of design include scale (i.e. low door handles to welcome smaller children (Meek and Landfried 1995), transitional spaces such as external pathways and internal corridors, location of specialist buildings near certain areas e.g. kitchen garden close to technology areas (hospitality); ponds near science buildings (Tanner 2000). Again there is little research on effects of these designs. Research on playgrounds indicates there are positive effects on learning that playtimes and informal use of playgrounds provide, but schools undervalue their educational use and how playtimes is an important part of the social world of child. Free play is often problematised as risky—physical safety and bullying—rather than having positive benefits (Armitage 2005). But built environments can create new play spaces such as bounded spaces, walls for ball games, open spaces for fast moving games although they may reproduce cultural and gender boundaries.

Furthermore, there is little research on the type and use of space required for sport and physical activity despite significant empirical research linking few extracurricular activities, low levels of physical

activity and childhood obesity to poorer learning capacities and often disadvantaged communities (e.g. Davidson's (2007) review of childhood obesity prevention; Dagkas ad Stathi'a (2007) study of 52 urban 16 year olds). Forest Schools (120 in UK) are modelled on the Scandinavian idea that children's contact with nature is important developmentally. A participative exercise reviewed the program's impact on children: confidence was developed with freer time to earn space and demonstrate independence; social skills as children gained greater awareness of actions on peers in team activities; communication in terms of language development prompted by sensory experiences; motivation and concentration as woodland led to keenness to participate; physical skills in terms of stamina and gross and fine motor skills and knowledge and understanding of natural surroundings and respect to environment. In addition, teachers gained a new understanding of the children and there were ripple effects as children talked about experiences at home. We note in Victoria there are no studies as yet of the impact of the Stephanie Alexander Garden Program.

Effect of spatial on attitudinal, behavioural, learning, affective outcomes

Environmental psychology has dominated attempts to assess the effectiveness of learning spaces on student outcomes, with the emphasis on quasi-experimental reduction models (Weinstein 1979). Few of these studies show any direct causal link between positive achievement in standardized tests and improved or new learning spaces. Many show negative correlations between specific aspects of building quality and outcomes. Most studies cite that mediating factors are the absent or uncontrollable factors (Tanner and Lackney 2006, Gifford 2002, Weinstein 1979). Dudek's (2000) work on the historical development of educational architecture and design provides the strongest body of evidence to date as proof of the links between space, pedagogy and outcomes.

Gifford's (2002, p. 298) theoretical framework for examining educational settings (based on Weinstein) states:

> …the personal characteristics of students (past school experience, attitudes toward learning. Age. Gender, personality) interact with physical features of the learning setting (its size, noise level, climate, population density and design) and the social-organizational climate (rules, curriculum, teaching style, progressive or traditional orientation) to produce learning-related attitudes (satisfaction with school, dissatisfaction with classroom, commitment to learning) and behaviors (class participation, attention to learning materials questioning, appropriate or inappropriate activity, persistence, creatively and, of course, learning and performance).

Gifford's analysis of EP findings for educational settings indicates that:

- Interior architecture has an influence on whether students are distracted or if they retain and recall information.
- Aesthetics has a positive effect on grades but this is often gender and age subjective.
- European studies indicate aesthetic appearance offers subtle message on staff and students such as the transmission of cultural values, stimulate or subdue, aid in creativity, slow mental perception and cause fear and joy.
- Scale of building, structural shape also impacts on behaviour
- Noise interferes with learning and may be gender specific (girls more affected than boys), and has a negative effect on students with autism.
- Incandescent is preferable to fluorescent lighting and although inconclusive studies have found adverse effects on learning outcomes from fluorescent lighting.
- Performance is best in cool but not humid classrooms. Air flow, temperature and air quality all have implications for learners in terms of health and well being but multiple mediating factors are involved – clothing, culture, home etc.
- Amount and arrangement of space is very important for classroom performance and related behaviours. This directly related to teaching strategies. Open learning spaces have positive

effects on outcomes where teacher pedagogy is matched and there are fewer behavioural problems.

- Space also affects teacher and learner feelings. This is specifically related to density, flow and furniture.
- Increased density leads to increased aggression that can be counteracted by pedagogy, layout and programs. Students need a degree of privacy and ownership to feel a sense of belonging.

The Research on the Impact of School Facilities on Students and Teachers A Summary of Studies Published Since 2000 (21st Century School Fund 2009 p2) combined with Schneider's Review 2002 "Do School Facilities Affect Academic Outcomes?" gives us a substantial body of evidence relating outcomes to space. Many of these studies have used regression modelling and in themselves are inconclusive but combined give a strong indication of the links. They conclude

- *Indoor Air Quality (IAQ)* due to mould and airborne bacteria having adverse effects on children's and teacher's health
- *Temperature and Humidity* – creates conditions which lead to Sick Building Syndrome and relative absenteeism and mental acuity
- *Ventilation and Air Flow* – is an occupational health and safety issue because children require more air in proportion to their body weight than adults. Studies indicate that air flow from windows is inadequate in schools to remove or prevent the build-up of carbon dioxide, poor air flow leads to poor performance of tasks.
- *Thermal Comfort* – have now determined the optimum temperature for learning, retention, task performance and job satisfaction
- *Lighting* – both natural (day) and artificial lighting have considerable effect on learner performance, Natural light optimizes student achievement and aesthetic perception
- *Acoustics* – good acoustics—quality rather than amount of noise- are fundamental to academic performance.
- *Building Age, Quality and Aesthetics* –effect student and teacher perceptions of safety and well-being. Building age not as important as quality of building conditions (Blincoe 2008). Students generally perform better in modernized or new environments but difficult isolating mediating factors, and therefore inconclusive
- (Buckley, Schneider & Shang 2005, Earthman & Lemasters 2009, Crampton 2009, Cellini, Ferreira, & Rothstein 2008, Tanner 2009, Hughes 2006, Schneider 2003, Bullcock 2007, Branham 2004, Duran-Narucki 2008, Sheets 2009, Picus, Marion, Calvo & Glenn 2005, Blincoe 2008, Buckley, Schneider & Shang 2004, Boese & Shaw 2005, Chaney & Lewis 2007, Kumar, O'Malley & Johnston 2008, Stevenson 2001, Earthman & Lemasters 2009, Buckley, Schneider & Shang 2005.Mendell and Heath 2005, AHMAN and Lundin 20000)
- *Furniture and carpets*: dampness and pollutants related to health problems eg. asthma
- *School Size* – the historical trend toward larger schools has been based on economies of scale. Restructuring for smaller neighbourhood or multi-campus schools and learning communities is having a positive effect on student outcomes and size can be the best predictor of test scores (Tanner 2009, Plank, Bradshaw & Young 2009).
- Reducing violence and disruptive behaviour
- Improved attitudes and behaviour
- Improved teacher attitudes
- Cost effective
- (Cellini, Ferreira, & Rothstein 2008, Crampton 2009, Branham 2004)
- *Class Size* studies are inconclusive not due to findings but due to varying methodologies:- pedagogy, environment (arrangement), age and stage, flow, density, crowding and privacy are mediating factors which are unable to be accounted for in studies of class environments.
- *Classroom design:* issues around viewing of teacher, board etc again largely focusing on obstructions and not linked to specific outcomes; use of all walls etc (Al-Haboubi and Ishteeaque 2000; Architectural Record 2005). What exists focuses issues such as spatial density, class size etc and impact on student outcomes (Garue, Oen, Hatch, Rao and Fadali 2005; Nye, Hedges and Konstantopooulos 2001, Gilstrap 2003). Glass et al (1979) and Gilstrap reviews indicate overcrowding or high spatial density reduces

achievement but not pedagogical strategies, social relationships and outcomes. Research on use of furniture in relation to crowding has been in offices rather than schools (Brennan et al 2002).

- Buckley et al (2004) in LA district found that compliance with health and safety regulations were positively related to academic outcomes.

The Price Waterhouse Research Report (2003) provides the most rigorous and expansive study to date, with 2000 schools in the UK being evaluated for building performance and student outcomes using mixed methods including 3 years of quantitative statistical data. However, they highlight the same mediating anomalies in their study that Gifford and others recognize and no measure of teacher practice is included within the data although it is recognized that this is a sustaining factor.

Gender and space

There is a well-established literature on how space is gendered historically and experienced in culturally different ways (Massey 1983, Gordon and Lahelma 1996). Feminist research indicates that use of space in and outdoor is still largely monopolised by boys, particularly outdoor spaces, for sport activities. Dedicated time/space use is one strategy. Weis and Centrie (2002) indicate that whereas schools can represent cultural affirmation and advancement for a cultural group, spaces within schools have same capacity for recognition of difference and cultural affirmation e.g. girls' room and a homeroom for Vietnamese students. But again little contemporary evidence on whether and how culture and gender are factors in the use of space and place attachment (Proshanky et al 1983) and spatial identity (Fried 2000), and if so, are there differential effects in terms of learning outcomes.

Gaps in the Consolidation Phase

Overall, when it comes to what practices are enabled through new learning spaces and with what effects, Fisher (2005) argues that existing literature that links learning spaces to student behaviour and learning is overly general and around key measures of building conditions. Gifford (2002) outlining the strengths and weaknesses of environmental psychology methodologies at three levels: fundamental processes (perception, cognition and personality), social management of space (personal space, territoriality, crowding and privacy) and the complexity of behaviour within space (working, learning, daily life and community). Perceptual studies utilize methods that include self-reporting, time sampling, behaviour inference, psychophysical estimating and phenomenology. Spatial cognition utilizes sketch maps, model construction, distance estimation and observation with the understanding that age and stage biases will affect how this data is presented and collected. The difficulty with perceptual studies is that researchers 'sacrifice experimental control, but in return are able to investigate the perception of real, complex settings that perceivers move through and feel connected to.' (p23)

There is little research on the role of the mediating variables—teacher professional development, intangibles etc and research has to now give equal weighting to pedagogy. Research is lacking on

- teacher and students' voices about learning spaces and how they change attitudes and practices, and with what effect.
- The relative importance of key determinants changing pedagogical repertoires—new learning spaces; student need; imposed or bottom up reform?
- psychological and sociological studies on the cultural and gendered messages and values imparted through built space
- use of transitional spaces (indoor/outdoor) and how these relate to issues around safety and privacy
- structures and processes that sustain the quality of a learning environment (built and socio-cultural)

- unpacking the complexity of assessing how spaces/relationships between different aspects of the spaces work together such as the intangibles of inter-relationship between spaces/furniture and activities
- spatial and temporal factors that assist collaborative learning and how different aspects of space work together in terms of relationships and with what effect
- how flexibility of space and mobility of technology and furniture impacts on use of space and learning by teachers and students
- testing the value of good design quality on outcomes: does this plateau over time?
- Testing the impact of innovative design for T & L for new ways of teaching and learning, and interaction of design feature
- Understanding relative value of investment in different areas e.g. relative benefits of capital investment in different aspects of school design e.g. refurbishment, rebuild, ICT
- Understanding the relationship between school buildings, effective school environment and complex interacting factors such as location and social mix that impact on learning and outcomes
- does the ownership of staff and pupils over built environment have long term benefits?
- How do teachers and students shape space for themselves pedagogically by using patterns of movement and circulation and patterns of daylight and views? Is there a specialized language that empowers people to create multiple spaces?
- Do changes in student populations and social mix result from new schools rather than attributing achievement differences to new school buildings i.e. indirect rather than direct effects. Can new schools hold onto or attract middle class families and thus change social mix that we know is important for raising of achievement scores? (Fuller 2009)
- What are the relationships between spatial/temporal elements, individual learning, social mix, and cultural contexts central to issues of personalisation, ownership, identity and inclusion?
- explore which spaces or combinations make the most difference in terms of effective practice :-'*bundles of value'*(Price Waterhouse Cooper, CABE)
- How does *generative or participatory re/design impact on conducive learning environments?*
- Do flexible spaces and learning spaces improve student behaviour and if so outcomes (e.g. libraries) ?
- How to use innovative pedagogies in traditional classrooms inappropriate for new integrated curriculum and inquiry based approach
- Studies of transitional spaces (indoor/outdoor) and issues around safety and privacy
- Does the use of internal and external physical space by boys and girls vary- by age, space, over time?
- How do structural factors such as space allocated per student, openness of space, use of underground or windowless facilities, size, building utilization rates, support facilities (storage) and availability of specialist instructional facilities (labs) impact on learning

Phase 4: Sustainability of innovation and effects

There is little recent literature that focuses on the long-term effects of new physical spaces and built environments. In part this is because there is a time lag between recent system-wide reform initiatives commencing in the early 2000s and now further stimulated by the BER in Australia. One exception is a major UK Technical Reports of Building Futures (Price Waterhouse 2003). While there is some evidence that new schools can attract and retain students and staff, with an initial rise of morale, and student attainment, there is no research to indicate whether this is ongoing.

Langer (2005) indicates in US studies that a lack of ongoing funding for 'green schools' means many sustainable strategies (e.g. reduced energy bills, less emissions, improved indoor quality…) are limited,

thus compromising both the design and opportunities to make schools into 'living labs'. Likewise, lack of maintenance and care for appearance has a downward effect in the long run.

One of the few longitudinal studies of effects of neighbourhood of, schools, peers and families on school success for middle year students by Bowen et al (2008) found longitudinal data of 4071 student perceptions as to social environments (people and places) indicated improvement in school engagement, trouble avoidance and grades.

The question is after buildings are made adequate (and what that means is contestable), is there a limit to which the built environment factor alone may affect student and learning outcomes? The literature suggests that improvement would plateau but again there is little evidence. It also depends on what element(s) of design are being considered—light air quality, scale, usage—in relation to what outcomes (social, affective or cognitive) for what students.

Overall, there is an inability of the various research paradigms (engineering architectural, psychological, critical pedagogy….) to talk with and learn from each other, even though all were concerned about improving student learning.

Gaps in the Sustainability and Evaluation Phase

Little to no research on how

- the learning outcomes arising from practices in new learning spaces e.g. how playgrounds or leisure facilities are utilised, new technologies etc.
- what types and degrees of participation in serial redesign are most beneficial?
- how shared spaces change community relations and perceptions over time? e.g. libraries.
- practices in schools built to model environmental sustainability translate into student learning i.e. raising environmental awareness as a desirable outcome?
- patterns of use impacted on by outside/inside visual and spatial links '
- long is learning improvement sustained/sustainable?
- classroom design, furniture and pedagogical use interrelate? And with what effects on student learning?
- teacher professional identity is effected
- investment is most likely to lead to improve which student outcomes :- social, affective and cognitive? Outdoors, indoors, refurbishment, informal social space or new buildings in general? What has the greatest impact—aesthetics, technology, physical quality, age?
- shared community spaces (libraries, sporting centres etc) increase the type of parental involvement may affect student learning outcomes?
- the changing role of libraries impacts on outcomes e.g. information literacy.
- budget considerations of programs impact on capacity to maintain and upkeep learning spaces:- furniture, technologies and general improvements.
- transitional spaces (indoor/outdoor), anthropological and social aspects of design, sensory stimulation, context, schools within schools, harmony and views and vistas, functional zones, circulation patterns and supervisable spaces… i.e. *socio-spatial features of school* design work together and with what tangible and intangible effects.
- standardized templates of school design may be cost effective relative to student outcomes. Critchlow (2007) suggests short-term cost gains of standardization are lost in the long term as not a good fit.

Emergent themes

While there are multiple fields of research (architectural, interior design, pedagogical, organisational, psychological, environmental) exploring the connections between learning spaces and behaviour, each provides a different paradigmatic perspective that frames what is significant in the relationship and how one evaluates effects on student learning. Despite this, the different paradigms are converging on agreement as to the need to focus of the relationships between *contextual*, *organisational*, *pedagogical and social practices of different learning spaces*.

We would agree with Woolner (et al 2007, 47) that "while the research indicates the parameters of an effective environment, there is overall a lack of empirical evidence about the impact of individual elements of the physical environment which might inform school design at a practice level to support student achievement".

Such research, Fisher (2005) argues, should follow these steps:

1. What student abilities do we want to achieve?
2. How can we assess these attributes?
3. What pedagogies should be used to achieve these desired learning outcomes?
4. What learning environments should be developed to fit these pedagogies?
5. How can we develop a pilot program and evaluate it?" (p 166)

In alignment with this approach, there are new conceptual frameworks.

First, the emergent literature suggests that if educational systems listen to and work with children and teachers they can transform both learning spaces and pedagogical approaches, creating possibilities for rethinking all aspects of school design through the focus on *spatial pedagogies* (Comber et al 2006). Although not supported by longitudinal studies, our review indicates that design is ongoing (serial redesign)(Blackmore 2008) and so the "process of user involvement must be continually refreshed and iterated to support ongoing change" (Higgins et al, 2005, page 3). This puts the focus onto school organisation, whole school culture, teacher and student practice.

Buildings alone are not enough; it is about relationships and changing cultures and practices. Higgins et al (2005) as others argue that *participatory or generative design* involving students and teachers needs to continue through all phases from design to evaluation in order to achieve sustainable impact within a rapidly changing context i.e. 'serial redesign' (Blackmore 2009). Temple (2007) suggests that locally governed processes of change and engagement are also necessarily dependent on a process of renewal as staff and students move on.

> It is important, therefore to beware of ' architectural determinism', of plans from renewable and development that do not allow for both local variation and ownership, and of programs which do not budget for an ongoing investment in, and it oration of, school environments. (Higgins et al., 2005 p. 6)

Our review suggests key interconnected elements necessary to sustain innovation and ongoing improvement of student learning in relation to the spatial dimensions of schooling:-

- the school organisation and whole school processes and practices that inform ethos or culture of inquiry and learning.
- sustaining teacher, community and student voice gained through participatory design and embed participation into everyday practice and decision making and thus enhancing teachers' and students' sense of self efficacy and agency

Second, critical role of teacher professional learning and pedagogy as the key mediating factors is largely ignored. Unless teachers are prepared to and are provided with the necessary professional

skills, tools and resources to change their practices, then new built spaces will not move then from default to innovative pedagogies. The first generation of teachers or initiators who may have been part of the design process feel ownership; the second generation entering schools are expected to sustain and improve any initiatives in practice; and the third generation of teachers in teacher education who expect redesigned pedagogies, schools and classrooms to be the norm, but who may be confronted with wide variability in reality. Teacher educators therefore have to be prepared to teach how new pedagogies can be mobilised across a range of classroom and school design patterns.

Third, explore the differentiating aspects of spatial pedagogies that recognise the complexity of teaching and learning and the difficulties of creating permanent structures and processes. This requires a new grammar of socio-spatial practice that gets beyond the tangibles to consider the intangibles, from the language occupancy to that of ownership, from student and teacher response to student and teacher agency. Overall, where there is research (aggregate school outcomes and quality of buildings) and lacks any specificity in regard to

Differential use of specialist /generalist spaces by students and teachers
Different needs and use of space for each age cohort or social group

A fourth emergent theme is the significance of the relationships between physical and virtual learning spaces and context, system supports, organisational factors (culture, patterns of communication, resource use, professional support), in and out of classroom settings, formal and informal interactions. Heppell (2004) argues that 'No one knows how to prevent 'learning-loss' when you design a room "pedagogically", whereas we know lots about designing for minimum heat loss'. …Not only is the evidence incomplete, particularly in areas such as the systems and processes and communication approaches that schools need to underpin their physical environment, but the research that has been done seems to be largely predicated on a traditional view of 'chalk and talk' learning in standardised 'one size fits all' institutions. (Higgins, Hall et al. 2005). The social practices of teaching and learning are closely associated with issues of identity, ownership and agency in relation to use of space and time i.e. the intangibles that include the affective, cognitive as well as social aspects of teaching and learning and organisational change.

These conceptual frames provide methodological hooks into the research on space and outcomes.

Future directions

New theoretical trajectories

There is convergence across the different paradigms towards generative design/redesign involving all stakeholders in the design/redesign process. The Price Waterhouse Technical report, *Building Schools of the Future* reported that the involvement of users (such as principals, teachers and students) is important in design of buildings and pupils benefit when they are involved in building planning and design.

Educators argue from the perspective of a 'critical pedagogy of space' (McLaren 1999) that focuses on working with teachers and children as well as architects in the re/design of the spaces. "One of the lessons that children learn from a very young age is that space is both enabling and constraining" (Morgan 2000 p281). At the same time, Lodge (2005) argues it depends on the purpose of student participation both in the design and transition phases: whether for functionalist and institutional reasons such as quality control or compliance to new rules of use, or students as sources of information or to encourage dialogue or more active view of space and pedagogy related to identity formation and community. New spaces should not lead to increased regulation.

Associations between identity formation and space are most recently theorised through notions of *'place attachment'* (Proshanky 1983) or how individuals identify with a place and gain a sense of belonging a *spatial identity* (Paechter 2004, Fried 2008). Emergent literatures on social geographies, critical pedagogies and eco-feminism refer to *place- conscious education* (Gruenewald 2003) that focuses on how space interacts with social relationships within specific contexts. Recent socio-psychological literature also refers to importance of the need to 'put a stamp' on the space or have the capacity to change the space to suit one's own use, what is referred in the design literature as *personalisation* (Lee 2007) or *ownership* (Killeen et al.2003). If people feel connected to a space, included and a sense of agency over the space, the literature suggests they are more likely to engage in behavioural change (and be ready to learn).

The focus theoretically and in terms of evidence is on relationships between learning spaces and enacted practices of teachers and students. But this also requires ways of theorizing changes in practice in relation to space and time. Arnot and Reay (2005) use Bernstein's notion that student voices and their talk (messages) can inform us about the structure of pedagogic communication that informs their identities. Researchers can tap into the various registers of student talk: classroom talk, subject talk, identity talk, code talk. This suggests if we are to understand how space influences learning and identity formation we need to tap into all registers if we are to consider all types of learning outcomes[i]. Jacklin (2004) draws from Bernstein's notion of 'rhythmic' pedagogic practices that also addresses the temporal aspects.

A third theoretical trajectory is that schools are no longer static or fixed places, enclosed territories or bounded places, but part of wider networks of relationships i.e. neighbourhoods, virtual and real communities (McGregor 2003). Schools are sites of intersecting networks of relations, technologies and practices in which space-time relations are constantly remade. A de-territorialisation of schooling is occurring (See also Thomson & Blackmore 2006). Further research is required on what this means for educational practices and organisation, and in turn on student learning.

Methodological approaches

Much of the research has been quantitative using statistical methods of large databases with a focus on standardised tests, most often in the USA. Some studies use quasi-experimental methods e.g.

comparisons between school populations before or after occupancy, or schools in new or old buildings, using a range of measures (eg. Maxwell 1999). While these provide sound data re quality of conditions of buildings, they neglect the significance of context and school cultures and the interpersonal dimensions. Survey data tends to focus on teacher and student perceptions of impact of space on own behaviours and learning but not on how this connects to their learning. Qualitative studies based on ethnographies or case studies usefully identify the intangibles and tenuous or conditional nature of direct links between built environment and a wide range of student learning outcomes. The case studies tend to focus on the space itself and not what is done in the space, or the effects of redesign/building.

This review suggests that there is a need for longitudinal studies that a focus with greater specificity on different teacher and student practices in different spaces. The methodological focus of exploring how space produces particular social practices, and in turn how social practices change spaces, would require multiple approaches

- Visual ethnographies that observe different uses of different spaces (open/specialist) (e.g. time lapse, video recall)
- Longitudinal studies that look at patterns of use of buildings, specific spaces and changes in pedagogical practice linked to specific learning outcomes
- Teacher and student reflection on meaning making, sense of self, learning and space (visual methodologies, self reporting etc…)
- Student and teacher action research exploring use of space and time i.e. focus on ongoing inquiry and problem solving
- Organisational and policy analysis that address how contextual changes in policy, resourcing, system support, and demography impact on use of spaces
- Case studies that explore relationships between school cultures and organization pedagogical practices in use of space, and student outcomes
- Identification of the types of professional development and supports that are most likely to lead to productive use of new learning spaces
- Geo-spatial mapping technologies
- Explore the range assessment tools that could be incorporated in ways that fit with our conceptual framework and that could be used also as research tools (See appendix 3B)

Conclusion: Learning places not learning spaces

We would suggest that the focus should be on people and learning places and not spaces. Place attachment and spatial identity is critical to learning. ‘While designers and architects use spatial models to support interaction’ research shows that it is ‘actually a notion of place which frames interactive behaviour’(Harrison and Dourish 1996). Place attachment can be produced through how learning spaces are designed and used. It is place attachment and various bounded places that impact on social interactions critical to student engagement and learning.

The literature indicates that space produces social relationships including learning, and that in turn teacher pedagogies and school organisation impact on the usage of space. If the focus is on a wide array of learning outcomes, social, psychological, affective, physical as well as cognitive, then the literature indicates that new learning spaces can, but do not necessarily, improve student learning.

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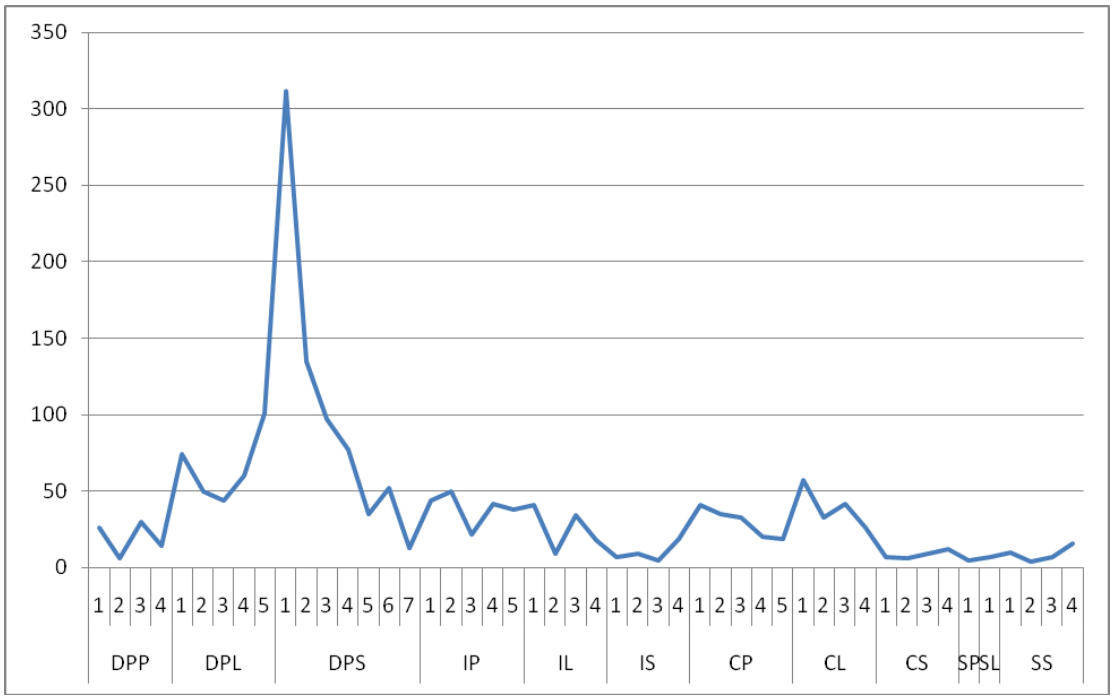
Appendices

Appendix 1

Below is a graphical representation of Table 1.



Coding Terms	Practitioners		Learners		Spaces	
Design	Consultation in design	DPP1	Personalised needs	DPL1	Principles and philosophical aspects of design (includes physical environment and influences on well-being)	DPS1
	1st generation users	DPP2	Voice through consultation	DPL2	Specialist use of space	DPS2
	Preparation for pedagogical change	DPP3	Access/availability to resources	DPL3	Contemporary approaches and trends within education broadly	DPS3
	Availability of resources	DPP4	Social	DPL4	Policy	DPS4
			Achievement	DPL5	Infrastructure	DPS5
					Furniture	DPS6
					Time	DPS7
Transition	Orientation to space	IP1	Needs of different learners	IL1	Governance	IS1
	Rethinking practices for teaching	IP2	Gendered spaces	IL2	Community-shared spaces	IS2
	Professional learning	IP3	Reorienting/positioning as learner within space	IL3	Access	IS3
	Adoption of space	IP4	Privacy and safety	IL4	Security	IS4
	Challenges of space	IP5				
Consolidation	Changes in pedagogy	CP1	Engagement in learning	CL1	Management	SP1
	Responses to space	CP2	Quality in learning experiences	CL2	Maintenance	SP2
	Collaborative planning and teaching	CP3	Collaborative learning experiences	CL3	Flexibility	SP3
	Enacted curriculum	CP4	Personalised learning	CL4	Fitness of purpose	SP4
	Privacy and ethics	CP5				
Sustainability/ Re-evaluation phase	Creativity and learning design	SP1	Creativity and problem-solving	SL1	Possibilities of redesign	SS1
					Virtual within the virtual	SS2
					Innovations	SS3
					Sustainability	SS4

Appendix 2

Databases such as ERIC, Ebscohost, SAGE, Science Direct, Inforword, ISI Web of Knowledge, Newsbank, national and international libraries, government (local, national, international) and Google scholar. Subject/discipline areas searched were Education, Health, Architecture, Urban Planning, Social Policy, Brain Science, ICT

Websites of most use include:

National Clearinghouse for Educational Facilities	www.edfacilities.org
Learning Through Landscapes	www.ltl.org.uk
Design Share	www.designshare.com
Educational Design Institute	www.edi.msstate.edu
Council of Educational Facilities Planners International	www.cefpi.com
Commission for Architecture and the Built Environment	www.cabe.org.uk
Futurelab Innovation in Education	www.futurelab.org.uk
Educause	www.educause.edu
Space Management Group	www.smg.ac.uk
American Institute of Architects	www.aia.org
Centre for Teaching: Learning Spaces	www.vanderbilt.edu/cft

Keywords & Themes:

Design
aesthetics
architectural models
between spaces
building design
buildings
classroom design
classroom diversification
classroom practice
ecology
environmental psychology
environmentalism
environmental models
environments
flow
furniture
hallways
indoor
intangibles
learning spaces
open planning
outdoor
school design
sustainability
transitions
water tanks

Planning
classroom plans
classroom strategies
curriculum planning
lesson planning
pedagogy

Specialised Spaces
art classroom design
computer laboratories
gymnasium
multipurpose
performing arts spaces
science laboratories
specialist spaces
technology spaces

Student interaction
co-operative learning
extracurricular activity
learning outcomes
personalised learning
student engagement
student mobility
student responses
student space
student teamwork

Teacher interaction
collaboration
collaborative teaching
professional learning
teacher education
teacher mobility
teacher responses
teacher space
teacher strategies
teacher teamwork

Technology
ICT
interactive
smartboards
technological design
technologies
whiteboards

Time-Space
asynchronous
temporality
schedules
spatiality
synchronous
time-tabling
time-use

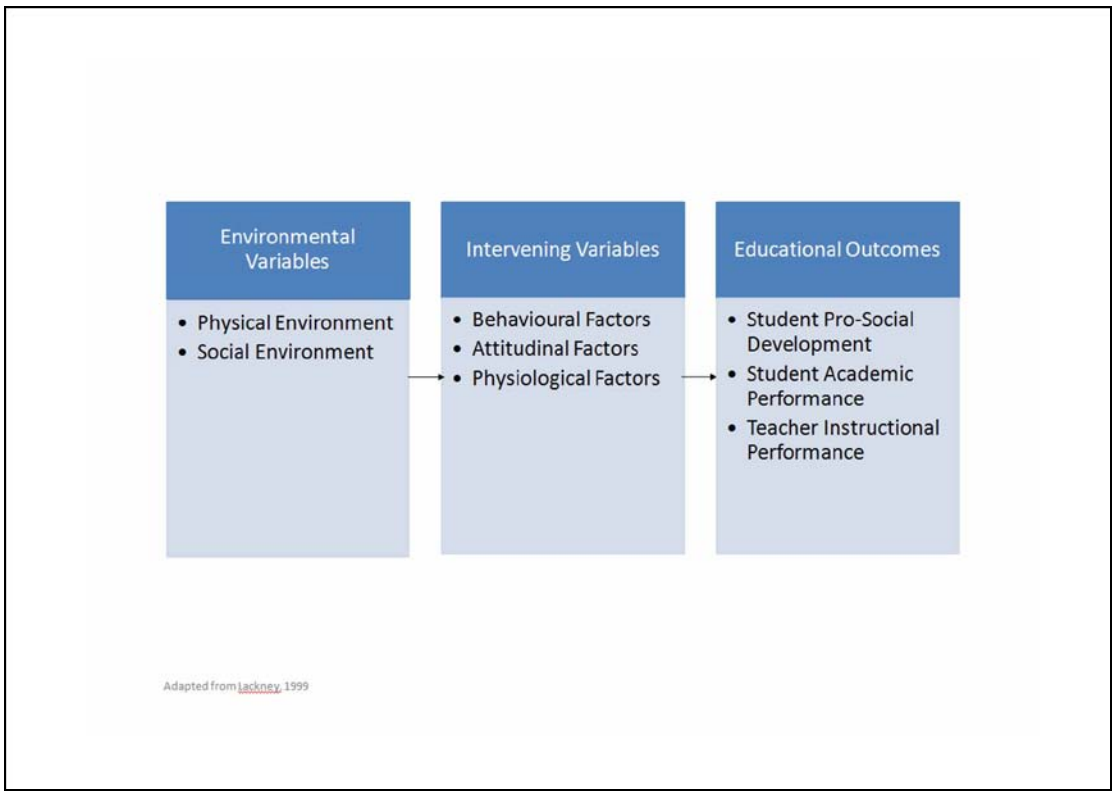
Usage of Space
building sharing
building usage
community spaces
external environment
forest spaces
green spaces
flexible environment
learning environment
physical environment
physical space
outdoor spaces
shared spaces
sharing spaces
space
utilisation of learning space

Well-being
emotional safety
physical safety
well-being

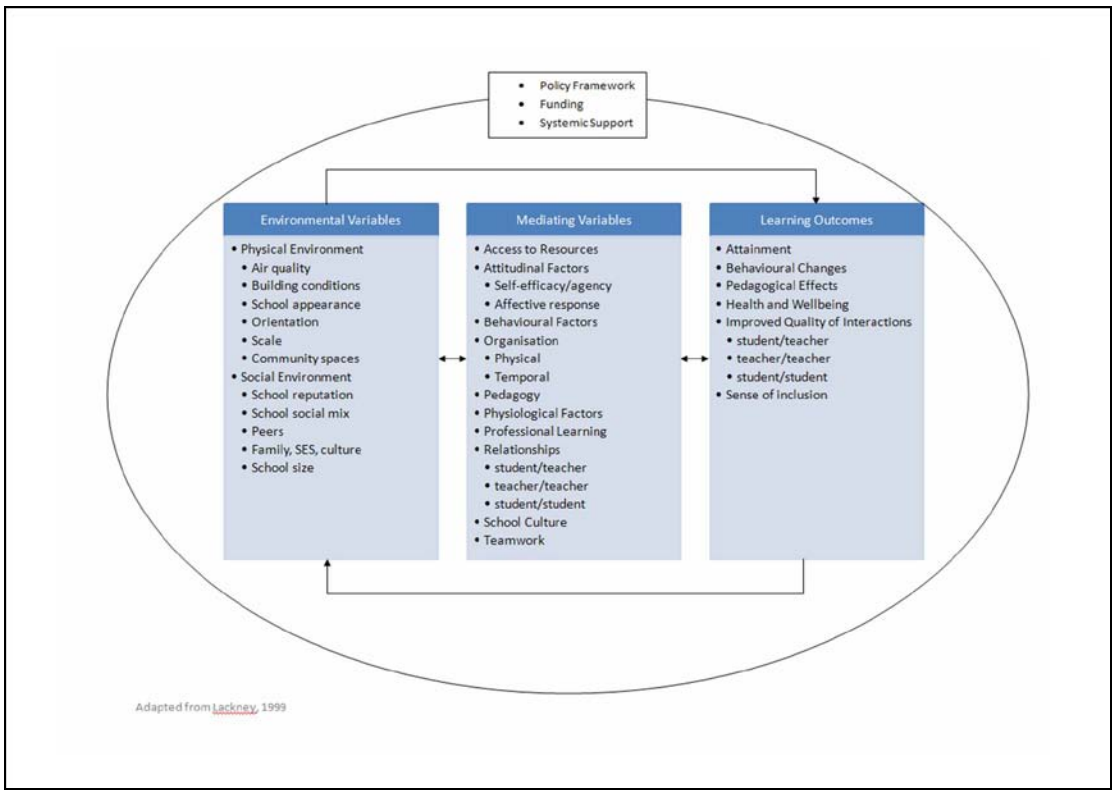
Other
relationships

Appendix 3

A)



B)



Appendix 4

Principles of Learning Space Design (Fisher, 2005)	
Principle 1- Individual settings	Describes types of spaces and spatial qualities that support individuals and research/they are essentially for self-directed learning. Student home-base, individual pod.
Principle 2- Group settings	Describes types of spaces and spatial qualities that support groups. Movable furniture allows spatial organisation to be controlled, facilitates small group collaborative and cooperative learning activities such as collaboration incubators, presentation spaces, display spaces
Principle 3- Activity rich settings	Describes types of spaces and spatial qualities that support activity. These spaces will be technologically enhanced and contain a range of services and other resources according to the studio space type. Project space plus wet areas, specialised focus laboratory.
Principle 4- Informal learning settings	Describes types of spaces and spatial qualities that support informal learning:- problem-based learning and collaborative team-based activities in non-timetabled spaces scattered across the campus in corridors, verandahs, cafeteria and library... outdoor learning, break out spaces
Principle 5- Staff settings	Describes types of spaces and spatial qualities that support activity that should not be isolated from students. Adult learning approach supports staff taking time out... teacher meeting, resources, in a supply plus school

Appendix 5

Fisher's (2005) synthesis of assessment tools

Transition phase:-

- *Sannoff's Assessment Tool (2001)*
  This tool includes a six factor *school building checklist* which is a post occupancy evaluation walk-through. This looks at the key elements of *context, massing, interface, wayfinding, social space and comfort.* There is also a *School Building Observation Form* which allows first time visitors in particular to give initial impressions of the buildings and spaces. The third element of the process is a *School Building Rating Scale* which is qualitative assessment took which rates physical features, outdoor areas, learning environments, social areas, media access, transition spaces and circulation routes, visual appearance, and safety and security. It uses 55 statements which can be rated by students, staff and community. There are also photo questionnaires and interviews in which users can assess positive and negative reactions or feelings regarding each space using a *Space Rating Scale.* Also included is a poem template for students to respond called *I Wish My School….*Finally a facilitated dialogue between stakeholders using *Relating Objectives for Learning to Education (ROLE).*

- *BREAMM Building Evaluation Assessment Method –*a computer generated post-occupancy evaluation tool which requires specialist training and analysis but adaptable to include use by students. It looks at management, health & wellbeing, energy, transport, water, materials, land use, ecology and pollution. The focus of this tool is on conditions and not outcomes or pedagogy, but could be adapted to develop projects associated with environmental sustainability and health.

Consolidation phase:-

- *OECD/PEB EQES (Evaluation of Quality in Educational Spaces) 2009* – asks 5 broad research questions regarding the 22 Quality Performance Objectives (QPO). These are:
  - Which *QPOs* are considered important in the *educational mission* of the school or (if it exists) in the *design brief* for the school?
  - Which *QPOs* are effectively met in the *everyday functioning of the school*?
  - What *school-related factors* are affecting the ability of the school to meet its performance objectives?
  - What *local factors* are affecting the ability of the school to meet its performance objectives?
  - What *(national or regional) policy-related factors* are affecting the ability of the school to meet its performance objectives?

  QPO are agility (flexibility), openness to the community, accessibility for people with disabilities, external/internal accessibility, student current and future capacity, teacher space, support spaces, furniture, internal/external noise, lighting, temperature/humidity, maintenance, symbolism, appearance, learning resource, healthy environment, safe environment, social spaces. The tool itself is used in conjunction with teacher, student and community interview data, student achievement data and measured against policy and socioeconomic contexts.

- *Fisher's Matrix Linking Pedagogy and Space* links pedagogical activity and attributes to both spatial constructs and layouts, behavioural and processual steps. While developed to inform design it could be used to reflect on and evaluate space.

- *Wolff's Problem Based Design Model :* 32 design features of learning spaces which can support individualized and collaborative learning using space, furniture, layout, technology that adhere to best practices around flow, physical conditions, interaction, privacy, flexibility and functionality. Addresses issues around group size, physiological and psychological support, furnishing, adjacencies, functional spaces and structural aspects.

Sustainability phase:-

- *DesignShare Awards Criteria* - 6 design criteria are predicated on three main conditions that *learning is a lifelong process, design is always evolving, and resources are limited.*
  - enhance teaching and learning and accommodate the needs of all learners;
  - serve as a center of the community;
  - result from a planning and design process that involves all community interests;
  - provide for health, safety, and security;
  - make effective use of available resources;
  - be flexible and adaptable.

Bibliography

21st Century School Fund (2009). Research on the Impact of School Facilities on Students and Teachers: A Summary of Studies Published Since 2000, 21st Century school fund.

(CABE), C. f. A. a. t. B. E. Client guide: achieving well designed schools through PFI, CABE, UK**:** 19.

Cabe believes that good design is fundamental to higher quality public buildings and represent true value for money. Good design improves our enjoyment of places and the quality of time we spend there. Where better to signal a commitment to quality design of public buildings than in our schools, the places where our children learn and grow up? CABE has taken a particular interest in the design of schools because we are in the early stages of the biggest school construction programme for over thirty years. Lack of recent investment has led to many schools degenerating into environments that fall well short of even modest expectations. This will not 'true value for money' when our research has shown that well designed schools directly affect the quality of the learning environment and improve pupil performance and staff morale, help to deliver modern curricula and enhance the standing of a school within its community.

(CABE), C. f. A. a. t. B. E. (2004). Being involved in school design: a guide for school communities, local authorities, funders and design and construction teams. London, CABE**:** 66.

It is now widely agreed by those commissioning, designing, building and using schools that school communities should be involved in the design process for their buildings. The aim of this guide is to demonstrate the importance of carefully planned collaboration between funders, local authorities, school communities and design teams in order to achieve the best buildings and grounds possible. The guide is a joint publication from CABE Enabling and CABE Education Foundation. CABE has appointed enablers, experienced built environment professionals, to give advice to many school projects, and is often asked to suggest ways to programme in meaningful involvement. The CABE Education Foundation works with teachers and educators to inspire young people to engage with the built environment and believes that involvement in their own school building project is enjoyable and beneficial for both the school and the pupils. The guide provides some background information on the school building process, but at its core is a guide to being involved, a chart and ten case studies. These studies provide examples of effective involvement across a range of existing procurement routes. The checklist and chart place these, and other, different types of involvement within the context of a typical school building project. They are not intended as blueprints for involvement, but we hope they provide useful ideas.

(CABE), C. f. A. a. t. B. E. (2005). The client design advisor: Building schools for the future**:** 6.

This publication, produced with the Royal Institute of British Architects, is aimed at local education authorities and schools. It explains the requirement for, role and appointment of experienced architects as client design advisors within the Building Schools for the Future programme, which will transform every secondary school over the next 10-15 years.

(CABE), C. f. A. a. t. B. E. (2005). Picturing school design: a visual guide to secondary school buildings and their surroundings using the Design Quality Indicator for schools**:** 30.

A major programme of school construction and refurbishment is under way in England – so getting school design right is more important than ever. Picturing school design, a CD presentation and booklet based on the Design Quality Indicator for Schools, aims to help professionals make the right choices.

(CABE), C. f. A. a. t. B. E. (2006). Assessing secondary school design quality: research report. London, CABE**:** 101.

The design quality of secondary schools completed over the last five years is no good enough to secure the government's ambition to transform our children's education. While there are signs that design quality is improving, it is not doing so quickly enough. Too many of the mistakes of the past look like being repeated in the first waves of schools being built under the building schools for the future (BSF) programme. This presents a major challenge. Everyone involved in the BSF programme needs to recommit themselves to excellence in design and to redouble their efforts to turn aspirations into reality. Standards will need careful monitoring to ensure that children get the schools they deserve.

(CABE), C. f. A. a. t. B. E. (2009). Successful school design: How CABE's schools design panel works, (CABE), Commission for Architecture and the Built Environment**:** 14.

Successful school design sets out when reviews happen in relation to the procurement process and explains how the schools design panel assesses design quality. It is made up of three separate publications. How the CABE schools design panel works Lists the 10 assessment criteria used by the panel in full and explains what the overall design quality ratings it awards mean. It also gives details of the briefing meetings and site visits by CABE staff before the review, what happens at the review and what happens afterwards.

(CABE), C. f. A. a. t. B. E. (2009). Successful school design: How CABE's schools design panel works: Presentation, (CABE),

Commission for Architecture and the Built Environment**:** 39.

Successful school design sets out when reviews happen in relation to the procurement process and explains how the schools design panel assesses design quality. It is made up of three separate publications. How the CABE schools design panel works. Lists the 10 assessment criteria used by the panel in full and explains what the overall design quality ratings it awards mean. It also gives details of the briefing meetings and site visits by CABE staff before the review, what happens at the review and what happens afterwards.

(CABE), C. f. A. a. t. B. E. (2010). Client guide: Creating excellent primary schools**:** 135.

There is a clear link between well-designed primary schools and pupil performance and behaviour. Successful school design is the result of hard work and collaboration between designers, contractors and visionary, committed clients. Creating excellent primary schools takes readers step by step through the process, offering practical tools and a dozen inspiring case studies to show just what can be achieved.

(CABE), C. f. A. a. t. B. E. (2010). "Our school building matters: How to use investment in the fabric of your school to inspire learning."

The quality of the buildings and spaces where we live and learn has a profound impact on all our lives. Understanding how they get built, and knowing that local people can influence the process, gives pupils the skills and confidence to play a bigger, more positive role in their communities for the rest of their lives.

Abassi, N. (2009). Pathways to a better personal and social life through learning spaces; the role of school design in adolescents' identity formation. Faculty of Architecture, Building and Planning. Melbourne, University of Melbourne. **Doctor of Philosophy**.

This research examines the contributions of school design to adolescents' identity formation. Framed within an exploratory qualitative inquiry, it integrated literature review of theories of identity, their implications for education, relevance to recent history, research and practice of school design and investigation of four innovative secondary schools in Australia. Five design principles were identified including secondary schools in Australia. Five design principles were identified including 'downsizing schools', 'maximising flexibility', 'creating social spaces', 'furniture solutions' and 'promoting transparency' that through supporting adolescents' identity formation have implications for the better design of future secondary schools.

Abdul-Samad, Z. and S. Macmillan (2005). The valuation of intangibles: Explored through primary school design**:** 8.

It has become a commonplace to refer to the potential for good design to lead to schools that raise educational attainment, as well as offices which promote teamwork and productivity, and hospitals where patients recover more quickly. These claims correspond with a considerable re-awakening of interest in the impact of the built environment on outcomes and a growing evidence base. Some private sector organisations have deliberately invested in architectural design to achieve specific, if intangible, outcomes, but recent public sector audits of schools reveal designs where best practice has not been achieved and where the rhetoric about design and educational attainment is unlikely to be matched in reality. There is a need both for better evidence about the impact of design on outcomes, and for ways quantify the benefits of good design so as to take them into account in affordability calculations. The pilot study reported here investigates the impact of good design on 'improved pupil supervision', 'increased attendance', 'better well-being', 'enhanced educational attainment', 'flexibility of teaching spaces', and other intangible benefits. The paper concludes by suggesting that improved understanding of the impact of design on outcomes, combined with new valuation methods for capturing intangibles, should raise awareness of appropriate levels of investment needed to achieve design quality and deliver particular outcomes.

Abu-Ghazzeh, T. M. (1999). "Communicating Behavioural Research to Campus Design: Factors Affecting the Perception and Use of Outdoor Spaces at the University of Jordan." Environment and behaviour **31**(6): 764-804.

This article focuses on the study of outdoor spaces at the University of Jordan located in Amman, the capital of Jordan. The objective is to assess user perceptions and patterns of outdoor space use. This researcher used a qualitative approach to gain insights into aspects of human-environment intersections. The present study analysed a qualitative data set on decision choices to visit an outdoor campus area. The aim was to determine whether meanings and significance existed. A total of 140 participants including students, faculty, and administrative staff made a series of choices concerning outdoor spaces that they would visit. Following the interviews, this researcher inspected the most frequented 10 open spaces, as mentioned by the participants, and recorded the physical features that were noted to be related to use of the space. Findings of this study revealed that outdoor spaces between university buildings are focal points in student everyday behaviour. Designers of outdoor spaces need to keep abreast of current research in the area of environmental behaviour and environmental perception, and many design principles need to be formulated in terms of current knowledge in these fields.

ACER (2010). School life questionnaire. A. C. f. E. Research. Melbourne, ACER.

Achilles, C. M., J. D. Finn, et al. (1997). "Using class size to reduce the equity gap." Educational Leadership **55**(4): 40.

Reports that Project STAR (Student Teacher Achievement Ratio) and other studies show that small class size can raise student achievement and increase equity. Debate around class size emerging from discussion of test scores; Problems

and misunderstanding regarding the confusion over the terms class size and pupil-teacher ration; Benefits of class size reduction.

Adesoji, F. and S. Olatunbosun (2008). "Student, teacher and school environment factors as determinants of achievement in senior secondary school chemistry in Oyo state, Nigeria." The Journal Of International Social Research **1/2** (Winter).

The study constructed and tested an eight-variable model for providing a causal explanation of achievement of secondary school students in chemistry in terms of student variables - attitude to learning chemistry, background knowledge in Integrated Science, teacher variables - attitude to chemistry teaching, attendance at chemistry workshop and school environment related variables-class size, laboratory adequacy and school location. The study adopted an ex-post facto research type the population was made up of 621 senior secondary III chemistry students and 27 Senior Secondary III chemistry teachers in Oyo State, Nigeria. Four sets of instruments were used, these were chemistry Achievement Tests (SACS), Teacher. Attitude Towards Chemistry Teaching Scale (TATCTS) and Laboratory Adequacy Inventory (LAI). The results revealed that 7.20% of the total effect on achievement in chemistry was accounted for by all the seven predictor variables when taken together. It was also revealed that only four variables -school location(X1) laboratory adequacy (X3), teachers' attitude to chemistry teaching(X5) and teachers' attendance at chemistry workshop(X4) had direct causal influence and also made significant contributions to the prediction of achievement in chemistry (X8) (the criterion variable). Recommendations based on the significance of these variables were then highlighted.

Ahman, M., A. Lundin, et al. (2000). "Improved health after intervention in a school with moisture problems." Indoor Air **10**(1): 57-62.

In a school with floor moisture problems, the personnel had complaints consistent with the sick-building syndrome (SBS). Interventive measures including the laying of a ventilated floor were undertaken to eliminate the emissions. To examine if the intervention resulted in positive health effects, 34 personnel and 336 pupils were interviewed just before the intervention and also 7 months after. Also were interviewed 21 personnel and 224 pupils at an adjacent school serving as a control. Compared with the control school, the problem school showed more complaints, more general symptoms and more symptoms from the eyes, airways and skin, both among the personnel and the pupils. In the post-intervention examinations, the excess of symptoms among the personnel had almost disappeared. Among the pupils, the frequency of eye irritation was reduced but a general improvement of the other symptoms was not as obvious. However, after adjustment for a recent common cold, atopy and stress among the pupils, only one symptom ("stuffy nose") remained significantly elevated. In conclusion, the intervention was followed by positive health effects, supporting the hypothesis that emissions from building material had contributed to the excess of symptoms. A recent common cold was highly related to the symptoms and should be considered in future SBS studies.

Ahrentzen, S. and G. W. Evans (1984). "Distraction, Privacy, and Classroom Design." Environment and behaviour **16**(4): 437-454.

Environmental features of elementary school classrooms are examined in relation to distraction and privacy. Teachers' adjustments of their activities to make their settings less distracting are also explored. Classrooms were measured on interior spaciousness, degree of open perimeter, and amenities for private study. A group of 65 students and 13 teachers from 5 schools were interviewed. Environmental influences on distraction, both positive and negative, are particularly prominent among teachers. In addition, teachers' adjustments of curricular activities to prevent distraction are associated with the amount of non-structural walls in the classroom. Few architectural features are associated with student distraction. Students in classrooms with amenities for private study actually report lower levels of privacy than those students without such classroom amenities. This unexpected finding may be due to limited access to these amenities even when present in the classroom. When they want to be alone, children prefer to be in secluded study areas or corners. Possible explanations for the difference between teacher and student responses are discussed.

Al-Enezi, M. (2002). A study of the relationship between school building conditions and academic achievement of twelfth-grade students in Kuwaiti public high schools., Virginia Polytechnic Institute and State University, United States. **PhD:** 174.

This study explored the relationship between school building conditions and the academic achievement of twelfth students in selected public high schools in Kuwait. The population of the study was 56 high schools (28 boys' schools and 28 girls' schools) that offered a Sciences and Arts majors. The major research questions in this study were: (a) is there a relationship between overall, cosmetic, and structural conditions and student achievement; (b) does the relationship between building condition and student achievement differ between boys' and the girls' schools; and (c) what aspects of physical building components are related to student achievement. The high school principals were given the revised Commonwealth Assessment of Physical Environment (CAPE) to assess building conditions. Student achievement was measured by final examination scores collected from the Information Center at the Ministry of Education. Pearson r, was used to determine if there is a relationship between building conditions and student achievement. This analysis revealed that a positive significant relationship exists between student achievement scores and building conditions in the boys' schools. The results of two-way ANOVA and the t-test, used sequentially to compare academic achievement in the top and bottom quartiles, found that building conditions affect significantly the achievement of students in the Sciences major. The t-test highlighted significant differences in subjects in the Sciences major among only the boys' schools. Multiple regression, used to explain the variance in student achievement, indicated that building conditions explain at least 77% of the variance of Sciences majors' achievement, but did not

account for any Arts majors' achievement. Because the SES index was neither available nor introduced into a formula, this resulted in a heavier weighting given to the remaining variables. The building conditions of the girls' schools did not explain student achievement in either the Sciences or the Arts majors. Step-wise multiple regression, used to determine which physical aspects of a building's condition best predict student achievement, indicated that graffiti and roof leaks are the main predictors of achievement. Six conclusions were drawn from this study: (a) a significant positive relationship was found between the overall, structural, and cosmetic building condition and student achievement in the Sciences major when all 56 school buildings were analysed; (b) a significant positive relationship was found between the overall and structural building condition and student achievement in the Arts major when all 56 school buildings were analysed; (c) a significant relationship was found between building conditions and academic achievement in boy's schools in the Sciences major; (d) building conditions had a lesser impact on academic achievement in the boys' schools in the Arts major; (e) in the girls' schools, building conditions did not affect academic achievement in either the Sciences major or Arts major; and (f) graffiti and roof leaks were the main predictors of physical aspects of a building's condition that accounted for student achievement. This study then underscores the need for the Kuwaiti Ministry of Education to establish policy supporting a program of improved facilities for all new schools. More research is needed to extend the breath of findings regarding the relationship between building conditions and student academic achievement. This study should be replicated in other non-U.S. countries.

Al-Haboubi, M. H. and E. M. Ishteeaque (2000). "Designing New Classroom Buildings." Journal of Architectural Engineering **6**(4): 129.

This study is a continuation of a work on analysing the traditional shapes of classrooms. A model was presented that considers the rectangular classroom divided into five subareas as a function of viewing distance and horizontal viewing angle. Future classrooms are under recommendation to take the shape of a trapezoid. In this study, analysis of the subarea that has the best view of the presented material is made and some shapes of classroom buildings containing the recommended trapezoidal design are presented.

Alton-Lee, A. (2003). Quality Teaching for Diverse Students in Schooling: Best Evidence Synthesis Iteration (Best Evidence Synthesis) Wellington, NZ Ministry of Education

Amedeo, D. and J. A. Dyck (2003). "Activity-enhancing arenas of designs: a case study of the classroom layout." Journal of Architectural and Planning Research **20**: 323-343.

American Architectural Foundation (2009). School of One Design Charette.**:** 5.

Focuses on designing the space for New York City Schools' pilot concept entitled "School of One" which redefines the role of technology in the learning environment. The space has to accommodate asynchronous learning with different students working of varying lessons. In place of classrooms, a series of learning pods, some with fixed and some with movable furnishings were envisioned.

Anastopoulou, S. (2004). Investigating multimodal interactions for the design of learning environments: A case study in science learning, The University of Birmingham. Doctor of Philosophy**:** 224.

This thesis focuses on multimodal interactions for the design of a learning environment. The process of designing such systems involves studying the benefits of multimodal interactions in learning. Therefore, it analyses the structure of the interactive space between the learner and the content to be learnt, and introduces and tests a framework to structure it. It proposes that multimodal interactions can encourage rhythmic cycles of engagement and reflection that enhance learners' meaning construction in science concepts, such as 'forces and motion'. The framework was the outcome of an iterative process of analysis and synthesis between existing theories and three studies with learners of different ages. Through these theory-informed studies, the significance of physical manipulation of objects and symbols through the employment of multiple modalities was emphasised as a way to facilitate learners' meaning construction, engagement and reflection.

Applebee, A., M. Adler, et al. (2007). "Interdisciplinary Curricula in Middle and High School Classrooms: Case Studies of Approaches to Curriculum and Instruction." American Educational Research Journal **44**(4): 1002-1039.

This study examines 11 interdisciplinary teams involving 30 teachers and 542 students in New York and California. The teams represented an array of approaches to interdisciplinary curricula, ranging from simple correlation to major reconstrual of the contributing disciplines. Teams that engaged in the most reconstrual of traditional content also tended to use instructional approaches that emphasized cognitively engaging instruction, including an emphasis on envisionment-building activities and extended discussion of significant ideas, but individual members of teaching teams still varied considerably in teaching style. The study concludes that interdisciplinary coursework is neither a problem nor a solution in efforts to increase student achievement; rather, it involves a number of tradeoffs that need to be considered at the school site.

Arbitare (2009). "On the Decline in Schol Design." Abitare(490): 115-117.

The article discusses the decline in school furniture design. It states that height-adjustable chairs are rarely utilized for classrooms due to their cost and less durability. It notes that pedagogue and physician Maria Montessori developed a

model that has an open pavilion-like school with light-weight natural furniture that was built in proportion to children. The author states that some employment-creation measures are being conducted to renew school structures as talks on outdated education models arise.

Architectural Record (2005). "A twist in classroom furniture." Architectural Record **193**(6): 204-204.
This article reports that recognizing the trend for instructors to use all four walls of a classroom, KI developed 360 degree classroom furniture, a new line of desks, tables, and chairs. Designed with students, teachers, and janitorial maintenance in mind, 360 degrees; improves space utilization and encourages teacher and student creativity. Often students strain to see their teacher; with 360 degrees, the entire desk can rotate completely, enabling instruction from any point in the room.

Architecture Today (2004). "Technology: winds of change - St. Wilfrid's school in Blackburn." Architecture Today **150**: 64-68.
"Natural ventilation for deep-plan classrooms in a new secondary school is provided by windcatchers. Designed by Aedas Architect, the new St. Wilfrid's Church of England high school is located on a brownfield site in southwest Blackburn."

Armitage, M. (2005). "The Influence of School Architecture and Design on the Outdoor Play Experience within the Primary School." Paedagogica Historica: International Journal of the History of Education **41**(4): 535 - 553.
Since the very earliest times, schools have provided a place (the playground) and a time (playtimes) in which children can have time away from the direct involvement of adults and formal learning. Although the basic design of school grounds has changed in a number of ways over the years, from the subtle to the more direct, what effect these changes have had on the overall education of the child is less clear. Research has identified a number of positive effects on leaning that playtimes and the informal use of school grounds provides, yet it is also clear that schools themselves often greatly under-use this potential, or even actively restrict access to it, as a counter to what is often seen as the 'problem' of playtime. This paper will draw on recent research into 'what' happens on school playgrounds and 'where' it happens, using visual examples from the UK. The findings from this research will explore the direct links that have been found between school building design and children's use of the outdoor environment for play.

Arnold, D. E. (2002). "Block Schedule and Traditional Schedule Achievement: A Comparison." NASSP Bulletin **86**(630): 42-53.
Block scheduling constitutes one of the major types of restructuring considered by school administrators seeking to improve student performance. The relationship between two school schedules-the seven-period A/B block and the seven period traditional schedule-and achievement of students in grade 11 was examined. Comparisons showed no significant increase in students' test scores over time associated with the alternating schedule. Although school leaders may find some improvement in the initial year of implementation, improvements may be negated by decreased improvement rates in later years. A statistical analysis bears out more general literature on the subject.

Arnot, M. and D. Reay (2007). "A Sociology of Pedagogic Voice: Power, inequality and pupil consultation." Discourse: Studies in the Cultural Politics of Education **28**(3): 311-325.

Baker, M. and M. Foote (2006). "Changing Spaces: Urban School Interrelationships and the Impact of Standards-Based Reform." Educational Administration Quarterly **42**(1): 90-123.
Background: This article is an historical sociospatial analysis of change during the past three decades within and between three high schools in a deindustrialized city in the northeastern United States. Sociospatial relations are the everyday spatial practices, perceptions, and representations that constitute social worlds. Interrelated with the continued economic decline and spatial segregation in many U.S. cities, state standards-based reform policies are reinforcing and furthering a more hierarchical, homogeneous, and fragmented educational space, increasing the marginalization of some urban schools, teachers, and students. Purpose: This historical sociospatial analysis of urban secondary schools will describe the conjunction of demographic and policy changes contributing to patterns of uneven development that raise questions about the consequences and sustainability of the current state and federal standards-based reform initiatives.

Bandura, A. (1997). Self-efficacy: the exercise of control. New York, WH Freeman.
Ideal for advanced undergraduate or graduate courses, or for professional use, the book is based on Bandura's theory that those with high self-efficacy expectancies - the belief that one can achieve what one sets out to do - are healthier, more effective, and generally more successful than those with low self-efficacy expectancies. He begins with a discussion of theory and method: what self-efficacy is and how it can be developed. Bandura then demonstrates how belief in one's capabilities affects development and psychosocial functioning during the course of life, underscoring provocative applications of this work to issues in education, health, psychopathology, athletics, business, and international affairs

Barbara, N., H. Larry, et al. (2001). "Are Effects of Small Classes Cumulative? Evidence From a Tennessee Experiment." Journal of Educational Research **94**(6): 336-345.
Some scholars argue that the effects of small classes in the early grades are not cumulative—that the benefits of small

classes accrue in the 1st year of small classes. That argument suggests both policy implications and scientific questions of why additional benefits should not accrue from additional exposure to small classes. In this article, the cumulative effects of small classes on achievement were investigated with data from Project STAR, a 4-year, large-scale randomized experiment on the effects of class size. Controlling for achievement in the previous-year small classes in Grades 1, 2, and 3 yielded additional positive effects on reading and mathematics achievement. Thus, there are additional (cumulative) effects of small classes after the 1st year that may be large enough to be important for education policy.

Barnett, R. (2007). A will to learn : being a student in an age of uncertainty Maidenhead: Open University Press.

Barrett, P. and Y. Zhang (2009). Optimal Learning Spaces Design Implications for Primary Schools. SCRI: Research Report, Salford Centre for Research and Innovation**:** 55.

Following Manchester City Council's (MCC) involvement in SCRI's Senses, Brain and Spaces workshop in March 2007, it became evident that there is potential in investigating the possibility of infusing the design, construction and use of new / refurbished schools with insights from scientific knowledge of the sensory impacts of spaces, including to some degree how they are mediated by neurological processes. From this starting point, a research activity entitled 'Optimal Learning Spaces' (OLS) has been developed in conjunction with MCC. This project focuses on teaching and learning environments at the micro-level, rather than on educational policies, management or organizational structures. There are two elements to this project whose aim is to develop an evidence base for what constitutes an optimal learning space through: n A thorough exploration and synthesis of the international literature on design issues related to schools with particular regard to the sensory impacts of spatial variables on the learning process. This report concentrates on mainstream primary schools, although nursery and kindergarten examples are used where relevant to highlight design approaches. The report is divided into four sections. It begins with an Introduction that presents the background about this project. The foundations are discussed in the second section, which identifies the study procedure. The third part looks at the issues to address the specific design strategies of schools – using the lessons from various case studies to highlight what to consider and what to void. A number of recent case studies from around the world are used throughout this section related to specific points – those with supporting evidence of impacts are termed "confirmatory cases", whilst those without have been called "illustrative cases". The final part summarises the practical suggestions drawn from this study and also introduces the work.

Bartel, M. (2007). "Art Classroom Design." from http://www2.goshen.edu/~marvinpb/MB_Home.htm.

An ideal art room has some attributes that are the opposite of those needed in standard classroom. It can be expensive and less than ethical to construct inappropriate and unsafe facilities for learning in visual art. I write this as an art teacher, designer, artist, and architectural design consultant. This checklist for school artroom design gives a minimum of features needed for art instruction. If you are an art teacher, a new facility is a "chance in a lifetime" to get the kind of teaching space you have always dreamed of. If you are an architect or an administrator, you can take pride in providing the best possible facilities for instruction.

Barth, J. M., S. T. Dunlap, et al. (2004). "Classroom environment influences on aggression, peer relations, and academic focus." Journal of School Psychology **42**(2): 115-133.

Peers serve as reinforcers and models of behaviour, and consequently classrooms containing high numbers of students with poor academic skills or behaviour problems are likely to promote these behaviours in individual students. This study examined how variations in social and academic classroom composition as well as the larger school context affected behaviour in a normative sample of children over a 2-year period. Teachers provided ratings of individual students, which were then aggregated to form teacher-based measures of classroom environment. Concurrent and longitudinal effects of classroom and school environments on individual behaviours were examined for students in 65 classrooms in 17 schools. Poorer classroom environments were associated with poorer levels of student aggression, peer relations, and academic focus. Changes in student behaviour over time could be explained by the current classroom environment.

Bartusek, L. (2002). Bricks & Mortarboards: The Link Between Buildings and Learning. COMPASS: A guide for those that lead, Iowa School Board
VII.

A school building is an important tool to support learning. Experts agree that school facilities should be designed to facilitate what we know today about providing the best possible education for all students. We interviewed a number of experienced school architects and reviewed several articles to learn more about trends affecting school building design. This article summarizes what we found.

Bateman, D. (2009). Playing with Reggio spaces in higher education for teacher education. *Australian Association for Research in Education International Education Research Conference*. Melbourne, Vic, Australian Association for Research in Education.

Bateman, D. (in press). "**Transforming higher education teaching and learning spaces through Reggio Emilia**." Journal of Innovative Higher Education.

Bayne, S. (2004) Smoothness and Striation in Digital Learning Spaces. E-Learning **1**, 302-316

It is Deleuze & Guattari's description of smooth and striated cultural spaces (Deleuze & Guattari, 1988) which informs this exploration of pedagogical alternatives within the learning environments of cyberspace. Digital spaces work to constitute subject and text in ways which are distinct, and it is awareness of this distinctiveness which must inform our engagement with the internet as a space for learning and teaching. By using Deleuze & Guattari's conceptualisation of the smooth and the striated, the author works towards a way of understanding how a theorisation of internet 'topography' can inform pedagogical choice within online learning contexts. The author begins with a summary of the relation between the striated and the smooth as defined by Deleuze & Guattari, and moves on to consider how this distinction can be extended into the environments of cyberspace. She then explores how a pedagogical approach might be developed which attempts to inhabit 'smooth' internet spaces, and ends with a consideration of the virtual learning environment or 'e-learning system' which, in defining itself as a space of containment, regulation and efficient progression, functions as a strongly striating element within pedagogical web space.

Beard, A. Picture school design: a visual guide to secondary school buildings and their surroundings using the Design Quality Indicator for Schools. London, CABE**:** 30.

Picture school design as drawn on the extensive experience of the DfES and CABE's enabling programme to develop an essential tool designed to inform stakeholders and assist project teams in the creation of new 21st century learning environments. It uses the structure of the Design Quality Indicator for Schools, which was developed by the DfES in partnership with the Construction Industry Council. The publication illustrates various approaches to key design issues within the school site and building, and shares best practice as well as identifying common problem areas.

Beeland, W. D. (2002) Student Engagement, Visual Learning and Technology: Can Interactive Whiteboards Help?

The purpose of this action research study was to determine the effect of the use of interactive whiteboards as an instructional tool on student engagement. Specifically, the desire was to see if student engagement in the learning process is increased while using an interactive whiteboard to deliver instruction. In addition, an effort was made to determine if methodology impacts the level at which students are engaged in the learning environment when a whiteboard is used in the classroom. In other words, does the manner in which the whiteboard is used affect the level of student engagement? A total of ten middle school teachers and 197 students participated in the study. In each of the ten classes, the teacher presented a lesson using an interactive whiteboard. After the lesson, students were given a survey, and some students completed a questionnaire. Teachers also completed a survey and questionnaire. The results of the surveys and questionnaires indicated a strong preference for the use of interactive whiteboards in the classroom. The results will be used to make further technology spending decisions at our school.

Belojevic, G., V. Slepcevic, et al. (2001). "Mental performance in noise: The role of introversion." Journal of Environmental Psychology **21**(2): 209-213.

A mental arithmetic task was applied on 123 medical students (43 males and 80 females) under quiet (42 dB/A/Leq) and noisy laboratory conditions (recorded traffic noise, 88 dB/A/Leq). Personality trait of intro-extroversion was estimated with the Eysenck Personality Questionnaire. Two groups of subjects were formed concerning intro-extroversion, using a testing mean score as a dividing criterion: 46 introverts (<mean score) and 77 extroverts (>mean score). Concentration problems, fatigue and noise annoyance during the experiments were measured with numeric ten-point self-rating scales. There was no significant effect of noise on the accuracy of mental processing, compared to the quiet condition. Extroverted subjects performed significantly faster in noise, compared to the quiet condition ($p<0{\cdot}05$). Concentration problems and fatigue were more pronounced in noise, compared to quiet conditions, but that was only among introverted subjects ($p<0{\cdot}05$). Correlation analysis revealed a highly significant negative relation of extroversion and noise annoyance during mental processing ($p<0{\cdot}01$).

Bennett, C. (2001). Classrooms and Computers: An Elementary School Case Study. International Society for Occupational Ergonomics and Safety. , Fairfax, Virginia, USA.

Children now use computers throughout their education. As schools have focused on purchasing computers and providing internet access, there has been little consideration of ergonomics. Even if educators and school administrators acknowledge students would benefit from better ergonomics, they may assume it is too expensive or not know where to begin. This paper describes the processes used to implement low cost ergonomic improvements and provide training for teachers, staff and students in an elementary school.

Ben-Peretz, M., S. Schonmann, et al. (1999). The Teachers' Lounge and its Role in Improving Learning Environments in Schools. School climate: Measuring, improving and sustaining healthy learning environments. H. J. Freiberg, Falmer Press, Limited (UK) 246.

Benya, J. (2001). Lighting for schools, National Clearinghouse for Educational Facilities.

Bernardi, N. and D. C. C. K. Kowaltowski (2006). "Environmental Comfort in School Buildings: A Case Study of Awareness and Participation of Users." Environment and behaviour **38**(2): 155-172.

This article describes the results of a study on user behaviour in relation to environmental comfort conditions. A case study was conducted in school buildings in the region of the city of Campinas, Sao Paulo, Brazil. The methodology adopted was based on field observations of technical aspects of the school environment and of types of user behaviour (interventions) that introduced changes in the classroom space. Questionnaires were applied to users. A follow-up study evaluated user perception of possible interventions. User knowledge on environmental comfort concepts was also assessed. The results of the case study showed few interventions by users in favour of their own comfort. Low participation results may, in part, be attributed to the context, where users, schoolchildren, are subject to discipline codes with restricted spontaneous behaviour in favour of individual comfort. Environmental awareness should therefore be stimulated by teaching concepts of environmental comfort in primary and secondary schools.

Berner, M. M. (1993). "Building Conditions, Parental Involvement, and Student Achievement in the District of Columbia Public School System." Urban Education **28**(1): 6-29.

Little research has been done on the need to repair and refurbish school buildings because of the impact that the condition of buildings has on the students, rather than just the need to maintain local government's capital investment. This study uses Washington, DC, as a case study showing that the size of a public school's Parent-Teacher Association (PTA) budget is positively related to the school building 's condition. The condition is, in turn, shown to be statistically related to the student's academic achievement. An improvement in the school's condition by one category, say from poor to fair. is associated with a 5.5 point improvement in average academic achievement scores.

Bickford, D. and D. Wright (2005). Community: The Hidden Context for Learning. Learning Spaces. D. Oblinger. Boulder, Educause.

Biesinger, K. D., K. J. Crippen, et al. (2008). "The Impact of Block Scheduling on Student Motivation and Classroom Practice in Mathematics." NASSP Bulletin **92**(3): 191-208.

Results are presented from a mixed-method investigation into the effects of Block Schedule on student self-efficacy, attitude, and instructional practices within the context of mathematics. Students exposed to block schedule showed no change in attitude toward mathematics, whereas those on a traditional schedule demonstrated a significant decrease. Students on block schedule also made significantly greater gains in self-efficacy. If reformed teacher practice is a goal of transitioning to block schedule, results point to a critical need for professional development.

Biner, P. M., D. L. Butler, et al. (1991). "Inside Windows: An Alternative to Conventional Windows in Offices and Other Settings." Environment and behaviour **23**(3): 359-382.

People prefer to have windows in many spaces. However, there are spaces such as the interior of large buildings where it is not possible to have windows. In some of these situations, people could have `inside windows," that is, windows to another inside space rather than to the outside. Two studies investigated the desirability of inside windows. In the first study, 35 full-time secretaries and 205 students completed a questionnaire about both the desirability of inside windows in a number of situations and the effects of inside windows. Results indicated that inside windows were generally desirable. Secretaries rated inside windows as slightly less desirable than did students. Judgments concerning the effects of inside windows suggested that secretaries may have lower preferences because they tend to focus on the negative effects of inside windows relative to students. There were two settings for which secretaries and students were similar: the office and the library. In the second study, preferred sizes of inside windows were obtained using a model of an office. The 36 subjects indicated that inside windows were generally preferred, but were smaller than conventional windows for comparable spaces. The desire for inside windows, and their size, was greater if the space being viewed had a conventional window.

Bissell, J. (2002). Teachers' Construction and Use of Space.**:** 63.

Describes the influence of school architectural design on teachers' work by examining how teachers actually use their work environment, how their use of the facility compares with expectations of what their experiences should be, and how school design supports or constrains their work. Extensive diagrams and photographs accompany this case study that examines how 17 teachers in two high schools arrange, use, and move through their teaching spaces. Includes ten references.

Bissell, J. (2004). "Teachers' construction of space and place: the method in the madness." Forum **46**(1): 28-32.

Black, R. (2002). Alternative spaces: no more walls. Education Foundation Research Seminar. Australia**:** 4.

In 2002, one of the Education Foundation's research areas concerned rethinking the physical learning environment which supports young people's learning and connects the school to the community. Following its Summit No More Bored Kids: Real Alternatives for Public Schools, the Foundation held a research seminar to explore innovative new models for Australian government schools. The Education Foundation Research seminar invited twenty leading Australian and international researchers, policymakers and practitioners from the worlds of education and architecture to share knowledge and generate new opportunities for innovative school design. This paper summarises the rich discussion which took place at the seminar.

Black, R. (2003). Thinking community: New Australian Partnerships for public education, THE EDUCATION FOUNDATION**:** 18.

International commentary on the priorities of nation building has for the past decade centred around the role of education in building the knowledge capacity required for economic competitiveness. There has also been a resurgent interest in the notions of social cohesiveness, civic engagement and social capital. Many national vision statements present a charter for progress and prosperity based on quality education and community cohesion. A growing belief that these goals cannot be wholly met through top-down public policy (Latham, 2001; Stewart-Weeks, 1998) has led to an international interest in new boundary-crossing approaches that bring together the skills, resources and experience of the public, private and philanthropic sectors. These creative partnerships include social entrepreneurship and social coalition approaches. They have the potential to develop responses to previously intractable problems and to redefine the roles and relationships of government, business, community agencies and the philanthropic sector. In Australia, some of the most innovative education policy involves interagency collaboration to find cross sectoral solutions to young people's needs. At the grass roots level, however, the partnership approach has had little impact on the interactions between most schools and their local communities. Although such partnerships can be a powerful mechanism for change for both partners, they remain a peripheral exercise implemented on the fringes of an overcrowded curriculum by a small number of visionary teachers and principals. The Education Foundation is an independent, not for profit organization established in 1989 with a social mission to improve society through its public schools. Based loosely on a number of US models but unique in Australia, the Foundation is moving from its original strategy of seed funding innovative teaching ideas within individual schools to strategic change making partnerships that maximize the organization's impact across the Victorian public education system, strengthen cooperative relationships at the grass roots and build real capacity in schools and their communities. An independent organization such as the Foundation has a powerful role to play in supporting the capacity building in schools that leads to creative partnership. It can create a platform for young people's involvement in school-community partnerships, conduct professional development and help develop workable strategies, research and document the benefits of good partnership and work with key players in education and other sectors to overcome barriers to effective practice. However, this role does not obviate the need for clear policy leadership that removes the structural barriers and helps to shift the cultural barriers to school-community partnership.

Black, R. (2007). Engaging Students in School: An Education Foundation Australia Fact Sheet, Education Foundation**:** 1.

Black, R. (2007). How Equitable Are Our Schools? An Education Foundation Australia Fact Sheet, Education Foundation**:** 1.

Black, R. (2007). Mentors and Role Models for Young People: An Education Foundation Australia Fact Sheet, Education Foundation**:** 1.

Black, R. (2007). New spaces for learning: An Education Foundation Australia Fact Sheet, Education Foundation**:** 1.
Because buildings affect the way people feel, experience and learn, the success of schools is intimately linked to their physical environment. In recognition of this, educational innovators are calling for school designs that overcome the limitations of conventional learning spaces. Schools are public places with which people form relationships full of meaning, memories and values, yet in Australia, school design has been one of the most neglected aspects of education reform. From the outside, many Australian schools are inward looking and unwelcoming. On the inside, they are industrial and inflexible. These buildings operate as a hidden curriculum, transmitting messages about how and for whom learning takes place. They work against innovative teaching, restrict learning and inhibit connection between the school and its community.

Black, R. (2007). Student Participation: An Education Foundation Australia Fact Sheet, Education Foundation**:** 1.

Blackmore, J. (2008). Working against the odds: portrait of City Heights College AARE Annual Conference. Brisbane.
This paper provides a portrait of one inner city school in metropolitan Melbourne. Victoria has been distinctive in recent years for its system wide program of reform promoted through the Blueprint for Victorian Schools. Now into its second phase, there is realisation that some schools confront more 'challenging circumstances'. City Heights Secondary College confronts particular issues-located in a suburb with wide socio-economic disparity due to simultaneous processes of gentrification and the emergence of pockets of poverty arising from concentrations of recent refugee arrivals and working class economic dislocation. CHSC has a reputation for performing 'above its capacity' in terms of 'adding value' to its students. This school typifies the struggle that schools that make a difference undergo due to wider systemic factors out of its control - immigration, demographics, parental choice and school reform. In order to avoid closure and to address the constantly changing student populations, the schools had undergone 'serial redesign' in terms of its facilities and program.

Blackmore, J. (2009). A blueprint for success? Two portraits of school redesign from Victoria. European Conference on Educational Research. Vienna

This case study explores the ways in which policy frames some of the possibilities and problems for schools when it comes to redesign. Set in Victoria, it provides two portraitures illustrating the complexity of educational reform. It

considers how two schools work with the raft of policies associated with the Blueprint for Victorian education that seemingly encourage educational redesign with its focus on leadership capacity building, professional development, student learning and investment in creative building spaces to meet new curriculum needs but which produce serious contradictions for schools in practice. These schools are simultaneously applauded for apparent successes against the odds in being innovative while being required to form new institutional arrangements and priorities or face closure. The paper undertakes a discourse analysis of the Blueprint now in its second phase, and utilising a critical policy sociology considers how schools identify and work with the various possibilities and problems arising from their specific contexts.

Blackmore, J. (2009). Schools cannot do it alone: radical redesign from the ground up. AARE Annual Conference. Canberra.

In Victoria, school redesign has been driven through the Blueprint - a policy focusing on whole school reform, professional learning, leadership capacity building and curriculum and assessment reform. The Blueprint's second phase has been driven by a Building Futures program that links the provision and use of multiple variations of school structures and governance, particularly in areas of greatest expansion or contraction and where school populations are often more diverse and from lower socioeconomic backgrounds. Such radical redesign presents significant challenges to teachers and leaders in how they address the complexity of change, but also sustain and maintain if not enhance their programs to benefit their students. This paper examines how schools engage with and acquire resources to undertake redesign in the ways in which they are supported or impeded in redesign by regions and governments. The paper draws significantly on theories of Bourdieu in terms of teacher and leader habitus but also Smith's institutional ethnography to explore how 'texts' are produced and 'practices' enacted.

Blackmore, J. and K. A (2008). Education, health and well-being: a critical nexus Understanding Health H. Kelleher.

Blackmore, J. and D. Hayes (2007-2010). Redesigning schools and school leadership: an Australian comparative study, ARC Discovery Project.

Educational research has identified what good schools look like, but we still have a limited understanding of how they came to be this way. This longitudinal research funded by the Australian Research Council investigated how schools change for sustained improvements in student learning, better community relations and more rewarding work for school personnel, what we call school redesign. Using mixed methods over three years in Australia, alongside a parallel UK projects, the project investigated why, how, and with what effect schools operating in challenging circumstances redesign; identify associated forms of teacher and principal leadership; and provide rich cases to inform professional practice and policy. Case studies of Victorian schools focused on how restructuring, and new buildings raised issues around changing teacher practices.

Blades, M. (2001). "Catering for young people in schools. " Nutrition and Food Science **31**(4/5): 189-193.

This article provides a brief overview of what young people eat. Their likes and dislikes are mentioned together with their eating habits. The role of the Local Authority Caterers' Association (LACA) in the provision of school meals is discussed as well as the findings of a questionnaire on school meals given to members of LACA.

Blaser, P. (2009). "DESIGNING Learning Environments FOR (Gasp!) Designers." Interiors & Sources **16**(5): 58-59.

The author discusses the importance of classroom design to adult learners studying design. She says that if design studios in colleges are built to support inter-disciplinary collaborations, as in architecture with interior design, a better understanding of each other's role in the design process can be best achieved. Some may argue that it is academic approach that will drive this goal but she counters that if pedagogy is considered equally with facility, collaborative success is more achievable.

Blatchford, P., E. Baines, et al. (2006). "The Effect of a New Approach to Group Work on Pupil-Pupil and Teacher-Pupil Interactions." Journal of Educational Psychology **98**(4): 750-765.

The main impetus for the SPRinG (social pedagogic research into grouping) project was to address the wide gap between the potential of group work and its limited use in schools. It is an ambitious project that developed key principles and strategies to improve the effectiveness of group work in everyday primary classes and across a whole school year. On-the-spot and video-based systematic observations showed more active, sustained engagement, more connectedness, and more higher order inferential joint reasoning within SPRinG groups than in control comparisons. The authors argue that group work can be successfully implemented into everyday school classrooms and improve pupil interactions, provided teachers take time to train pupils in the skills of group working.

Blatchford, P., P. Bassett, et al. (2005). "Teachers' and Pupils' Behaviour in Large and Small Classes: A Systematic Observation Study of Pupils Aged 10 and 11 Years." Journal of Educational Psychology **97**(3): 454-467.

The authors examined class size effects on teacher-pupil interactions, pupil engagement, and pupil-pupil interaction. They extended previous research by recognizing the hierarchical nature of observation data and the possible influence of other variables. The study used a time sampling method involving 257 children (aged 10-11 years) in 16 small (25 or under) and 26 large (31 and over) classes. In small classes, there were more individualized task-related contacts

between teacher and pupils and a more active role for pupils. These results confirmed those from earlier research on children aged 4 and 5 years. Against expectation, class size did not affect pupil on-task behavior or peer interaction. There was a moderating role for school subject and a beneficial effect of teaching assistants.

Blincoe, J. (2008). The age and condition of Texas high schools as related to student academic achievement. Austin, TX, University of Texas. Doctor of Education.

There are many inadequate high school facilities in Texas, and unfortunately many of these are found in areas of low socioeconomic status and high minority percentages. According to a Texas Comptroller's Office (2006) report on the conditions of school facilities in Texas, roughly 40% were considered in the categories of fair, poor, or needs replacing, with the average age of these facilities being 34.5 years old. Most states, including Texas, have not properly assessed high school buildings for indoor air quality, lighting, acoustical control, heating and air conditioning, electrical systems, or secondary science laboratories. It is also not clear if these conditions and the age of the building have an impact on student academic achievement in Texas. This study investigated three research questions: (a) the relationship between the building condition of public high schools in Texas and student achievement scores in science, mathematics, and English language arts as measured by the Texas Assessment of Knowledge and Skills (TAKS); (b) the relationship between the building age of public high schools in Texas and student achievement scores in science, mathematics, and English language arts as measured by TAKS; and (c) the relationship between building age and condition of public high schools in Texas and graduation rate? This quantitative study utilized an ex post facto methodology to examine the relationship between the high school facilities and standardized test scores. This study sampled high schools whose data were presented in the 2006 Texas Comptrollers report and compared to TAKS data. The instrument utilized was developed and tested by the Texas Comptroller's Office. This study utilized an analysis of variance (ANOVA) and a regression model. Statistically significant findings showed a relationship between excellent condition of a school, as compared to schools in lesser condition, and student TAKS scores in science, math, and English language arts scores. Age of the school also had a significant relationship: Schools over 49 years old had a significant impact on student TAKS scores in science, math, and English language arts. Similar findings showed a negative correlation between schools over 49 years old and graduation rate. Schools in excellent condition had a positive correlation to student graduation rate. Determining the effect of inadequate high school facilities on student achievement can help inform the education and legislative communities of any correlations between the condition and age of a high school building and the academic achievement of the students in these buildings. Providing school facilities that are safe and provide quality learning conditions are issues that must be addressed in Texas.

Blunden, D., C. Spring, et al. (1974). "Validation of the Classroom Behavior Inventory." Journal of Consulting and Clinical Psychology **42**(1): 84-88.

Used factor-analytic methods to assess construct validity of the Classroom Behaviour Inventory (CBI) by L. M. Greenberg, et al, a clinically developed scale for rating behaviours associated with hyperactivity. Administration to 320 kindergarten males revealed that the CBI measures 3 dimensions of behaviour: Hyperactivity, Hostility, and Sociability. Correlations of CBI ratings and classroom observations were used to measure concurrent validity. Significant concurrent validity was obtained only for the CBI impulsiveness category. The utility of the CBI in identification and treatment of Ss with behaviour problems is discussed.

Boman, E. and I. Enmarker (2004). "Factors Affecting Pupils' Noise Annoyance in Schools: The Building and Testing of Models." Environment and behavior **36**(2): 207-228.

This article reports two studies intended to develop and assess conceptual models of how different factors mediate and moderate the annoyance reaction in school environments. In the first, a survey of 207 pupils was conducted where assumptions about mediators and moderators were formulated and tested. In the best model, general sensitivity and adaptation led to a higher degree of annoyance causing stress symptoms. In the second study, focus group interviews with 16 pupils were performed to set up a model of mediating and moderating factors from pupils 'statements in the formation of annoyance. The objective was also to get their opinions about ways to improve the sound environment in school. The interviews indicated a serial arrangement in which stress symptoms and distraction mediated between chatter and disturbance. Thus, the two studies suggested different models for the prediction of the annoyance reaction. The pupils' views about how to improve the school sound environment are discussed in the framework of an empowerment model.

Bondy, E., D. D. Ross, et al. (2007). "Creating Environments of Success and Resilience: Culturally Responsive Classroom Management and More." Urban Education **42**(4): 326-348.

Creating safe and productive environments with a diverse student population requires more than the strategies recommended in the original classroom-management literature. Drawing from the literature on culturally responsive classroom management, psychologically supportive classroom environments, and building resilience, the authors describe the practices used by three effective novice teachers in urban elementary classrooms during the first 2 hours of the first day of school. The study was based on videotape and interview data that were qualitatively analysed using an inductive approach. The novice teachers focused on developing relationships and establishing expectations through the use of "insistence" and a culturally responsive communication style. The study provides clear pictures of the ways in which teachers teach and insist on respectful behaviour and establish a caring, task-focused community. As such, it

demonstrates how teachers create environments of success and resilience for students who have historically floundered in school.

Bosch, S. (2006). Research priorities: how facilities affect educational outcomes. Educational facilities planning: leadership, architecture and management. C. Tanner and J. Lackney. Boston, Pearson Education**:** 323-348.

Our lack of understanding of school facility effects on students and teachers is gaining national attention as a serious problem. In 2001 President George W Bush's No Child Left Behind Act was passed. the goals of this legislation were to increase accountability for states, school districts, and individual schools through standardized testing; to provide parents and students attending low-performance schools with more school choices; to improve flexibility for state and local governments in spending federal education dollars; and to emphasize reading proficiency, particularly in younger students. The act includes amendments from Healthy and High Performance Schools Act, sponsored by Senator Hillary Clinton of New York that recognizes the need for research to assess the health and learning impacts of environmentally unhealthy schools on students and teachers. The Secretary of Education has been authorized to conduct various studies, including one that examines the "characteristics of those public elementary and secondary school buildings that contribute to unhealthy school environments" (personal communication, October 2, 2002). The study described in this chapter supports the goals of the Department of Education. The findings of this research project most directly support researchers who study school facility effects (hereafter referred to as SFE) on educational outcomes, but may indirectly support school designers, architects, and building managers, by focusing future research efforts on acquiring knowledge that is relevant to them. This study is an important step in improving our understanding of the links between physical school variables and measures of student, school, or school district success, ultimately contributing to the development of higher quality schools and smarter, more well-rounded students.

Boulton, M. J., E. Duke, et al. (2009). "Associations between being bullied, perceptions of safety in classroom and playground, and relationship with teacher among primary school pupils." Educational Studies **35**(3): 255 - 267.

This study examined three main issues among 364 primary school children: (1) self-reported levels of perceived safety in classroom and playground, and relationship with teacher, (2) associations between perceived safety in the two contexts and peer reported levels of being bullied, and (3) if relationship with teacher moderated the associations between peer reported levels of being bullied and perceived safety in classroom and playground. Data were collected in individual and small group interviews. Overall, while most participants reported positive relationships with their class teacher, and felt safe in their classroom and in the playground, a substantial minority did not. The correlations between level of being bullied and perceived safety in classroom and playground were significant but of modest size. Relationship with teacher did moderate the correlation for perceived safety in the classroom, but did not do so for perceived safety in the playground. No significant age or sex differences were obtained. The theoretical and practical implications of these findings were discussed.

Bowen, G. L., R. A. Rose, et al. (2008). "The Joint Effects of Neighborhoods, Schools, Peers, and Families on Changes in the School Success of Middle School Students*." Family Relations **57**(4): 504-516.

Abstract: Longitudinal self-report data from 4,071 students are used to examine the degree to which students' perceptions of their social environments (people and places) are associated with changes in 3 school success outcomes: school engagement, trouble avoidance, and grades. Specific variable dimensions within the neighbourhood, peer, and family domains had significant effects on one or more of these school outcomes. Implications of the findings for further research and intervention practice are discussed, including the availability of a Web-based resource for linking these findings with evidence-based intervention and prevention strategies.

Branch, M. A. (1994). "Tomorrow's schoolhouse: Making the pieces fit." Progressive architecture **75**: 77-83.

New pedagogy and technology are changing school design. Features work by Ehrenkrantz & Eckstut and Gruzen Samton.

Branham, D. (2004). "The Wise Man Builds His House Upon the Rock: The Effects of Inadequate School Building Infrastructure on Student Attendance." Social Science Quarterly (Blackwell Publishing Limited) **85**(5): 1112-1128.

This article looks at the effect of school infrastructure on student attendance and drop-out rates. Using the school as the unit of analysis, Tobit analysis is performed to analyze 226 Houston Independent School District schools. The quality of school infrastructure has a significant effect on school attendance and drop-out rates. Students are less likely to attend schools in need of structural repair, schools that use temporary structures, and schools that have understaffed janitorial services. School districts who wish to maximize attendance and minimize drop-out rates should avoid temporary solutions to school building inadequacies and provide students, teachers, and administrators with quality permanent structure schools, and quality janitorial staffs to maintain those schools.

Brennan, A., J. S. Chugh, et al. (2002). "Traditional versus Open Office Design: A Longitudinal Field Study." Environment and behavior **34**(3): 279-299.

Research in open office design has shown that it is negatively related to workers' satisfaction with their physical environment and perceived productivity. A longitudinal study was conducted within a large private organization to investigate the effects of relocating employees from traditional offices to open offices. A measure was constructed that

assessed employees' satisfaction with the physical environment, physical stress, co-worker relations, perceived job performance, and the use of open office protocols. The sample consisted of 21 employees who completed the surveys at all three measurement intervals: prior to the move, 4 weeks after the move, and 6 months after the move. Results indicated decreased employee satisfaction with all of the dependent measures following the relocation. Moreover, the employees' dissatisfaction did not abate, even after an adjustment period. Reasons for these findings are discussed and recommendations are presented.

Brenner, N. and S. Elden (2009). "Henri Lefebvre on state, space, territory." International Political Sociology **3**: 353-377.

In this article, we offer an account of how the French Marxist philosopher and sociologist Henri Lefebvre can be read as a theorist of territory. While Lefebvre's writings on state space have generated some interest in recent years, the territorial dimensions of his thinking on this issue have not been explored. Meanwhile, the question of territory has been oddly undertheorized in the post-1970s literatures on international relations and spatialized political economy. Against this background, we suggest that Lefebvre's work contains some insightful, if unsystematic, observations on the relationship between states, space and territory. Following consideration of Agnew's (1994) influential injunction that social scientists transcend the ''territorial trap,'' we develop this reading of Lefebvre with reference to three key dimensions of his approach to state space as territory—first, the production of territory; second, state territorial strategies; and third, the ''territory effect,'' namely, the state's tendency, through its territorial form, to naturalize its own transformative effects on sociospatial relations. Thus construed, Lefebvre's approach productively raises the issue of how the territorial trap is actually constructed and reproduced.

Breunlin, D. C., B. J. Mann, et al. (2005). "Personalizing a Large Comprehensive High School." NASSP Bulletin **89**(645): 24-42.

Although bringing a personalized learning environment to a small school is challenging in its own right, it is much easier than personalizing the environment of a large school. This article describes the interventions used in one suburban school with over 3,700 students to move the learning environment toward a more personalized climate. The multi-pronged strategies used are discussed, as are the results of a repeat-measure climate evaluation. During the researchers' years of involvement with the school, the climate was clearly moved toward personalization.

Bridgland, A. and P. Blanchard (2001). "Flexible delivery/flexible learning ... does it make a difference?" Australian Academic & Research Libraries **September**: 177-191.

Flexible learning is fast becoming an essential model for teaching and learning practices as its methods cater to the wide-ranging needs and hectic lifestyles of learners. While rapid developments in information and communications technologies have provided opportunities for flexible learning practices, the fundamental principle of flexible learning embraces a student-centred approach compared to the traditional teacher-led model. This paper explores the theoretical principles of flexible learning including an examination of the social, pedagogical and practical issues, and highlights the realities of resourcing flexible delivery by presenting a case-study of the Percy Baxter Collaborative Learning Centre al the University of Melbourne.

Briesch, A. M. and S. M. Chafouleas (2009). "Review and Analysis of Literature on Self-Management Interventions to Promote Appropriate Classroom Behaviors (1988-2008)." School Psychology Quarterly **24**(2): 106-118.

In the late 1980s, J. W. Fantuzzo and colleagues conducted a review of the self-management literature in order to better define the characteristics of this class of interventions. Results indicated that many interventions were minimally student-directed despite the title "self-managed" and that student-managed interventions demonstrated incremental effects above teacher-managed interventions. In the current study, updated information was compiled with regard to how self-management interventions have been described, including the degree to which self-management interventions continue to rely on external (i.e., teacher) contingencies. Review of the literature identified 16 different characterizations of self-management interventions, each of which varied widely in terms of the number of intervention components included as well as the degree to which students were involved in implementation. Although self-observation and recording of a predefined behavior appear to be the cornerstones of self-management interventions, meaningful differences were noted, including whether reinforcement was involved and whether changes in performance were tracked over time. Furthermore, although self-management interventions appear to have undergone a small shift toward increased reliance on internal (i.e., student-managed) contingencies, adults continue to play a large role in the implementation.

Brithecker, D. (2005). The educational workplace: What the 'classroom of the future' will look like, Federal working group for posture and mobilization support, Wiesbaden, Germany.

A four-year pilot study on a "movement-ergonomic" workplace design and "movement-oriented" teaching methods for primary school students

British Council for School Environments (2007). Learning Journeys, Moving Towards Designs for New Learning Spaces: Two Truths and a Suggestion., British Council for School Environments, London, United Kingdom 19.

Discusses how educational space should reflect the pedagogy, the role of flexible furniture in learning spaces, and how boundaries between formal and informal learning spaces should be blurred.

Bronzaft, A. L. and D. P. McCarthy (1975). "The Effect of Elevated Train Noise On Reading Ability." Environment and behavior **7**(4): 517-528.

Brook, D. (2009). Designing Learning Spaces for 21st Century Learners.
Advocates learner-centered instructional spaces, considering the culture of the school; flexible, connected, and collaborative environments; rich technology; and consideration of physiology in furnishings, lighting, and acoustics.

Brown, B. B. (1992). "The ecology of privacy and mood in a shared living group." Journal of Environmental Psychology **12**(1): 5-20.
The present study demonstrates that social, physical, and behavioural aspects of context contribute to the experience of privacy regulation and mood in a shared living group. The study tracked social contacts, physical settings, activities, privacy regulation, and mood at random times over one week in a ten-student shared living facility. Results showed that solitude was a frequent experience even when students were in the shared residential facility. Past research has shown solitude to be an aversive state. This finding is confirmed, with a caveat: the most aversively experienced solitude occurred when students desired to be alone. Thus, aversive experiences when alone did not signal times of desired but unattained contact. Within shared living quarters, participants were not socially overloaded--they were frequently alone and often desired greater intimacy. Yet they also reported positive experiences of place attachment in both the family home and the private apartments, but not in the shared living spaces outside the apartments. The study also proposes that experience sampling methodology (ESM) provides a good technique for researchers interested in using environment and behavior frameworks such as transactional world views and behaviour setting theory.

Brown, J. L., S. M. Jones, et al. (2010). "Improving Classroom Quality: Teacher Influences and Experimental Impacts of the 4Rs Program." Journal of Educational Psychology **102**(1): 153-167.
This study capitalizes on recent advances in the reliable and valid measurement of classroom-level social processes known to influence children's social-emotional and academic development and addresses a number of limitations in our current understanding of teacher- and intervention-related impacts on elementary school classroom processes. A cluster randomized controlled trial design was employed to (a) examine whether teacher social-emotional functioning forecasts differences in the quality of 3rd-grade classrooms, (b) test the experimental impact of a school-based social-emotional learning and literacy intervention on the quality of classroom processes controlling for teacher social-emotional functioning, and (c) examine whether intervention impacts on classroom quality are moderated by these teacher-related factors. Results indicated (a) positive effects of teachers' perceived emotional ability on classroom quality; (b) positive effects of the 4Rs Program on overall classroom quality, net of teacher social-emotional functioning indicators; and (c) intervention effects that are robust to differences in these teacher factors. These findings support and extend recent research examining intervention-induced changes in classroom-level social processes fundamental to positive youth development.

Brown, M. (2005) Learning Space Design Theory and Practice. Educause Review **40**, 30

Brown, M. (2005). Learning Spaces. Educating the Net Generation. D. Oblinger. Boulder, Educause.

Bruckner, M. (1997). "Eavesdropping on Change: Listening to Teachers During the First Year of an Extended Block Schedule." NASSP Bulletin **81**(593): 42-52.
More and more high schools are moving to a block scheduling arrangement, which results in longer and fewer classes each day. Changes in teaching strategies are essential to the success of such programs, for without significant revisions in classroom time use, block scheduling results in lengthy lectures or multiple lessons forged together, sometimes without logic.

Buckley, J., M. Schneider, et al. (2004). The effects of school facility quality on teacher retention in urban school districts, National Clearinghouse for Educational Facilities.
The attrition of both new and experienced teachers is a great challenge for schools and school administrators throughout the United States, particularly in large urban districts. Because of the importance of this issue, there is a large empirical literature that investigates why teachers quit and how they might be better induced to stay. Here we build upon this literature by suggesting another important factor: the quality of school facilities. We investigate the importance of facility quality using data from a survey of K-12 teachers in Washington, D.C. We find in our sample that facility quality is an important predictor of the decision of teachers to leave their current position.

Buckley, J., M. Schneider, et al. (2004). LAUSD School Facilities and Academic Performance. Washington, D.C., 21st Century School Fund.
Reports the results of a study on the relationship between the extent to which schools in the Los Angeles Unified School District (LAUSD) comply with health and safety regulations and academic performance. Schools were evaluated on fourteen measures of compliance which included aspects of environment, safety, maintenance, and vehicular traffic. The fourteen measures were combined to create an "Overall Compliance Rating" (OCR) for each school and it was discovered that the OCR was linked to academic achievement.

Buckley, J., M. Schneider, et al. (2005). "Fix It and They Might Stay: School Facility Quality and Teacher Retention in Washington, D.C." Teachers College Record.

The attrition of both new and experienced teachers is a challenge for schools and school administrators throughout the United States, particularly in large urban districts. Because of the importance of this issue, there is a large empirical literature that investigates why teachers quit and how they might be induced to stay. Here we build upon this literature by suggesting another important factor in the teacher decision to stay or leave: the quality of school facilities. We investigate the importance of facility quality using data from a survey of K - 12 public school teachers in Washington, D.C. We find in our sample that facility quality is an important predictor of the decision of teachers to leave their current position, even after controlling for other contributing factors.

Bullard, J. (2010). Creating Environments for Learning: Birth to Age Eight., Pearson Education, Inc., Upper Saddle River, NJ

Provides a textbook for study of the creation of early childhood and primary learning environments, with chapters on creating healthy and safe environments, arranging the classroom, design considerations, developing learning centers within the space that serve specific subject areas and play, outdoor learning spaces, and family areas.

Bullock, C. (2007). The Relationship Between School Building Conditions and Student Achievement at the Middle School Level in the Commonwealth of Virginia. Educational Leadership and Policy Studies. **PhD:** 135.

The purpose of this study was to investigate the relationship between school building condition and student achievement as measured by their performance on the Standards of Learning (SOL) examinations at the middle school level in the Commonwealth of Virginia. Three major data components were used to complete this study. The first component was the condition of the school buildings. To obtain this information, principals were asked to complete the Commonwealth Assessment of Physical Environment (CAPE) assessment instrument. The second component was the percentage of passing scores from SOL examinations for each middle school in the Commonwealth of Virginia. The third component was the socioeconomic status of the students attending the schools as measured by the percentage of students participating in the free and reduced lunch program. Three research questions were used to examine this topic. The first research question examined the differences in the SOL results of students in school buildings rated as standard and substandard. The second research question examined the differences in the SOL results of students in school buildings rated cosmetically as standard and substandard. The third research question examined the differences in the SOL results of students in school buildings rated structurally as standard and substandard. This study found that building condition is related to student achievement. Students performed better in newer or recently renovated buildings than they did in older buildings. The percentage of students passing the Commonwealth of Virginia Standards of Learning Examination at the middle school level was higher in English, mathematics and science in standard buildings than it was in substandard buildings. One of the largest differences in percentage of students passing was in English at 6.10 percentage points. This difference was significant at the .05 level of significance. This is noteworthy because student's ability to read affects all other academic areas. Building age, windows in the instructional area, and overall building condition were positively related to student achievement. Finally the data from this study were compared to the results of earlier studies that examined high schools in the Commonwealth of Virginia, finding that these results were consistent with the findings of other studies.

Bunting, A. (2004). "Secondary schools designed for a purpose: but which one?" Teacher (Camberwell, Vic.)(154): 10-13.

Bunting, A. (2005). "Rethinking schools as learning centers: Thoughts from Australia." Education Facility Planner **40**(3&4): 24-28.

Social, economic and educational considerations are increasingly questioning the viability of the "stand alone" school. Given the importance of education in the knowledge age and the desire to reconnect with community, the concept of "learning village" is appealing.

Burch, P., G. Theoharis, et al. (2010). "Class Size Reduction in Practice: Investigating the Influence of the Elementary School Principal." Educational Policy **24**(2): 330-358.

Class size reduction (CSR) has emerged as a very popular, if not highly controversial, policy approach for reducing the achievement gap. This article reports on findings from an implementation study of class size reduction policy in Wisconsin entitled the Student Achievement Guarantee in Education (SAGE). Drawing on case studies of nine schools, we identify school principals as critical and overlooked influences in the implementation of class size reduction policies. Principals' influence proved central in three challenge areas: the use of space, serving the needs of diverse learners and building teacher capacity. By comparing the patterns of practice across schools, we have identified school leadership practices and dispositions for CSR that appear related to improving achievement levels.

Burke, C. (2005). "Contested Desires: The Edible Landscape of School." Paedagogica Historica: International Journal of the History of Education **41**(4): 571 - 587.

Food and drink are associated with survival and for children and young people the edible landscape represents an essential part of survival in the modern school. Within any institution that 'contains' persons over time, such as schools, hospitals and prisons, the organization and control of eating and drinking takes on a particularly significant role. At one and the same time, food and drink and the space in which they are served and consumed can become a site of contested desires, a space where authority and resistance are exercised. It is clear from early accounts that the

association of school children with food and drink was also seen as potentially chaotic. It served to remind those seeking to 'improve' the morals and behaviour of the 'lower' classes of the chasm of difference that existed between the social classes. There is a sense of fear and revulsion in these early accounts of collective consumption. But schools and kindergartens were, from the middle of the nineteenth century and well into the twentieth century, also important sites for the production and consumption of food as a form of pedagogy. This paper explores the interior and exterior edible landscape of school in the UK context and suggests some pointers to its significance in terms of the development of pedagogy and curriculum.

Burke, C. (2007). "The View of the Child: Releasing "visual voices" in the design of learning environments." Discourse: Studies in the Cultural Politics of Education **28**(3): 359-372.

This article introduces the concept of "visual voice" to facilitate a critical commentary on current discourses surrounding pupil participation in the design of learning environments for the future. The significance of material and spatial conditions constructing particular views of children and childhood is first discussed through some historical examples. Then, it is suggested that unpicking the complexity of the notion "the view of the child" is essential in developing critical awareness around possible frameworks for participation. Some historical and contemporary ways of viewing children's capacities as co-designers of their educational environments are discussed and this is followed by a critique of some approaches to participation in the design process current in the UK. Finally, through examples of some recent attempts to explore the meaning of "the visual culture of school" in an inter-disciplinary research setting, the article argues for a new approach to participation that engages children and adults in meaning making through layered narratives of the re-design of learning environments.

Burke, C. (2009). ""Inside out": a collaborative approach to designing schools in England, 1945–1972." Paedagogica Historica: International Journal of the History of Education **45**(3): 421 - 433.

This article explores the European dimension of a collaborative approach to school design through the lives and relationships of a group of key individuals who in England set about transforming school in the post-war era. The philosophy and practice of this group of architects, educators, designers and policy makers, who regarded the school environment as reflecting the essential humanity of children and their teachers is explored through archival documentation as well as oral testimonies. The notion that teachers might be spacious in their thinking is traced through the personal histories of HMI, architects and artists who collaborated during the years 1945–72 within a culture of commitment to public service. Design from the 'inside out' is explained as a process that was rooted in the development of a common vocabulary generated by research through practice.

Burke, C. and I. Grosvenor (2003). The school I'd like: children and young people's reflections on an education for the 21st century. London, Routledge Falmer.

Burke, C. and I. Grosvenor (2004) Schools Our Kids Would Build. Architecture Week

Butin, D. (2000). Classrooms.**:** 4.

Addresses classroom design trends and key issues schools must consider to attain better classroom space flexibility and adaptability. Discusses classroom space design issues relative to technology. Reviews design considerations necessary in classrooms that must accommodate varying grade levels. Also discusses importance of nuances in lighting, furniture, classroom size ratios, and partition arrangement. Includes design principles important for all classrooms at all grade levels, including those relating to outdoor accessibility, clustering, the fostering of creativity and student engagement, and classroom adaptability.

Butin, D. (2000). Multipurpose Spaces.**:** 2.

Examines multipurpose class spaces, educational trends influencing multipurpose classroom use, and key issues when using these spaces. Issues discussed include room location, technology integration, food services, acoustics, lighting, outdoor space, capacity, and storage. Design principles emphasized indicate that multipurpose classrooms should reflect the spirit of the school and foster flexibility and adaptability.

Caldwell, B. (2005). The new enterprise logic of schools, International Networking for Educational Transformation.

This book is the second in a series of publications for International Networking for Educational Transformation (iNet), the international arm of the Specialist Schools Trust. The first, *Re-imagining the self-managing school* (Caldwell, 2004a) described best practice of self-management in schools around the world. Such practice had outstripped the initial concept that had been covered in earlier co-authored books on the topic (Caldwell and Spinks, 1988; 1992; 1998). The conclusion was that schools were undergoing a profound change as they set out on the path to transformation. There was a high level of coherence and good sense in what was unfolding, and the concept of 'new enterprise logic' seemed appropriate. *The new enterprise logic of schools* provides an opportunity to describe its major features and illustrate its practice. This book complements the contributions of David Hargreaves in his publications on personalising learning that lies at the heart of transformation (Hargreaves, 2004a; 2004b). He has painted on a broader canvas in proposing a '21st century educational imaginary', replacing the '19th century imaginary' that shaped much of policy and practice in schools in recent times. The new enterprise logic is helping shape the new imaginary. I acknowledge with deep

appreciation the contributions of several hundred leaders who described how the new enterprise logic was driving the transformation of their schools. These contributions were made in presentations and discussions during an exciting series of seminars and workshops from February to May 2005 in Australia, Chile, England and New Zealand.

Calmenson, D. W. (2000). "Freestyle Teaching." Interiors & Sources (10595287) **8**(1): 66-72.

The article reports on the integration of architectural design with the need to enhance learning capabilities of the students at Kennedy Elementary School in Janesville, Wisconsin. The main concern of the renovation process of the school buildings is to create features that reflect the way children are taught inside the school. It is part of the school's commitment in improving the quality of education they are providing and give the community an idea of their commitment in educating children.

Camgöz, N., C. Yener, et al. (2004). "Effects of hue, saturation, and brightness: Part 2: Attention." Color Research & Application **29**(1): 20-28.

This is the second part of an experiment by Camgöz, Yener and Güvenç, which investigates attention responses for foreground-background colour relationships. One hundred and twenty three university undergraduates in Ankara, Turkey, viewed eight background colours selected from HSB colour space, on which colour squares of differing hues, saturations, and brightness's were presented. Participants were asked to show the colour square attracting the most attention on the presented background colour. Findings showed that on any background colour, colours of maximum saturation and brightness attract the most attention (67%). The yellow-green, green, and cyan range attracts the most attention (45%), followed by the red and magenta range (30%). Foreground-background colour relationships in terms of attention are also included in the findings of the study.

Campion, H. (2004). "The use of space in 21st century education culture." Forum **46**(1): 39-43.

Canter, D. V. and K. H. Craik (1981). "Environmental psychology." Journal of Environmental Psychology **1**(1): 1-11.

The origins and development of environmental psychology are summarized and a general definition of the field is offered. Its current vigorous state is held to be a product both of the way its practitioners have met the challenges of application and of the benefits accruing from the cumulative impact of several scientific research traditions. Whilst the core of the field is appropriately placed within the discipline of psychology, its strength derives also from continuing transactions with other disciplines. One major conclusion from considering the early and recent development of the field is that any premature or narrow definition of it could reduce its future vitality.

Cardon, G., D. De Clercq, et al. (2004). "Sitting habits in elementary schoolchildren: a traditional versus a "Moving school"." Patient Education and Counseling **54**(2): 133-142.

This study evaluated differences in sitting habits in the classroom between the project "Moving school" and a traditional school in 8-year-old children. Twenty-two children, since 1.5 years involved in the project were compared to 25 children in a traditional school. Making use of the Portable Ergonomic Observation (PEO) method, it was observed that children from a traditional school spend an average of 97% of the lesson time sitting statically, from which one-third with the trunk bend over 45°. In the "Moving school" this posture was replaced by dynamic sitting (53%), standing (31%) and walking around (10%), while trunk flexion over 45° was nearly not observed. Children from the "Moving school" also showed significantly less neck and trunk rotation. Additionally, accelerometric data showed significantly more physical activity in lessons of the "Moving school". Rates of self-reported back or neck pain did not differ significantly between both study groups. Results show that sitting habits are more favourable in a "Moving school". Further research is needed to study the impact of implementing "Moving school" concepts in traditional schools on sitting habits.

Carrington, V. (2002). Alternate tasks: no more bored kids. No more bored kids: Real alternative for public schools Education Foundation**:** 1.

Casey, T. (2003). School grounds literature review: Phase one of the Scottish school grounds research project, Grounds for Learning, sportscotland and Play Scotland**:** 29.

'We are looking to create schools which are conducive to pupils learning and teachers teaching, which are accessible and welcoming, and which are an integral part of the community. (Building our Future, Scottish Executive, 2003:15) Children and young people can spend up to twenty five percent of their total school time in the school grounds. School grounds therefore offer an important resource for learning, play and child development, and to promote positive health and well-being, understanding of the environment, citizenship and physical activity for children. However there is a belief that in many schools the potential of this resource currently lies untapped. This literature review of existing research undertaken in Scotland, the UK and abroad is the first phase of the Scottish School Grounds Research Project 2002/3 on the use of, and attitudes towards the use of, school grounds in Scotland. It aims to take a broad look at school grounds research and therefore does not focus on any one particular use or user group. As well as considering existing school grounds research the review provides a policy context. Therefore in addition to published research and articles from refereed journals, the literature review makes some reference to extended case-studies and unpublished research where it is current and of relevance to the Scottish context. Legislation and policy guidelines are also included

where they inform the research project context. The review is divided into four broad areas: an overview of school grounds; the break time use of school grounds including discussions of: the social value of break time; tradition and culture in the playground; inclusion; supervision; trends and concerns; change and school grounds including: the case for change; outdoor learning and play spaces; change focussing on behaviour, health and activity; participation; successfully supporting change; school grounds as compensation; the current planning, programming and policy contexts.

Cash, C. (1993). Building condition and student achievement and behaviour., Virginia Polytechnic Institute and State University. Doctor of Philosophy**:** 159.

Cattier, A. (2005). Navigating Toward the Next-Generation Computer Lab. Learning Spaces. D. Oblinger. Boulder, Educause.

Cavenaugh, W., G. Tocci, et al. (2009). Architectural Acoustics: Principles and Practice, John Wiley and Sons, Hoboken, NJ
Provides design professionals with information on basic concepts, acoustical materials, and technologies for controlling wanted or unwanted sound within and around buildings. The book covers fundamental acoustic principles, design criteria, acoustical materials, control strategies, and methods for a wide variety of building types, including educational facilities. Particular attention is given to places for listening and performance such as theaters, concert and recital halls, outdoor arenas, classrooms, multiuse auditoria, libraries, music practice and rehearsal rooms, recording and broadcast studios, and sports venues.

CEFPI (2004). Elementary school post-occupancy evaluation. Creating Connections: The CEFPI guide for Education Facility Planning, CEFPI, Council of Educational Facility Planning International**:** 4.

CELE CELE organising framework on evaluating quality in educational spaces 9.
Background and purpose of the Framework: The following statement summarises the conclusions of experts participating in three OECD meetings in 2005-06 on "Evaluating Quality in Educational Facilities": "All individuals have a right to a quality educational facility, a physical space that supports multiple and diverse teaching and learning programmes and pedagogies, including current technologies; one that demonstrates optimal, cost-effective building performance and operation over time; one that respects and is in harmony with the environment; and one that encourages social participation, providing a healthy, comfortable, safe, secure and stimulating setting for its occupants." Governments have a responsibility to invest in quality educational spaces because the physical environment can have a significant impact on the present and future professional, educational and personal lives of students, staff and their communities. This Framework highlights the important role of quality spaces in increasing access and equity for all in education, improving educational effectiveness and promoting acquisition of key competencies, and optimising building performance and operation. The school is an essential component of a diverse and complex knowledge economy, and it must respond to its changing needs and demands. In essence, we evaluate educational spaces to measure their responsiveness to these changing needs and demands. Are governments prepared to challenge traditional paradigms of school design, construction and operation – and invest in new ones – in order to improve their schools to meet the needs of tomorrow's knowledge economy? The objective of the CELE Organising Framework for Evaluating Quality in Educational Spaces and the accompanying matrix is to demonstrate the inter-relationships over a facility's life cycle between the broad policy issues that both shape and respond to quality issues in educational spaces; current conceptions of what defines "quality" in educational spaces; the demands and benefits of the space to its numerous users and other stakeholders; and appropriate methods that can be used to evaluate different aspects of quality. This Framework is not intended to serve as a checklist. It is a multi-dimensional, policy-oriented tool that will be used in this OECD project to help discern the most appropriate means by which to evaluate different aspects of quality in educational spaces in different countries at local, regional and/or national levels. It can also be used by individual countries to assess "quality" in terms of their own goals and priorities.

Cellini, S., F. Ferreira, et al. (2008). The value of school facilities: Evidence from a dynamic regression discontinuity design, The Trachtenberg School, George Washington University**:** 50.
This paper estimates the impact of investments in school facilities using the housing market. We draw on the unique characteristics of California's system of school finance, comparing districts in which school bond referenda passed or failed by narrow margins. We extend the traditional regression discontinuity (RD) design to account for the dynamic nature of bond referenda: the probability of future proposals depends on the outcomes of past elections. Using our "dynamic RD" estimator, we first show that bond funds stick exclusively in the capital account, with no effect on current expenditures or other revenues. We can thus interpret the effect of referendum passage as reflecting the impact of improvements in the quality of school facilities. We find that passing a referendum causes immediate, sizable increases in home prices, implying a willingness-to-pay on the part of marginal homebuyers of $1.50 or more for each dollar per pupil of facility spending. These effects do not appear to be driven by changes in the income or racial composition of homeowners. While we find suggestive evidence that bond passage leads to increases in student test scores, this effect cannot explain more than a small portion of the housing price effect, indicating that bond passage leads to improvements in other dimensions of school output (e.g., safety) that may be not captured by test scores.

Chan, C. (1979). The Impact of School Building Age on Pupil Achievement.**:** 18.

Research conducted in Georgia reveals that pupils in school buildings with modern facilities attain higher achievement than pupils in buildings with older facilities. All public schools in Georgia containing eighth grade students were classified as non-modernized, partially modernized, or modern according to results of questionnaires administered to building principals in 1975-76. Academic achievement data providing the dependent variable for the analysis were derived from scores on the Iowa Tests of Basic Skills taken by each school's eighth-grade students in 1975-76. Independent variables were school building age and socioeconomic status of each building's student population (based on the percentage of students participating free or at reduced rates in the school's lunch program). Analysis indicated that when the socioeconomic status variable was statistically controlled, school building age was significantly related (at the .05 level) to the composite, vocabulary, and mathematics scores on the Iowa Tests.

Chan, T. (2006). "Portable vs. permanent classrooms: A quasi-experimental study of fifth graders' attitude and mathematics achievement." Eastern Education Journal **35**(1): 69-74.

In this study, 43 fifth graders attended mathematics class in a portable classroom whereas 38 had their mathematics class in a permanent classroom of an elementary school. Student attitude and mathematics achievement between the two groups were compared. No significant difference was found. Student attitude and achievement was also observed through teachers' perception. Teachers in general did not perceive that portable classrooms had any negative impact on student attitude and achievement.

Chan, T. (2009). "Do portable classrooms impact teaching and learning?" Journal of Educational Administration **47**(3): 290 - 304.

Abstract: Purpose – The purpose of this paper is to examine the possible impact portable classrooms have on the teaching and learning process by exploring current related literature. Design/methodology/approach – This paper takes a synthesis approach, analyzing current studies to assess the impact of portable classrooms on teaching and learning. Findings – No significant impact of portable classrooms on teacher perception, teacher morale, teacher job satisfaction, student achievement, and behavior is detected. Negative student attitude is found in one of the studies reviewed. Technical testing shows negative relationships between portable classrooms and health and safety conditions, but the permanent structures are sometimes worse. Research limitations/implications – An experimental study on the impact of portable classrooms on teaching and learning is needed. Analysis of current studies indicate that the impact of portable classrooms on teaching and learning is not as negative as assumed. Still, the negative effects of deterioration or lack of maintenance cannot be underestimated; making implementation strategies, maintenance schedules, relocation plans, and plans for ultimate replacement vital. Originality/value – This paper represents the first of its kind to synthesize the findings of current studies on portable classrooms. Results are of great value to educational decision makers.

Chan, T. C. (1996). Environmental Impact on Student Learning.**:** 30.

School facilities play a significant role in shaping students' learning process. This document is a collection of articles that examined the impact of school facilities on learning. The articles were previously published in Chinese during the early 1980s in Hong Kong newspapers. Contents include: (1) "A Summary Report on the Relationship of School Building Age and Student Achievement"; (2) "School Design and Instructional Need"; (3) "Learning Environment and Student Achievement"; (4) "My View on Learning Environment--A Rejoinder"; (5) "Three Studies on School Facilities"; (6) "Environmental Psychology and Facility Planning"; and (7) "Educational Facility Research in America."

Chan, T.-W., C.-W. Hue, et al. (2001). "Four spaces of network learning models." Computers & Education **37**(2): 141-161.

The development of information and communication technology changes how, what, who, when, where and why we learn. Unfortunately, little is known of the exact impact that these changes will bring to education. However, we are certain that many new learning and teaching styles which are called learning models in the paper will emerge to cope with the changes in the near future. The present paper describes four spaces of learning models, namely, the future-classroom, the community-based, the structural-knowledge, and the complex-problem learning models, which are specifically designed to integrate the Internet into education.1 With the four spaces of learning models, the present paper may serve two functions. First, it offers a way to integrate an array of different communication technologies (e.g. handheld computer, wireless communication and the Internet) and learning theories into an integrated schema. Secondly, the paper offers a direction concerning how and what to look for in education with the Internet integrated in.

Chaney, B. and L. Lewis (2007). Public school principals report on their school facilities. U. D. o. Education. Washington DC, National Center for Education Statistics.

The extent to which school buildings support education has been an important topic for policymakers. One issue is the physical condition of the buildings, particularly as school buildings age. Another is the ability of the buildings to accommodate shifts in the nation's population: some communities have experienced decreases in school-age population due to outmigration or shifts in the age distribution, leading to below-capacity enrolment in their schools, while others have experienced large increases in population and have needed to build new schools, expand existing ones, or put more students in buildings than the buildings are designed to serve. This report is based on a survey of school principals conducted by the National Center for Education Statistics (NCES) in the Institute of Education Sciences, US Department of Education. It presents current information on the extent of the match between the enrolment and

the capacity of the school buildings, environmental factors that can affect the use of classrooms and school buildings, the extent and ways in which schools use portable buildings and the reasons for using them, the availability of dedicated rooms for particular subject areas (such as science labs or music rooms), and the cleanliness and maintenance of student restrooms. The data were collected from mid-September 2005 through late January 2006 from public elementary and secondary schools in the 50 states and the District of Columbia. T-tests were used to test for statistical significance.

Chang, C.-Y. and P.-K. Chen (2005). "Human Response to Window Views and Indoor Plants in the Workplace." HortScience **40**(5): 1354-1359.

The purpose of this paper was to report the effects of window views and indoor plants on human psycho physiological response in workplace environments. The effects of window views and indoor plants were recorded by measuring participant's electromyography (EMG), electroencephalography (EEG), blood volume pulse (BVP), and state anxiety. Photo Impact 5.0 was used to simulate the environment in an office, where six conditions were examined: 1) window with a view of a city, 2) window with a view of a city and indoor plants, 3) window with a view of nature, 4) window with a view of nature and indoor plants, 5) office without a window view, and 6) office without a window view and indoor plants. Participants were less nervous or anxious when watching a view of nature and/or when indoor plants were present. When neither the window view nor the indoor plants were shown, participants suffered the highest degree of tension and anxiety.

Chiles, P. (2003). "Classrooms for the future: "an adventure in design" and research." ARQ: Architectural Research Quarterly **7**: 3-4.

Four interactive classrooms have been constructed in Sheffield, England.

Ching Yee, W., R. Sommer, et al. (1992). "The soft classroom 17 years later." Journal of Environmental Psychology **12**(4): 336-343.

A 17-year follow-up was conducted on an innovative classroom designed to improve esthetics and increase student participation. Despite a deterioration in aesthetics due to neglect and poor maintenance, the room continued to maintain a constituency among students and faculty, and to enhance student participation relative to straight-row classrooms. Problems remain of accommodating an innovative design within a bureaucratic system based on standardization of spaces and functions.

Chism, N. (2005). Informal Learning Spaces and the Institutional Mission.**:** 4.

Addresses a shared understanding of what might fall under the heading of "informal learning spaces," discusses what constitutes the "institutional mission" and its various dimensions, identifies how institutional mission and space intersect, examines different spaces and determines what they say about learning, and identifies informal learning space issues about which we need a greater understanding.

Cilesiz, S. (2009). "Educational Computer Use in Leisure Contexts: A Phenomenological Study of Adolescents' Experiences at Internet Cafes." American Educational Research Journal **46**(1): 232-274.

Computer use is a widespread leisure activity for adolescents. Leisure contexts, such as Internet cafes, constitute specific social environments for computer use and may hold significant educational potential. This article reports a phenomenological study of adolescents' experiences of educational computer use at Internet cafes in Turkey. The purposes of the study were to understand and describe the phenomenon in depth and arrive at the essence of adolescents' experiences with the phenomenon. Data were collected through series of in-depth phenomenological interviews with six adolescents and analyzed using phenomenal analysis. The results include potential benefits of Internet cafes as specific social leisure contexts of educational computer use for adolescent development. Implications for designing and studying computer-based informal learning environments are presented.

Clark, A. (2005). Talking and listening to children. Children's Spaces. M. Dudek, Architectural Press, Oxford**:** 1-13.

Clark, A. (2010). Transforming Childrens' Spaces: Children's and Adults' Participation in Designing Learning Environments. , London: Routledge.

How can young children play an active role in developing the design of learning environments? What methods can be used to bring together children and practitioners views about their environment? What insights can young children offer into good designs for these childrena spaces? With the expansion of early childhood education and the move to 'extended schools', more young children will spend more time than ever before in institutions. Based on two actual building projects, this book is the first of its kind to demonstrate the possibilities of including young children perspectives in the design and review of children spaces. Situated at the heart of the debate about the relationship between the built environment and its impact on children learning and wellbeing, Transforming Children Spaces: provides insights into how young children see their environment; discusses children aspirations for future spaces; develops the 'Mosaic approach', pioneered by the author, as a method for listening to young children and adults. Emphasising the importance of visual and verbal methods of communication, this fascinating book demonstrates how practitioners and young children can articulate their perspectives, and shows how participatory methods can support new relationships between children, practitioners and architects. This book is essential reading for those who work in

children's spaces and for those who design them as well as being of general interest to those studying education and childhood studies.

Clark, A. and B. Percy-Smith (2006). "Beyond Consultation: Participatory Practices in Everyday Spaces." Children, Youth & Environments **16**(2): 1-9.

The article discusses the issues that emerge in the participation of the youth in decision making at different levels from the everyday to a specific event. Organizations outside the child sector must recognize the equal worth of young people's views, opinions and abilities to take active roles. Tensions in participation will arise depending on how an organization is viewed or views itself and also from the assumptions held about young people and adults. It provides insights into the relationships between youth and adults.

Clark, H. (2002). Building education: the role of the physical environment in enhancing teaching and research. London, Institute of Education, University of London.

This publication provides an overview of some of the current themes relevant to school building design. It looks at the relationship between school buildings, attainment and behaviour and describes projects that address ways in which school buildings can support and encourage participatory learning, and enhance both the National Curriculum and individual schools' curricula. It examines the implications of opening up school buildings to the wider community and the role of the physical environment in the inclusion of children with special educational needs and disabilities. Finally, factors that will have implications for school buildings in the future such as environmental concerns and the impact of multimedia technology are addressed. The publication is an update of an earlier internal literature review into research on school buildings carried out in 1999 for the Makeover at School Project based at SENJIT (Special Educational Needs Joint Initiative for Training), Institute of Education. Since that time, interest in school buildings has been steadily gaining momentum. More architects have become involved in school design over the last five years as the result of increased government funding and changes in the way in which monies are distributed. There have been several conferences concerned with aspects of the educational built environment. Publicity for the growing number of projects and organisations that are addressing issues of school design in innovative ways is increasing. The contrast in the level of interest in the area and the lack of information currently available is evident in the frequent requests for literature and resources the Makeover at School Project receives.

Clayton, M. (2001). Classroom Spaces That Work. Strategies for Teachers Series.**:** 192.

Creating a physical environment that is organized, welcoming, and well-suited to the needs of students and teachers can present a challenge to both beginning and experienced teachers. Based on the responsive classroom approach, this guide for educators of kindergarten through grade 6 is designed to help teachers set up physical spaces that are conducive to effective learning and teaching. Following an introduction, chapter 1 examines ways to make the classroom fit the range of physical sizes in the group, accommodate children with special needs, and support students' developmental needs. Chapter 2 presents strategies for developing and maintaining an orderly and predictable classroom, including furniture, storage space, clustered work areas and a personal space for each student. Chapter 3 focuses on the design of the whole-group meeting area of the classroom. Chapter 4 examines how furniture, materials, and storage spaces can be set up for active learning. Chapter 5 presents ways classroom displays can be used as a teaching tool. Chapter 6 discusses how to create ambience in a classroom. Chapter 7 deals with avoiding health hazards in the classroom. The book concludes by suggesting that small, simple changes in classroom design can have dramatic effects and that it is important to have a flexible attitude about classroom design and to share ownership of classroom design changes with students.

Clements-Croome, D. (2008). "Work performance, productivity and indoor air." Scandanavian journal of work, environment & health **Supplement**: 10.

Temperature, relative humidity, and air quality all affect the sensory system via thermo receptors in the skin and the olfactory system. Air quality is mainly defined by the contaminants in the air. However, the most persistent memory of any space is often its odour. Strong, emotional, and past experiences are awakened by the olfactory sense. Odours can also influence cognitive processes that affect creative task performance, as well as personal memories and moods. Besides nitrogen and oxygen, the air contains particles and many chemicals that affect the efficiency of the oxygenation process in the blood, and ultimately the air breathed affects thinking and concentration. It is important to show clients the value of spending more capital on high-quality buildings that promote good ventilation. The process of achieving indoor-air quality is a continual one throughout the design, construction, commissioning, and facilities management processes. This paper reviews the evidence.

Cohen, S., G. W. Evans, et al. (1980). "Physiological, motivational, and cognitive effects of aircraft noise on children: Moving from the laboratory to the field." American Psychologist **35**(3): 231-243.

Studied the effects of aircraft noise on 3rd- and 4th-grade students as evidence for the effects of community noise on behavior and as an example of a study that examines the generality of laboratory effects in a naturalistic setting. The impact of noise on attentional strategies, feelings of personal control, and physiological processes related to health was measured. Results are consistent with laboratory work on physiological response to noise and on uncontrollable noise as a factor in helplessness. 142 Ss from noisy schools had higher blood pressure than 120 Ss from matched quiet

schools. Noisy-school Ss were also more likely to fail on a cognitive task and more likely to give up before the time to complete the task elapsed. The development of attentional strategies predicted from laboratory and previous field research was, on the whole, not found. The implications for understanding the relationship between noise and behavior and for influencing public policy are discussed.

Cohen, S. and S. L. Trostle (1990). "Young Children's Preferences for School-Related Physical-Environmental Setting Characteristics." Environment and behavior **22**(6): 753-766.

Environmental preferences for size, shape, color, complexity, texture, and lighting within a school-related setting were examined among kindergarten and first grade school children. Using a guided "story-walk" as a prop, each characteristic was presented to the child in simplified pictorial contexts incorporating the school and its immediate surroundings. It was found that children discriminate, in selected fashion, in their preferential responses to physical-environmental characteristics of the environment. Findings of principal interest suggest that boys and girls respond differently to environmental features such as color, shape, light, and complexity, with girls demonstrating stronger preference for more diverse and dramatic environmental stimuli than do boys. The significance of this finding for evaluating spatial-cognitive knowledge among boys and girls is discussed.

Cole, P. (2002). From schools to learning centres. No more bored kids: Real alternative for public schools Education Foundation**:** 1.

Coles, A. D. (1999). "Report Raises Concerns About Portable Classrooms." Education Week **18**(39): 5.

Provides health-related information concerning students in the United States. Possibility of exposure to airborne cancer-causing toxins among California students attending classes in portable classrooms; Results of a survey on the views of Americans on sex education; Sex differences in levels of stress.

Coley, D. A., S. Hunt, et al. (2009). "Acoustics in Schools: Explaining the Options to Architects by the use of Approximate Formulae and Graphs, with a Special Emphasis on Dining Spaces." Indoor and Built Environment **18**(6): 505-513.

The UK is undertaking a large-scale rebuilding of its school stock. The scale of the operation has meant that designers with little knowledge of school design are frequently involved. One negative consequence of this can be poor acoustic design and therefore a poor indoor environment. This paper is in part pedagogical, and presents a series of new key relationships in the acoustics of school spaces with an emphasis on dining rooms -- an area with which architects have been found to have difficulties. Hopefully, this work will allow architects and building services engineers to appreciate better various salient points and to understand fully the flexibility they have to design novel spaces that can provide a high quality educational experience. Several novel equations are derived that acousticians, building services engineers, and architects may feel useful during the early stages of the design process. Three case studies are also given.

Collier, R. (2005). "Ballarat learning exchange: a model for vocational education and training in Australia." Education Facility Planner **40**(3&4): 14-18.

This project, based in Ballarat in Victoria, Australia, represents a model in co-operative planning by a wide range of educational providers to meet the identified vocational education and training needs of young people. The local business community find this a successful, viable training facility for vocational education.

Collins, R. J. (2009). "One-Stop Design." American School & University **82**(3): 246-249.

The article focuses on the importance of design-building and construction management for the purpose of school projects. In design-build projects the owner has a single contract with the design builder. In sole-source design system there are licensed and experienced professionals in appropriate discipline. The article informs that if an owner trusts an architect to design a particular project, the owner should trust the firm to provide construction management services too. INSET: A phased renovation.

Comber, B., H. Nixon, et al. (2006). "Urban Renewal From the Inside Out: Spatial and Critical Literacies in a Low Socioeconomic School Community." Mind, Culture, and Activity **13**(3): 228 - 246.

This article focuses on how teachers worked to build a meaningful curriculum around changes to a neighborhood and school grounds in a precinct listed for urban renewal. Drawing on a long-term relationship with the principal and one teacher, the researchers planned and designed a collaborative project to involve children as active participants in the redevelopment process, negotiating and redesigning an area between the preschool and the school. The research investigated spatial literacies, that is, ways of thinking about and representing the production of spaces, and critical literacies, in this instance how young people might have a say in remaking part of their school grounds. Data included videotapes of key events, interviews, and an archive of the elementary students' artifacts experimenting with spatial literacies. The project builds on the insights of community members and researchers working for social justice in high-poverty areas internationally that indicate the importance of education, local action, family, and youth involvement in building sustainable and equitable communities.

Copeland, W. D. (1978). "Processes mediating the relationship between cooperating-teacher behavior and student-teacher classroom performance." Journal of Educational Psychology **70**(1): 95-100.

To explain previously detected relationships between cooperating-teacher behavior and student-teacher behavior subsequent to microteaching training, 2 alternate hypotheses were tested: (a) the model of target skill utilization provided by the cooperating teacher encourages student-teacher skill utilization, and (b) the classroom ecological system as shaped by cooperating-teacher skill utilization supports student-teacher skill utilization. 32 credential students were randomly assigned to 2 levels of each treatment that reflected the 2 hypotheses, were provided wth microteaching training in the target skill, and were subsequently observed during classroom teaching. A 2-way ANOVA of skill-utilization scores supported hypothesis (b). Implications for teacher education and classroom based research are discussed.

Cotterell, J. L. (1984). "Effects of School Architectural Design on Student and Teacher Anxiety." Environment and behavior **16**(4): 455-479.

This study used student diaries of events at the point of entry into junior high school to identify three categories of anxiety, which were analyzed in terms of the differences in student personality (conceptual level) and in school design (open plan or conventional). In addition, follow-up observations were made of student and teacher behavior in class. The study found that students in open plan schools had lower levels of normlessness, and higher levels of schoolwork anxiety, than their counterparts in conventional design schools. For the anxiety category, threat from others, low conceptual level (CL) students experienced greater anxiety than high CL students. Results of the observations of teachers suggested that those in open plan schools experienced more tension and anxiety than those in conventional schools. In the open plan classrooms, transitions to new activities were more frequently needed and were more prolonged, and student off-task behavior was greater. Results were interpreted in terms of the effects of environmental load on information processing.

Council for the Australian Federation (2007). The future of schooling in Australia. FEDERALIST PAPER 2**:** 41.

Cowell, J. (2005). 21st century connected schools. AIA National Summit on School Design. University of Maryland**:** 7.

Representative from Cisco Systems. Discussing multiple networks and technologies.

Cox, M., C. Abbott, et al. (2003). ICT and attainment: A review of the research literature. ICT in Schools Research and Evaluation Series – No.17, DfES, Department for Education and Skills, UK**:** 51.

Cox, M., M. Webb, et al. (2003). ICT and pedagogy: A review of the research literature. ICT in Schools Research and Evaluation Series – No.18, DfES, Department for Education and Skills, UK**:** 43.

Craig, C. J. (2009). "The Contested Classroom Space: A Decade of Lived Educational Policy in Texas Schools." American Educational Research Journal **46**(4): 1034-1059.

In this article, examples excerpted from research studies conducted in Houston, Texas, the fourth largest city in the United States, are used to demonstrate how the discretionary classroom space where teachers and students actively live curriculum--guided, though, not controlled, by official documents and administrative oversight--has become increasingly disputed. Through meta-level narrative analysis, excerpts from several accounts that elucidate different manifestations of the contested classroom space in multiple school contexts are woven together. In the process, the ways that teachers, principals, parents, professors, consultants, district personnel, the media, researchers, and students contributed to the contentious environment are explicated. Also, versions of curriculum and instruction that increased the contestation are named. As a result, changes that teachers and students lived in classrooms from 1997 to 2007, the decade when educational policy making in Texas served as the prototype for the U.S. No Child Left Behind Act, are characterized.

Craig, W. M., D. Pepler, et al. (2000). "Observations of Bullying in the Playground and in the Classroom." School Psychology International **21**(1): 22-36.

The present study employed naturalistic observations to compare bullying and victimization in the playground and in the classroom. The results indicated that there were more opportunities to observe aggression and receive and initiate aggression in the playground than in the classroom. The frequency of bullying was higher in the playground (4.5 episodes per hour) than in the classroom (2.4 episodes per hour). The nature of bullying reflected the constraints of the context (i.e. direct bullying was more prevalent in the playground and indirect bullying was more prevalent in the classroom). Being at the receiving end of aggression was more likely to occur in the playground as compared to the classroom. Nonaggressive children were more likely to bully in the playground, whereas aggressive children were more likely to bully in the classroom. There was no difference across context in the proportion of episodes of reinforcement with peers present or in the rate of peer and teacher intervention. The results highlight the necessity of a systemic intervention programme that addresses not only the individual characteristics of bullies and victims, but also the roles of the peer group, teachers and the school.

Crampton, F. (2009). "Spending on school infrastructure: does money matter?" Journal of Educational Administration **47**(3): 306-322.

The purpose of this study is to further develop an emerging thread of quantitative research that grounds investment in

school infrastructure in a unified theoretical framework of investment in human, social, and physical capital. Design/methodology/approach – To answer the research question, what is the impact of investment in human, social, and physical capital on student achievement, the author uses canonical analysis, a multivariate statistical approach that allows for multiple independent and dependent variables. The null hypothesis is selected given the limited body of research on this question, and the state is selected as the unit of analysis. Level of student poverty is added as a control variable given an extensive body of research that supports its negative impact on achievement. Descriptive statistics are generated as well as a Pearson product moment correlation matrix to diagnose and address potential issues of multicollinearity and simultaneity. Three national databases are used: United States Census Bureau, US Department of Education's National Assessment of Educational Progress test score data, and the US Department of Education's Common Core of Data. Years analyzed are 2003, 2005, and 2007. Findings – The results of the canonical analysis are robust, statistically significant, and consistent over time. Investment in human, social, and physical capital accounts for between 55.8 and 77.2 percent of the variation in student achievement in fourth and eighth grade Reading and Mathematics. Investment in human capital is consistently the largest influence on student achievement followed by social and physical capital. The null hypothesis is rejected. Originality/value – This study advances the use of theory in explaining the impact of investment in school infrastructure on student achievement, a feature which distinguishes it from much previous research in this domain. The use of a theory also addresses a major weakness of traditional, atheoretical education production function research. In addition, utilization of canonical analysis rather than multiple regression to operationalize the theoretical model and analyze the data represents an advance in research design and statistical analysis for this type of research question.

Critchlow, S. (2007). "Is secondary school design standardisation a good idea?" Building Design(1794): 9-9.

The article shares the authors view on the significance of secondary school design standardization in Great Britain. Stafford Critchlow, director of Wilkinson Eyre Architects, shares that building on best practice and some form of standardisation must be the way forward if government targets are to be met. David Hills, director of DSDHA Architects, shares that standardised design would offer a short-sighted confidence of greater cost in school design, but in the long run would prove uneconomic.

Crocco, M. S., B. Faithfull, et al. (2003). "Inquiring Minds Want To Know: Action Research At A New York City Professional Development School." Journal of Teacher Education **54**(1): 19-30.

This article describes a professional development school (PDS) relationship between Teachers College, Columbia University, and the Beacon School in New York City. In examining this case of an urban high school with a diverse student population working with a college of education, the authors add to the literature on PDS partnerships, which has dealt mostly with elementary school partnerships with colleges of education. The authors focus on the action research projects conducted by teaching interns at Beacon who are also master's students in secondary education programs, chiefly social studies and English, at Teachers College. The authors analyze the impact of this collaboration on participants and institutions, while acknowledging the areas of strain in maintaining the professional development relationship over time.

da Graça, V. A. C., D. C. C. K. Kowaltowski, et al. (2007). "An evaluation method for school building design at the preliminary phase with optimisation of aspects of environmental comfort for the school system of the State São Paulo in Brazil." Building and Environment **42**(2): 984-999.

This study presents a method for evaluating and optimising environmental comfort parameters of school buildings during the preliminary stages of design. In order to test the method, 39 existing public school building designs in the State of São Paulo, Brazil, had their plans analysed and characterised in relation to their influence on environmental comfort. Four aspects of comfort were considered: thermal, acoustic, natural lighting and functionality. Since the evaluation method is based on preliminary design information only, parameters that otherwise would be analysed quantitatively had to be assessed by interviews with specialists using a qualitative five-point semantic scale. For each aspect of comfort, possible design solutions were rated from 0 to 1, according to the fuzzy set theory. The final mean grades for each comfort stated the building's average performance. Although conflicts between different comfort parameters are apparent, results show that multi-criteria optimisation can be applied as a design tool during the creative process. Maximisation of various aspects of comfort simultaneously was shown to be impossible, but compromise solutions could be found.

Dagkas, S. and A. Stathi (2007). "Exploring social and environmental factors affecting adolescents' participation in physical activity." European Physical Education Review **13**(3): 369-384.

This study explores the social factors that influence young people's participation in school and out of school physical activities. Fifty-two 16-year-old adolescents from different socioeconomic backgrounds in one suburban and one inner-city secondary school in the Midlands, UK, participated in group interviews which explored their perceptions about physical activity and the constraints they had experienced. The study suggests that involvement in physical activity is linked with students' social class, home environment and economic status. The level of participation of students from lower socioeconomic backgrounds was limited compared to their higher socioeconomic counterparts. Furthermore, adolescents' `cultural', physical' and `economic' capital were salient factors in their involvement in physical activity settings. This study stresses the need for better and wider provision of structured physical activity in schools in

economically deprived areas to compensate for lower participation levels.

Dahey, A. M. (1994). Co-operative Learning Classroom Project.

This project was undertaken to examine the changing needs of public middle schools in order to develop more appropriate furniture for the cooperative learning classroom. Schools are moving towards cooperative groups as the model for learning. The current classroom furniture and environment does not accommodate this trend. Putting students into groups does not necessarily lead to cooperative learning unless there is a shared and common goal leading to positive interdependence, face to face interaction, individual responsibility, social skills and group processing. Cooperative learning produces greater student achievement than traditional learning methodologies. Slavin found that 63% of the cooperative learning groups analyzed had an increase in achievement. I is argued here that underachieving students also do better. Children learn to take risks and are praise for their contribution in cooperative learning and are encouraged to see points of view other than their own. Such social benefits contribute to the overall satisfaction of learning and schooling. Students work with classmates who have different learning skills, cultural background, attitudes, and personalities. Heterogeneous groups promote student learning. These differences forces them to deal with conflicts and interact with others. Social interaction improves communication skills that become a necessity to functioning in society and also economic benefits because of changed nature of work. Argues that teachers take on a facilitative role. Addresses key issues such as class size, group size, space, personalisation, comfort, safety and type of classroom furniture.

Darling-Hammond, L., M. Alexander, et al. (2002). Re-designing high schools: what matters and what works. Stanford, California, School Redesign Network, Stanford University**:** 77.

Across the nation, there is a growing consensus that schools just change in fundamental ways if they are to accomplish the goals we now have for them: teaching our very diverse student population for higher order thinking and deep understanding. The system we work in today was invented nearly 100 years ago for another time and another mission—the processing of large numbers of students for rote skills and the education of only a few for knowledge work. It was never designed to teach all children to high levels. Caring and dedicated teachers, administrators, and parents work hard every day within this system to educate our children for more ambitious thinking and performance skills—and yet their efforts are often stymied by outmoded institutional structures, most notably the large, impersonal, factory-model school. A growing number of educators and policymakers believe that existing assembly-line schools that inhibit our students' and teachers' potential need to be replaced by smaller schools that are better designed to support teaching and learning. And we have evidence that small schools are indeed better for our children: All else equal, they produce higher achievement, lower dropout rates, greater attachment, and more participation in the curricular and extracurricular activities that prepare students for productive lives. There is real potential for the current small schools movement to transform the educational landscape in America for the better. Yet we must proceed with caution. "Small" is not synonymous with successful. There are ineffective small schools, some of which replicate the very problems they were seeking to solve. Small size is a necessary condition for effective schooling, but it is not enough. School designers are likely to be more successful if they can access the lessons learned from the reform efforts of the past several decades. A number of schools that have been extraordinarily effective and have helped other schools to replicate their success have important lessons to offer, based on the elements they hold in common. This publication lays out ten of those lessons—ten design features of effective small schools that help create the kind of education many of us want for all of our children: safe environments where exciting and rigorous academic work occurs in an equitable context—a setting where all groups of students succeed academically, graduate at high levels, and go on to college and productive work. Each section is accompanied by one or more profiles of small schools that are putting these features into practice and creating powerful learning opportunities for their students. The design features described in the following pages range from school structures that promote meaningful, sustained relationships among teachers and students, to curriculum and instructional practices that help all students achieve at high levels, to approaches that ensure teachers are experts at their craft, to strategies for involving families in schools and making decisions democratically. The features are not arranged in priority order, and, while successful schools tend to include most or all of these elements, not all of them enact each feature in the precise manner it is described here. Schools need to create means for enacting their goals that respond to their local contexts and work for the student, parent, and faculty members of their communities. The process of creating better schools is hard work. There is no progress without struggle. As we undertake this struggle together, we should remember the words that Langston Hughes used to describe our collective quest to build a better world: "Keep your hand on the plow. Hold on."

Darling-Hammond, L., J. Ancess, et al. (2002). "Reinventing High School: Outcomes of the Coalition Campus Schools Project." American Educational Research Journal **39**(3): 639-673.

Long-standing critiques of large "factory model" high schools and growing evidence for the benefits of small schools, especially for the achievement of low-income and minority students, have stimulated initiatives in many cities to redesign secondary education. This seven-year study of the Coalition Campus Schools Project in New York City documented a unique "birthing" process for new, small schools that were created as part of a network of reform-oriented schools in a context of systemwide reform. The study found that five new schools that were created to replace a failing comprehensive high school produced, as a group, substantially better attendance, lower incident rates, better performance on reading and writing assessments, higher graduation rates, and higher college-going rates than the

previous school, despite serving a more educationally disadvantaged population of students. The schools shared a number of design features, detailed in this study, that appeared to contribute to these outcomes. The study also describes successful system-level efforts to leverage these innovations and continuing policy dilemmas influencing the long-term fate of reforms.

Davidson, F. (2007). "Childhood obesity prevention and physical activity in schools." Health Education **107**(4): 377 - 395

Purpose – The aim of this literature review is to summarise and synthesise the research base concerning childhood obesity and physical activity, particularly in relation to teachers and schools and within a policy context of the UK. The review investigates childhood obesity, physical activity, physical education, the role of teachers, the role of schools and physical activity in the classroom. Design/methodology/approach – A literature review was undertaken involving selection of primary research and other systematic reviews. A computer search was performed using a combination of keywords including: obesity, prevention, intervention, preventive, teachers, schools, healthy schools, role models, physical activity, physical education, active school, active classroom. The review also includes samples of media coverage of the issue. Findings – This review highlights the complex and ambiguous nature of the evidence in relation to this important contemporary issue. Originality/value – A limited understanding of childhood obesity is evident from the review and this precludes definitive conclusions in relation to almost all aspects of the agenda. More quality research is needed in almost all areas of the topic, including areas such as the engagement of schools and teachers.

de Coninck-Smith, N. and M. Gutman (2004). "Children and Youth in Public: Making Places, Learning Lessons, Claiming Territories." Childhood **11**(2): 131-141.

De Jesus, R. (2000). Design Guidelines for Montessori Schools.**:** 80.

This report presents guidelines for use by architects, designers, and teachers in designing an environment that will complement and enhance the Montessori teaching method. Provides a history of the Montessori Method, analysis of books written by Montessori and her followers, review of methods and settings, and a section containing interviews and inventories done in six Montessori schools in Milwaukee, Wisconsin. Appendices contain school interview forms and pages describing "muscular education" from the book, "Montessori Method."

Deaney, R., K. Ruthven, et al. (2003). "Pupil perspectives on the contribution of information and communication technology to teaching and learning in the secondary school." Research Papers in Education **18**(2): 141.

This study explores pupils' views of the use of information and communication technology (ICT) within subject teaching and learning. Members of three year cohorts (Years 8, 10 and 12) in six English secondary schools took part in focus group interviews during the first half of 2000. The views elicited in the course of the 27 interviews are summarized in terms of six themes. Pupils saw computer-based tools and resources as helping not just to affect tasks and improve presentation, but also to refine work and trial options. They associated the use of such tools and resources with changes in working ambience and classroom relations, as well as with raised interest and increased motivation on their part. Finally, while pupils welcomed opportunities for independent working mediated by ICT in which they could engage more directly with appropriately challenging tasks, they were concerned that this reshaping of learning might be displacing valuable teaching.

Decuyper, S., F. Dochy, et al. "Grasping the dynamic complexity of team learning: An integrative model for effective team learning in organisations." Educational Research Review **In Press, Corrected Proof**.

In this article we present an integrative model of team learning. Literature shows that effective team learning requires the establishment of a dialogical space amongst team members, in which communicative behaviours such as 'sharing', 'co-construction' and 'constructive conflict' are balanced. However, finding this balance is not enough. Important questions such as 'communicating about what?', 'communicating with whom?' and 'communicating for what?' remain crucial. Five other process variables 'team reflexivity', 'team activity', 'boundary crossing', 'storage' and 'retrieval' are identified. Besides the core process variables, our model organises the most important inputs, catalyst emergent states and outputs of team learning.

DEECD (2009). Pedagogy and Space: Transforming Learning through Innovation, State of Victoria (Department of Education and Early Childhood Development)**:** 40.

Awareness of the relationship between the educational and architectural design features and principles when planning new learning environments in Victoria has escalated in the last five years. Not only should school buildings be durable and aesthetically pleasing, but they also need to be functional and fit for purpose. These trends are underpinned by a body of unique research. The research, associated with 162 schools since 2003, focuses on the way in which schools have used resources for time, space and information communication technologies (ICT) to change teacher practice. This publication explores the leading practices that have been adopted by schools and teachers in their quest to improve student learning outcomes and to more effectively identify and respond to student learning needs. Leading practice is proven, sustainable and adaptable practice leading to improved outcomes, validated by research. The design of new learning environments should enable teachers to work together differently, to learn and practise new skills together, and to readily access resources to support the teaching and learning relationship. The design of school environments

allows schools to use a mix of media and locations, flexible student and teacher groupings, and improved access to resources. The capabilities and confidence of teachers and students are central considerations when dealing with technological and cultural change. Therefore, school design must incorporate ICT as key learning and teaching tools. The action research indicates that schools have moved beyond engaging in isolated ICT professional learning activities for staff and moved to the model of professional learning in teams with a focus on student-centred learning approaches.

DEECD, Ed. (2009). Student needs, teacher practice and learning spaces: Transforming Learning through Innovation. Transforming Learning through Innovation, State of Victoria DEECD.

Deemer, S. A. (2004). "Classroom goal orientation in high school classrooms: revealing links between teacher beliefs and classroom environments." Educational Research **46**(1): 1 - 1.

Uncovering how teachers' beliefs about teaching and learning influence their instructional practices and students' goals in the classroom is important for understanding how to create learning environments focused on mastery and understanding. Most of the previous research on this topic has investigated these relationships in teachers, classrooms and students at either the elementary, middle or college level. Using this research as a guide, the current investigation examined relationships among teacher beliefs, instructional practices and classroom goal orientations in high school science classrooms. Path analysis techniques were used to analyze responses and revealed that personal teaching efficacy and teachers' perceptions of a supportive school culture were related to teachers' use of instructional practices focused on task mastery and understanding. Teachers' perceptions of a supportive school culture were also related to teachers' use of instructional practices focused on competition and to students' perceptions of a mastery classroom goal orientation. The use of practices focused on demonstrating ability was related to perceptions of a competitive school culture. In light of these findings, the applicability of research findings from the elementary and middle school settings is discussed, along with how the unique nature of the high school learning environment may explain these findings.

DeMary, J., M. Owens, et al. (2000). School Safety Audit Protocol., Virginia Dept. of Education, School Safety Resource Center. **June:** 75.

The 1997 Virginia General Assembly passed legislation directing school boards to require all schools to conduct safety audits. This audit is designed to assess the safety conditions in each public school to: (1) identify and, if necessary, develop solutions for physical safety concerns, including building security issues; and (2) identify and evaluate any patterns of student safety concerns occurring on school property or at school-sponsored events. The legislation also directed the superintendent of public instruction to develop a list of items to be reviewed and evaluated in the school safety audits. As a result, the Department of Education developed this school safety audit protocol to be used as a guide for the audit. The guide addresses components of the audit process, the audit protocol, the audit procedure, audit forms (buildings and grounds, development and enforcement of policies, data collection, prevention and intervention programs, staff development, student involvement, parent and community involvement, role of law enforcement, crisis management plan, standards for security personnel, Americans with Disabilities Act, and emergency response plan), and audit interviews. (EV)

Deming Public School District Do Better School Facilities Improve Learning?, Deming Public School District**:** 1.

DeNeui, D. L. and T. L. Dodge (2006). "Asynchronous Learning Networks and Student Outcomes: The Utility of Online Learning Components in Hybrid Courses." Journal of Instructional Psychology **33**(4): 256-259.

The current research focuses on the impact that learning management systems (LMS), specifically the Blackboard interface, are having on courses in psychology. Blackboard provides instructors with access to a powerful web-based instructional platform. One of the main benefits to students is the unfettered access to virtually anything an instructor presents in the classroom. For example, access to syllabi, course notes, interactive demonstrations, handouts, audio or videotaped lectures are all possible via this interface. Currently, few empirical studies have examined the impact of LMS on objective measures of student learning. The current project examines the relationship between the frequency of usage of these various utilities and student performance in a hybrid class. Results revealed a significant positive partial correlation between overall usage and their exam scores. The implications of these findings are discussed with respect to the current course; however, a discussion of the broader pedagogical implications is included as well.

Department for Education and Skills (2003). Schools for the future: exemplar designs, concepts and ideas. UK**:** 120.

School buildings have a crucial part to play in helping to raise educational standards. In recognition of this, the Government has made huge increases in capital investment in schools during the last five years – from under £700 million in 1996-97 to £3.8 billion this financial year, rising to £5.1 billion in 2005-06. Of necessity, a great deal of this funding has focused on catching up on a backlog of priority repairs or replacements, as well as on carrying out much needed improvements to accommodation. So far, it has not been possible to initiate a major new building programme. Now, this is set to change. The increase in annual funding to £5.1 billion marks a leap forward in investment planning. It will enable strategic and radical changes to be made to the schools estate. Around £2 billion a year will be spent on Building Schools for the Future – a programme with the aim of rebuilding and renewing all secondary schools over the

next ten to fifteen years. Over the same period, there will also be substantial new investment in primary school buildings.

Department for Education and Skills (2004). Classrooms of the Future: Innovative Designs for Schools.**:** 80.
Describes twelve pilot projects from British local education authorities creating innovative learning environments that are imaginative and stimulating, with the aim of inspiring children to achieve more. These primary and secondary schools feature increased community use of the buildings, partnerships with other cultural and scientific institutions, relocatable laboratories, sustainable design, and elevated service to rural communities. Includes drawing, plans, and colour photographs.

Department for Education and Skills (2006). Primary Ideas: Projects to Enhance Primary School Environments.**:** 86.
Presents a toolkit of design principles, creative ideas, and projects for primary school environments, aimed at inspiring staff, pupils and parents. Its aim is to help schools take an inclusive approach towards rebuilding, refurbishing and upgrading premises. The publication contains examples from the United Kingdom and overseas and includes case studies by the authors from work carried out in building two new classrooms at Ballifield Primary School in Sheffield.

Design Council (2001). What learning needs: The challenge for a creative nation, Design Council. **2001:** 57.
What Learning Needs paints a picture of what learning should look like. It makes an important contribution to the debate on the role of creativity, in just about every key area of our education system. Published in partnership with Demos

Designshare (2007). "The Color of Debate: Chapter 1." from http://www.designshare.com/index.php/articles/color-debate.
Presents a debate between school designers over the impact of color in the learning environment. The debate contrasts the designers' instincts against the existence and quality of actual research-based evidence on the emotive effect of various colors in learning environments.

DET (1999). Keeping kids at school. Perspectives on education, Department of Education, Victoria**:** 40.

DET (2001). Building for the future: Report of the facilities task force, Department of Education**:** 13.

DET (2003). Blueprint for government schools: Future directions for education in the Victorian government school system, State of Victoria, Department of Education & Training**:** 37.

DET (2003). Closing the Loop: Curriculum, Pedagogy Assessment & Reporting, OFFICE OF LEARNING AND TEACHING, Department of Education and Training**:** 18.

DET (2003). Department of Education & Training's Corporate Plan 2003–2006, State of Victoria, Department of Education & Training**:** 24.

DET (2003). Department of Education & Training's Corporate Plan Poster 2003–2006, State of Victoria, Department of Education & Training**:** 1.

DET (2005). SMALL SCHOOLS PROJECT: The implementation of the School Accountability and Improvement Framework in Victorian small schools School System Development, Department of Education & Training**:** 30.

DET (2005). Specialist Schools and the new School Accountability and Improvement Framework for Government Schools, School System Development Division, Department of Education and Training**:** 8.

DET (2005). Victorian Residential (Camp) Schools: A brief review of issues related to their engagement with the School Accountability and Improvement Framework, School System Development, Department of Education & Training.

DET (2006). Building Futures: Caring for your child, Department of Education & Training**:** 40.

DET (2006). Evaluation of the School Planning and Reporting Elements: School Accountability and Improvement Framework: RESEARCH KEY FINDINGS, Department of Education and Training**:** 21.

DET (2006). School Review Guidelines 2008, Office for Government School Education, Department of Education**:** 27.

DET (2006). School Strategic Planning Guidelines 2008, Office for Government School Education, Department of Education**:** 33.

DET (2006). Self-Evaluation Education Guidelines 2008, School Office for Government School, Department of Education**:** 12.

DET (2007). School Compliance Checklist Guidelines 2008, Office for Government School Education, Department of Education**:** 40.

DET (2008). Guidelines for the Annual Report to the School Community 2008, Office for Government School Education, Department of Education**:** 18.

DETYA (2001). Innovation and best practice in schools: Review of literature and practice, Department of education, training and youth affairs.

DfES (2003). Building better performance: an empirical assessment of the learning and other impacts of schools capital investment, Department for Education and Skills**:** 71.

The main focus of the analysis was on (a) whether a differential statistical association could be identified between the various types of capital spending and pupil performance, and (b) whether there was any evidence to suggest a causal relationship between any of the different types of capital spending and pupil performance. The key quantitative findings from the study are as follows: • The research provides some additional evidence showing a positive and statistically significant association between capital investment and pupil performance; • The most significant evidence, from a statistical point of view, is in relation to community primary schools. This is due to a number of issues relating to data quality and coverage for other types of schools; and • In terms of the different types of capital investment, the strongest positive findings are in relation measures of investment which can be related directly to the (ii) teaching of the curriculum (e.g. ICT-related capital spending, science blocks etc, referred to by the DfES as 'suitability' investment). This is consistent with expectations since, a priori, one would expect such investment to have a more direct impact on performance than other types of investment (e.g. repairs to roofs and windows, referred to by the DfES as 'condition' investment). The broader impacts of schools capital investment In recent years there has been considerable interest by policy makers in the UK and elsewhere in the uses to which school buildings can be put, which go beyond the education of school pupils (e.g. adult learning, childcare). In terms of debates about schools capital investment in the UK, these arguments are important in relation to 'value for money' and efficiency considerations. The qualitative research presented in the current report investigates whether any evidence can be provided to support the view that the impact of schools, and school buildings in particular, goes beyond learning outcomes amongst school pupils. The qualitative research involved, firstly, a design stage, during which a conceptual model was developed to organise the team's thinking about the nature of the broader benefits of schools capital investment, and how they might be categorised. This was done on the basis of discussions with officials in the DfES, as well as a trawl of existing literature on the broader benefits of schools, and schools capital investment in particular. The model was then used to provide a framework for the design of a detailed topic list for use in the in-depth interviews. Secondly, the qualitative research involved a series of in-depth interviews with headteachers, other teaching and non-teaching school staff, and a range of broader stakeholders such as community-based organisations, FE college staff and local businesses. The key findings from the qualitative research in relation to the broader uses of schools are as follows: • All of the headteachers interviewed indicated that their school was used, to some extent, by stakeholders in the wider community. • The main demand for school facilities was in terms of specialist facilities, auditoria and sports facilities; • The research provided some good examples of schools entering into mutually beneficial partnership arrangements with other stakeholders ; • The evidence suggests that, in relation to the broader benefits, schools capital investment is likely to be characterised by relatively low levels of deadweight, displacement, substitution and inequity.

DfES (2006). Education outside the classroom manifesto, Department for Education and Skills (DfES), UK**:** 24.

Dijkstra, P., H. Kuyper, et al. (2008). "Social Comparison in the Classroom: A Review." Review of Educational Research **78**(4): 828-879.

This article reviews research conducted on social comparison processes in the classroom since Festinger proposed his theory of social comparison. It covers the theoretical framework of social comparison theory, and it is organized around the following themes: motives for social comparison, dimensions of social comparison, direction of social comparison, and consequences of social comparison. The overall picture is an emerging one in which pupils prefer to compare their performances upward--specifically, with pupils who perform better than themselves but who resemble themselves on related and unrelated attributes. Although the magnitude of the effects of social comparison in the classroom is not examined, the review suggests that such upward comparisons not only lead pupils to perform better but evoke negative affect and lower academic self-concept. Topics discussed include inconsistencies (especially with regard to the direction of comparison and the motives underlying social comparison in the classroom), practical implications, and directions for future research.

Dillon, P. (2006). "Creativity, integrativism and a pedagogy of connection." Thinking Skills and Creativity **1**(2): 69-83.

A case is made for working in higher education across and between disciplines, variously known as inter- and multidisciplinarity. Integrativism is proposed as an inclusive term for these different but related modes of academic work. Working integratively is presented as a creative activity. The application of integrativism to the curriculum leads to the notion of a pedagogy of connection. Sociocultural theory is a theoretical foundation for a pedagogy of connection which consists of a framework for focusing on the contexts of connection and tools for making connections. Activity theory is the basis of analysing context and analogy and conceptual blending are examples of tools. The pedagogy of connection is demonstrated through the example of a sense of place. The example takes the form of a

design experiment.

Dillon, P. and M. Åhlberg (2006). "Integrativism as a theoretical and organisational framework for e-learning and practitioner research." Technology, Pedagogy and Education **15**(1): 7 - 30.

In this article integrativism is proposed as a framework for e-learning and practitioner research. The philosophical bases of integrativism are outlined. Foundational principles of integrating education, derived from the notions of continual quality improvement and high-quality learning, are explained. The extension of integrating education to embrace e-learning and practitioner research draws on ideas from sociocultural theory. A virtual learning environment is described which has been designed around an integrating approach to education. The practice of integrating education is facilitated in the virtual learning environment through the use of heuristics. Examples of heuristics are given. An online Master's course in information and communication technology in education, developed around the principles of integrativism, is outlined. Finally, examples are given of integrative, practitioner research.

Dinç, P. (2009). "Gender (in)difference in private offices: A holistic approach for assessing satisfaction and personalization." Journal of Environmental Psychology **29**(1): 53-62.

This research is a combination of gender studies, which highlights differences between men and women, and workplace research, which focuses on the performances that are assumed to affect employee satisfaction. The study proposes a multi-dimensional assessment model that enables consideration of several workplace issues in tandem. Focusing on user satisfaction, the first part of the study is a holistic approach concerned with technical, functional and behavioral variables that provides a broad understanding about gender (in)differences. Personalization, the core issue of the second part of the study, is measured through personal display items, autonomous behavior and office layout preferences of men and women employees. The findings indicate the presence of significant gender differences in terms of satisfaction felt with regard to the behavioral variables. The results also support previous findings indicating that men and women use different personal display items in order to personalize their offices. More women were diagnosed to be changing their room layout on a temporary basis whereas men and women were evidenced for having similar attitudes in making permanent changes and in preferring an office layout for themselves. The findings suggest that gender difference is still a valid subject in workplace research although the differences may not be as sharp as the conventional gender difference myth claims, implying a better understanding of the issues that differently satisfy men and women.

Dittoe, W. (2005). Seriously Cool Places: The Future of Learning- Centered Built Environments. Learning Spaces. D. Oblinger. Boulder, Educause.

Dittoe, W. (2007). Learning Spaces and Student Success: Creating The New Learning Environment: Enhancing Student Success Through Principled Space Planning and Design, KI Education.

Dixon, A. (2004). "Space, schools and the younger child." Forum **46**(1): 19-23.

Dixon-Woods, M., R. Fitzpatrick, et al. (2001). "Including Qualitative research in systematic reviews opportunities and problems " Journal of Evaluation in Clinical Practice **7**(2): 125-33.

Qualitative research now seen to have distinctive and important contribution to health care research. It not only has its own methodological sufficient approach in its own right, as a precursor to quantitative studies and during and after trials to explain processes and outcomes, and as a means of enhancing the link between evidence and practice However it is rarely used in systematic reviews, What is required is a form synthesis of both qualitative and quantitative forms of research, Such as synthesis needs to recognize methodological prejudices, problems in searching for qualitative evidence, and issues in synthesising qualitative data.

Doane, B. (2008). The Relationship Between School Facilities and Academic Achievement. The Faculty of the College of Education, Ohio University. **Masters of Education**.

Dockrell, J. E. and B. Shield (2004). "Children's perceptions of their acoustic environment at school and at home." The Journal of the Acoustical Society of America **115**(6): 2964-2973.

This paper describes the results of a large-scale questionnaire survey that ascertained children's perceptions of their noise environment and the relationships of the children's perceptions to objective measures of noise. Precision, specificity, and consistency of responding was established through the use of convergent measures. Two thousand and thirty-six children completed a questionnaire designed to tap (a) their ability to discriminate different classroom listening conditions; (b) the noise sources heard at home and at school; and (c) their annoyance by these noise sources. Teachers completed a questionnaire about the classroom noise sources. Children were able to discriminate between situations with varying amounts and types of noise. A hierarchy of annoying sound sources for the children was established. External LAmax levels were a significant factor in reported annoyance, whereas external LA90 and LA99 levels were a significant factor in determining whether or not children hear sound sources. Objective noise measures (LA90 and LA99) accounted for 45% of the variance in children's reporting of sounds in their school environment. The current study demonstrates that children can be sensitive judges of their noise environments and that the impact of

different aspects of noise needs to be considered. Future work will need to specify the factors underlying the developmental changes and the physical and location dimensions that determine the school effects.

Donohue, K. M., K. E. Perry, et al. "Teachers' classroom practices and children's rejection by their peers." Journal of Applied Developmental Psychology **24**(1): 91-118.

Using a classroom-level, prospective design, we examined the role of classroom context in children's peer relationships, specifically, whether learner-centered practices used by teachers predicted less peer rejection by children, as well as more positive attitudes and behaviors hypothesized to lead to rejection. Learner-centered practices involve individualization of instruction, encouragement of child autonomy, and focus on positive relationships in the classroom. Observers, teachers, and children reported on learner-centered qualities of the instructional environment in 14 first-grade classrooms. After controlling for between-classroom differences in children's interpersonal behavior problems at school entry, greater use of learner-centered practices was predictive of (1) children's report of less anger and more empathy toward a hypothetical disruptive peer, (2) fewer children with interpersonal behavior problems in the spring, and (3) lower classroom rates of peer rejection in the spring. Further, children's behavior problems in the spring partially mediated the relationship between observed teacher practices in the fall and rejection by peers in the spring.

Doppelt, Y., C. D. Schunn, et al. (2009). "Evaluating the impact of a facilitated learning community approach to professional development on teacher practice and student achievement." Research in Science & Technological Education **27**(3): 339-354.

The focus of this research was an evaluation of the impact of teacher professional development (PD) on student achievement during implementation of a reform curriculum. The PD consisted of five four-hour workshop sessions distributed over the time teachers were implementing the reform curriculum in their classrooms. The research was conducted in a mid-size, urban school district over the span of two years. Three groups of teachers were contrasted: teachers who continued to use the established curriculum (N = 5), teachers who implemented the reform curriculum without participating in the PD sessions (N = 5), and teachers who implemented the reform curriculum while participating in the PD sessions (N = 13). Teachers who participated in the PD had approximately a one standard deviation advantage in their students' achievement over those who did not. We collected evidence of particular features of the PD that explained the differences in student achievement. The features included: distributing the workshops throughout the implementation; engaging teachers in an active learning process situated in the curriculum; and facilitating a collaborative community of teacher professionals. This study led us to believe that not only are the individual features of the PD important, but the combination of all three together is particularly powerful.

Douglas, D. and R. Gifford (2001). "Evaluation of the physical classroom by students and professors: a lens model approach." Educational Research **43**(3): 295-309.

A method for linking classroom evaluations to specific physical properties and for comparing the evaluations of different groups is described and illustrated. Thirty-five college classrooms were photographed and shown to 20 professors and 51 undergraduate students, each of whom evaluated the friendliness of and their overall preference for all the classrooms. Seven physical properties of the classrooms were reliably assessed by independent observers. Using a modified Brunswik lens model, the relations between the physical properties and the evaluations by the two groups were established and compared. Between 40 and 57 per cent of the variance in the evaluations could be explained from only three classroom properties: view to outdoors, seating comfort and seating arrangement. Evaluations by the students and professors were surprisingly similar, an encouraging sign for classroom designers.

Downer, J. T., L. M. Booren, et al. (2010). "The Individualized Classroom Assessment Scoring System (inCLASS): Preliminary reliability and validity of a system for observing preschoolers' competence in classroom interactions." Early Childhood Research Quarterly **25**(1): 1-16.

This paper introduces the Individualized Classroom Assessment Scoring System (inCLASS), an observation tool that targets children's interactions in preschool classrooms with teachers, peers, and tasks. In particular, initial evidence is reported of the extent to which the inCLASS meets the following psychometric criteria: inter-rater reliability, normal distributions and adequate range, construct validity, and validity. These initial findings suggest that the inCLASS has the potential to provide an authentic, contextualized assessment of young children's classroom behaviors. Future directions for research with the inCLASS are discussed.

Dudek, M. (2000). Architecture of schools: the new learning environments. Oxford, Architectural Press.

Architecture of schools: the new learning environments is an essential design guide; highly illustrated and technically detailed, it provides vial information on school architecture. Mark Dudek views school building design as a particularly specialized field encompassing ever-changing educational theories, the subtle spatial and psychological requirements of growing children, and practical issues that are unique to these types of building. He explores the functional requirements of individual spaces such as classrooms, music rooms, craft areas and the gymnasium. The dynamics of their incorporation within a single institution area are a defining characteristic of the effective educational environment. In addition, Mark Dudek discusses more esoteric factors such as the effects of colour, light, surface texture and imagery on behaviour, alongside the more practical aspects of designing for comfort and health. The historical context of school design is balanced by a highly engaged account of the contemporary architectural debate, the impact of the educational curriculum on design, and changing approaches to funding and procurement. Key case

studies address those issues important in the creation of modern school settings. They are state-of-the-art examples from all parts of the world and include Woodlea Primary, Hampshire; Seabrid Island School, British Columbia and The Little Village Academy, Chicago. Mark Dudek runs a design and research group specialising in educational environments at the School of Architecture, University of Sheffield. He is also a practising architect and consultant to the Educative Design Group who are currently working on a number of new school projects.

Dunkin, M. J. (1978). "Student characteristics, classroom processes, and student achievement." Journal of Educational Psychology **70**(6): 998-1009.

A comparison between two different approaches to apportioning variance in posttest achievement scores was made with data on 29 lessons on one social studies topic. One method led to exaggerated estimates of the contribution of student characteristics through ignoring joint contributions of student characteristics and process variables. Comparisons were also made among three different criterion measures in exploring process-product correlations. Residualized achievement scores using, first, the individual student and, second, the class as the statistical unit were used, as well as unadjusted achievement scores. The same set of process variables tended to correlate significantly with all three product measures, though some differences were noted. Relationships among student characteristics, process variables, and student achievement indicated possible teacher expectancy effects.

Durán-Narucki, V. (2008). "School building condition, school attendance, and academic achievement in New York City public schools: A mediation model." Journal of Environmental Psychology **28**(3): 278-286.

Little is known about how the condition of school facilities affects academic outcomes. This study examines the role of school attendance as a mediator in the relationship between facilities in disrepair and student grades in city and state tests. Data on building condition and results from English Language Arts (ELA) and Mathematics (Math) standardized tests were analyzed using a sample of 95 elementary schools in New York City. Variables relevant to academic achievement such as ethnicity, socioeconomic status, teacher quality, and school size were used as covariates. In run-down school facilities students attended less days on average and therefore had lower grades in ELA and Math standardized tests. Attendance was found to be a full mediator for grades in ELA and a partial mediator for grades in Math. This study provides empirical evidence of the effects of building quality on academic outcomes and considers the social justice issues related to this phenomenon.

Dykman, B. M. and H. T. Reis (1979). "Personality correlates of classroom seating position." Journal of Educational Psychology **71**(3): 346-354.

Based on evidence that physical space serves to regulate the intensity of perceived threat, and that the experience of threat is mediated by personality characteristics, it was predicted that peripherally seated students in the classroom would have poorer self-concepts and greater personal space needs than centrally seated students. Personality, personal space, and attitudinal measures (e.g., Self-Esteem Inventory, School Sentiment Index) were administered to 9 classes of high school students (181 9th-22th graders). Comparisons of extreme sections of the classroom revealed a significant polarization of student traits on 3 categories of variables dominated by self-concept and class participation issues. Results support the notion that differential participation and physical isolation are closely related to self-concept.

Dzuka, J. and C. Dalbert (2007). "Student Violence Against Teachers: Teachers' Well-Being and the Belief in a Just World." European Psychologist **12**(4): 253-260.

This paper presents two studies investigating student violence against teachers in Slovakian secondary schools. The studies aimed at gauging the prevalence of student violence (Study 1) and at testing the hypothesis that teacher well-being can be explained by student violence and by teachers' belief in a just world (BJW) (Study 2). Study 1 examined a representative sample of 364 teachers in one of the eight Slovakian provinces, and found that 177 (49%) of them reported at least one experience of violence in the last 30 days. Reports of violence were particularly widespread in vocational schools in the provincial capital. Study 2 investigated a sample of 108 teachers at Slovakian vocational schools, and found that 60 (55%) of them reported at least one experience of violence in the last 15 days. The more violence the teachers reported, the more often they experienced negative affect, the less often they experienced positive affect, and the less satisfied they were with life. Finally, the BJW was adaptively associated with teacher well-being in terms of life satisfaction and positive affect. For victims of violence, BJW was further associated with negative affect: the more they believed in a just world, the less frequently they experienced negative affect. Consequences for research on teacher health and organizational justice research are discussed.

Eadie, G. (2001). The Impact of ICT on Schools: Classroom Design and Curriculum Delivery, a Study of Schools in Australia, USA, England, and Hong Kong.**:** 46.

Evaluates current and possible future impacts of information and communication technology (ICT) on school timetables, curricula, and facilities. Facilities-related topics include new configurations of existing space, sharing of spaces, configurations and equipment for classroom flexibility, virtual and linked classrooms and campuses, wireless technology, changes to library areas, and reconfiguration of the teaching schedule. Includes 17 references and 42 website referrals.

Earthman, G. (1998). The impact of school building condition and student achievement and behaviour. The Appraisal of Educational Investment: European Investment Bank/OECD. Luxembourg

One of the most provocative and compelling questions regarding school buildings is the influence of the built environment has upon the performance of students and teachers. Common belief held by educators and architects is that the building does indeed have an influence upon how well students and teachers perform. The big question, however, is the degree of influence and how can that be accurately measured. Over the past sixty years, considerable research has taken place in the United States to assess the possible relationship between student performance and built environment. Researchers have mounted studies to investigate the influence of various buildings components such as wall colour, building configuration, the presence or absence of windows in classroom, air conditioning, and space allocation per pupil, use of carpeting on the floor, noise, levels, thermal conditions, and furniture types upon student performance in an effort to discover the relationship. For the most part, these research efforts have proven very valuable to the designers of new school buildings; most new school buildings in the United States incorporate the best features in the above list because of the research efforts. A problem that is inherent in the research is the lack of predictability on results. In the hard sciences, predictability resulting from scientific investigation is almost a given; yet in the social science, predictability is very difficult at best to demonstrate. The research discussed in this paper in no way can result in predictability. There is, however, benefit that can be derived from examination and use of the research findings in these studies. One major deficiency in the research on school facilities has been the lack of replication of sound studies. The studies present here show the beginning of a progression of studies using the same methodology, but with different populations. These studies may be the start of discovering some generalities regarding the impact of buildings on student performance.

Earthman, G. (1998). The Impact of School Building Condition and Student Achievement, and Behavior. Paper presented at the European Investment Bank/Organization for Economic Coordination and Development International Conference, (Luxembourg, November 16-17, 1998).

A brief narrative description of the journal article, document, or resource. This paper examines study findings on the relationship between the educational facility and the student variables of academic achievement and student behavior, revealing the extent that thermal environment, proper illumination, space, and equipment and furnishings have on students. Additionally discussed is the relationship between parental involvement, school building conditions, and student achievement. In almost all cases, the better the built environment is, the more positive the impact on students' test scores is: test scores between students in substandard buildings compared to students in better school environments differed by 5 to 17 percentile points. Also, in cases where there was greater parental involvement in fundraising for school purposes, the school buildings were in better condition. The conclusion is that money spent on school building improvement is money well spent. While it is known that better prepared graduates of the local school system are more productive citizens, the degree of influence the school environment has on later life remains unknown. (GR)

Earthman, G. (2002). School Facility Conditions and Student Academic Achievement. Williams Watch Series, UC Los Angeles: UCLA's Institute for Democracy, Education, and Access: 20.

This paper shows that the condition of school facilities has an important impact on student performance and teacher effectiveness. In particular, research demonstrates that comfortable classroom temperature and noise level are very important to efficient student performance. The age of school buildings is a useful proxy in this regard, since older facilities often have problems with thermal environment and noise level. A number of studies have measured overall building condition and its connection to student performance; these have consistently shown that students attending schools in better condition outperform students in substandard buildings by several percentage points. School building conditions also influence teacher effectiveness. Teachers report that physical improvements greatly enhance the teaching environment. Finally, school overcrowding also makes it harder for students to learn; this effect is greater for students from families of low socioeconomic status. Analyses show that class size reduction leads to higher student achievement.

Earthman, G. (2004). Prioritization of 31 Criteria for School Building Adequacy., American Civil Liberties Union Foundation of Maryland, Baltimore , Jan 05, 2004.

Prioritizes the 31 criteria for school facilities established by the Maryland Task Force to Study Public School Facilities based on the links between conditions in school buildings and student achievement. The author, drawing on a large quantity of research, recommends addressing first the criteria that relate to student health and safety: 1) potable water, 2) fire safety, 3) adequate lavatories, 4) security systems, and 5) emergency communications systems. Elements directly linked to student achievement should then be addressed as follows: 1) human comfort, 2) indoor air quality, 3) lighting, 4) acoustical control, 5) secondary science laboratories, and 6) student capacity.

Earthman, G. and et. al. (1995). A Statewide Study of Student Achievement and Behavior and School Building Condition. Paper presented at the Annual Meeting of the Council of Educational Facility Planners, International (Dallas, TX, September 1995).

Almost every educator would agree that a well-maintained school building is essential for a proper learning environment. This paper presents findings of a study that examined the relationship between student achievement/behavior and school-building condition. A survey sent to all high schools (n=199) in North Dakota elicited

responses from 120 principals, a 60 percent response rate. The Comprehensive Test of Basic Skills was used as a measure of student achievement and the numbers of disciplinary incidents as an indicator of student behavior. School-building condition was measured by principals' responses to an evaluative instrument. Findings indicate that a positive relationship existed between student achievement and building condition and between student behavior and school condition. Study results were compared with other studies that used similar methodologies with different populations. The data support the hypothesis that there is a positive relationship between student achievement/behavior and school environment. Three figures and 10 tables are included.

Earthman, G. and L. Lemasters (2009). "Teacher attitudes about classroom conditions." Journal of Educational Administration **47**(3): 323 - 335.

Abstract: Purpose – This research was designed to investigate the possible relationship between the attitudes, teachers have about the condition of their classrooms when the classrooms were independently assessed. Previous research reported teachers in unsatisfactory classrooms felt frustrated and neglected to such an extent that they sometimes reported they were willing to leave the teaching profession. This paper aims to address these issues. Design/methodology/approach – Eleven high schools in which the principals state the buildings are in unsatisfactory condition are identified and matched with 11 schools assessed as being in satisfactory condition. The My Classroom Appraisal Protocol© (MCAP) is used to gather impressions and attitudes of teachers. The MCAP is entered into the internet, and teachers in the selected schools are asked to voluntarily complete the instrument and submit it electronically. Findings – The differences between the responses of teachers in satisfactory buildings are significantly different than those of teachers in unsatisfactory buildings at the $p<0.05$ level of confidence. Similar results are obtained on the attitudinal scale of the MCAP, again at the $p<0.05$ level. Research limitations/implications – The size of the population is small, which limits applicability. Practical implications – These findings clearly indicate the physical environment influences attitudes of teachers, which in turn affects their productivity. Such effects could cause morale problems in the teaching staff. Originality/value – The findings indicate the condition of the classroom can cause morale problems with teachers. School authorities need to recognize the importance physical conditions have upon teachers so that negative feelings and attitudes do not pervade the faculty. Such feelings eventually may influence the achievement of students.

Earthman, G. and L. Lemasters (1996). Review of Research on the Relationship between School Buildings, Student Achievement, and Student Behavior. Annual Meeting of the Council of Educational Facilities Planners, International Tarpon Springs, FL**:** 18.

A brief narrative description of the journal article, document, or resource. The most persistent question in the field of school facility planning relates to that of the relationship between the built environment and the performance and behavior of users, particularly students. Ways in which the built environment affects two student variables--student achievement and student behavior--are explored. The first variable is student achievement as measured by some form of standardized or normed test, or examination administered to all students in the schools under study. The other variable is student behavior that can include specific level of student activity or school climate. A survey of research summarizes open-education programs and open-space schools, school building age, thermal factors, visual factors, color and interior painting, hearing factors, open space, windowless facilities, underground facilities, site size, building maintenance, and numerous other factors. All of the studies demonstrated a relationship between student performance--both achievement and behavior--and the condition of the built environment. The relationship varied from very weak in some early studies to a considerable degree of relationship in recent studies. Some of the more important factors that were found to influence learning are those relating to control of the thermal environment, proper illumination, adequate space, and availability of equipment and furnishings, particularly in science education. Some areas of needed research are discussed.

Eclipse Research Consultants (2005). Better designed buildings: improving the valuation of intangibles. E. R. Consultants, Eclipse Research Consultants**:** 9.

There has never been a better time for architects to get to grips with the issue of delivering value. There is widespread recognition at many levels and certainly among government clients, of the social and economic benefits to be gained from well-designed buildings. In March 2005, the National Audit Office endorsed the positive impact of buildings on service delivery in its report Improving Public Services through better construction. The Office of Government Commerce's procurement pack Achieving Excellence in Construction contains a whole section devoted to the delivery of design quality, and the Treasury's Green Book2 recognises that non-monetary benefits need to be included among value-for-money assessment criteria for public building proposals. The emergent notion of public value – the added value created by government and the public sector in its widest sense, and delivered through services, laws, regulations and so on – is being keenly debated as part of a move towards public service reform. A recent paper from the Cabinet Office categorises the things citizens value into better outcomes, services and trust, and proposes that a public value perspective could generate more effective policy conclusions3. One of the authors of that paper, Geoff Mulgan, recently published an essay on the contribution of the physical environment to public value4. Supporting these general endorsements of the contribution of the built environment to social and economic outcomes is a growing body of evidence about the benefits of good design. At the urban level, the Guggenheim effect in Bilbao has been widely reported – closer to home Brindley Place in Birmingham demonstrates how design features such as good connectivity, transport links and mixed use correlate with successful social and economic outcomes leading to inward investment

and sustainable regeneration5. David Halpern's book6 reviews several hundred published studies concerned with the social and behavioural consequences of urban design and housing, while housebuilders have their own rules of thumb about the impact of parking, views and tree-lined streets on marketability. Footfall and sales per square metre are used as indicators of successful design in the retail sector....etc.

Edney, J. J. (1976). "Comment on Functional Properties." Environment and behavior **8**(1): 31-47.

EdTech Planning Group (2008). Classroom of the Future., EdTech Planning Group, Mt. Kisco, NY.

Presents a video tour of a classroom of the future, featuring multiple display screens, flexible furnishings, ample size that allows for circulation, a mobile teacher workstation, abundant power outlets, wireless and video capability, sophisticated zoned lighting, quiet and locally controlled HVAC, and acoustical isolation.

Education Foundation (2004). Equity excellence and effectiveness: Moving forward on schooling arrangements in Australia, Education Foundation**:** 16.

Education Foundation (2004). Findings from the project: Action Research to Identity Innovative Approaches to, and Best Practice in, Enterprise Education in Australian Schools, Australian Government Department of Education, Science and Training**:** 184.

Education Foundation (2005). School's out! The impact of the city centre on middle years curriculum and pedagogy, Education Foundation**:** 42.

The impact of the experience on middle years pedagogy is felt most by those schools which are already on the path to whole school reform incorporating current middle years philosophy. Teachers in general believe they learn from the experience, although most had not anticipated this. Transferring this learning into curriculum and planning at school is not occurring in schools which are not already considering reform. Other research indicates that major change in schools requires leadership from senior staff, particularly principals, who currently do not attend the City Centre in any numbers. There are boundaries and limitations of a centre like this, managed and funded privately. The City Centre was at full booking capacity for 2005 by late February, with many 2004 schools returning with more students. It is anticipated that 56 schools will participate this year, 17% of the total number of potential Victorian secondary students. Last year 12% of all Victorian government schools sent students. The city itself may have limited capacity to absorb the number of students from all schools undertaking one-day and extended research visits. The City Centre site is small and the number of staff, while expanding, is limited by resource constraints. Equipment and technical support is improving but is also constrained by available resources. As many schools incorporate the experience into their camps programs, some costs are expected. The current cost per student of $100 is offset by scholarships for some students. However, for rural students, who must pay for accommodation and food for

the week, the total cost is usually between $400 and $500 without a scholarship. This prohibits some students from participating and puts strain on some families who do send their children. Rural and regional teachers would value more orientation to the city itself ahead of the visit and some help with finding cheap, safe accommodation. The Education Foundation has excellent and growing connections with individual philanthropists, trusts, foundations and corporate organizations with a commitment to social responsibility. The combination of government, corporate citizenship and philanthropy has the potential to deepen and expand the learnings of the City Centre to the benefit of students and teachers across Victoria.

Education Week (2005). "Creature Comforts." Education Week **25**(11): 43-43.

This article presents information on a research report on the quality of school facilities. A 2004 research report issued by the National Clearinghouse for Educational Facilities--and funded by the Ford Foundation and the 21st Century School Fund--concludes that the quality of school facilities is an "important predictor" of teachers' decisions on whether to stay at a school. The report points to a number of aspects of school facilities--including air quality, temperature, and classroom lighting--that have been shown to affect teacher morale and student performance.

Educational Technology Support Center (2005). New Classroom Model is Sustainable and Replicable.

Five K-12 classroom teachers have been selected to develop a replicable classroom model of technology integration that is sustainable and that supports research-based instructional strategies through the careful selection of technology tools, the provision of technology-related professional development, and through ongoing support and collaboration. Interactive whiteboards, document cameras and projectors, wireless response systems and classroom audio systems will be used. This describes the sustainable classroom model, the various technologies, and provides supporting documents.

Egilson, S. T. and R. Traustadottir (2009). "Participation of students with physical disabilities in the school environment.(Report)." AJOT: American Journal of Occupational Therapy **63**(3): 264(9).

OBJECTIVE. We investigated the factors that facilitate or hinder school participation of students with physical disabilities and explored the interaction of those factors. METHOD. The study used a mixed-methods design that used qualitative and quantitative data. Qualitative data were gathered on 49 participants: 14 students, 17 parents, and 18 teachers. Data analysis was based on grounded-theory procedures. Quantitative data were gathered on 32 students

using the School Function Assessment. RESULTS. The characteristics of each school setting influenced students' participation. Some settings presented more challenges than others, particularly those with open spaces and limited structures such as the school playground and field trips. Possibilities of student participation decreased with increasing numbers of risk factors, but the interaction between factors was equally important. CONCLUSION. To promote school participation of students with disabilities, occupational therapists should consider a confluence of child, environmental, and task factors rather than focusing on individual aspects. KEY WORDS * disabled children * education * environment design * socialization * task performance and analysis

EHIB (1999). Saugus Union School District Environmental Health Consultation: Review of Environmental and Clinical Laboratory Information., California State Dept. of Health Services, Oakland. Environmental Health Investigations Branch. (EHIB)**:** 71.
Parents of children in the Saugus Union School District in California were concerned about the safety of classrooms, particularly portable classrooms. Their concerns were amplified by assertions of a local medical toxicologist following evaluations of some teachers and students, and by an Environmental Working Group report about alleged problems with portables throughout California. Efforts by the school district, environmental consultants, and Los Angeles County health authorities were not sufficiently reassuring to some parents. This report discusses results from an evaluation of the classrooms by the Environmental Health Investigations Branch (EHIB) of the California Department of Health Services. Findings indicated no elevated health risks to students. The report's first part details evaluation methods and findings, while the second part directly answers each of the questions posed to EHIB staff at a parent meeting. Data tables provide results of environmental sampling at each school.

Ehrenberg, R., D. Brewer, et al. (2001). "Class Size and Student Achievement." Psychological Science in the Public Interest **2**(1): 1-30.

Elliott, G. (2001). "Classrooms that Make the Grade." Interiors & Sources (10595287) **8**(15): 26-28.
The article focuses on the significance of interior design in classroom to enhance students' learning and achievement. Interior design coordinator of Fanning/Howey Associates Inc. Gay Elliot claims that good design is considered essential in learning because it stimulates responses among children. Moreover, it reveals the need for builders and school officials to be aware of the classroom design in establishing a good learning environment for students.

Ellis, J. (2005). "Place and identity for children in classrooms and schools." Journal of the Canadian Association for Curriculum Studies **3**(2).

Emmer, E. T. and R. F. Peck (1973). "Dimensions of classroom behavior." Journal of Educational Psychology **64**(2): 223-240.
Examined (a) the relationship among the descriptive categories in each of 5 classroom observation instruments and (b) the relationship among dimensions of classroom behavior across systems. 5 observation systems were used: the Fuller Affective Interaction Records, the Observation Schedule and Record, Form 5, the Cognitive Components System, the Coping Analysis Schedule for Educational Settings, and the Brophy-Good Dyadic Observation System. Observations were made on a total of 138 occasions in 28 5th- and 8th-grade classrooms. Factor analyses were done on the different systems and estimates made of the stability of the dimensions. An intersystem factor analysis identified several general dimensions of classroom interaction. Application of the factors obtained in the development of a comprehensive taxonomy of classroom behavior is discussed.

Erickson, P. W. (2010). "Designing for security." American School & University **82**(6): 26-29.
The article provides information on the changes in the building structure that provides safe and healthy learning environment in schools. Several security elements are suggested to be considered during layout planning of an institute that includes controlled entrances, technology and staff training. It is suggested to consider the advice of a security specialist while planning an education facility to help in integrating security into architectural, electrical and mechanical sites. INSET: A secure transition.

Evans, B. (2004). "Classrooms of the Future." Architects' journal **20**(219): 26-41.
Five design models from the British government's nationwide Classrooms of the Future program. Includes working details of a prototype for a pre-fabricated classroom.

Evans , G. (2006). "Child Development and the Physical Environment." Annual Review of Psychology **57**: 423-451
Characteristics of the physical environment that influence child development are discussed. Topics include behavioral toxicology, noise, crowding, housing and neighborhood quality, natural settings, schools, and day care settings. Socioemotional, cognitive, motivation, and psychophysiological outcomes in children and youths are reviewed. Necessary methodological and conceptual advances are introduced as well.

Evans, G. and L. Maxwell (1997). "Chronic noise exposure and reading deficits: the mediating effects of language acquisition." Environment and behavior **29**(5): 638-656.
First- and second-grade schoolchildren chronically exposed to aircraft noise have significant deficits in reading as indexed by a standardized reading test administered under quiet conditions. These findings indicate that the harmful

effects of noise are related to chronic exposure rather than interference effects during the testing session itself. We also provide evidence that the adverse correlation of chronic noise with reading is partially attributable to deficits in language acquisition. Children chronically exposed to noise also suffer from impaired speech perception, which, in turn, partially mediates the noise-exposure-reading deficit link. All of these findings statistically controlled for mother's education. Furthermore, the children in this study were prescreened for normal hearing by a standard audiometric examination.

Evans, G. W. (1980). "Environmental cognition." Psychological Bulletin **88**(2): 259-287.

Reviews research on human cognition in real, everyday settings. Cognitive mapping literature is organized into 5 empirical categories: age, familiarity, gender, class and culture, and physical components of settings. Methodological and conceptual issues in the environmental cognition literature are discussed, emphasizing problems with hand-drawn sketch map methodologies and theoretical ambiguities about the cognitive-mapping process. In particular, the lack of integration of pertinent cognitive research with the environmental psychology literature on cognitive mapping is noted. Potential applications of environmental cognition work to architecture, planning, and education are discussed. (3½ p ref) (PsycINFO Database Record (c) 2010 APA, all rights reserved)

Evans, G. W., M. J. Yoo, et al. (2010). "The ecological context of student achievement: School building quality effects are exacerbated by high levels of student mobility." Journal of Environmental Psychology **30**(2): 239-244.

National reports along with numerous statewide studies indicate that the physical infrastructure of American schools is crumbling. At the same time there is emerging evidence that school building quality matters for children's academic achievement. We integrate two separate literatures that have demonstrated that low school building quality as well as high rates of student mobility each contribute to reduced academic achievement by showing that these two variables statistically interact. Elementary school children in 511 New York City public schools have lower achievement scores if they attend schools of poor structural quality and with high rates of student mobility. The significant main and interactive effects of school building quality and student mobility on standardized test scores occur independently of socioeconomic and racial composition of the school.

Evans, G. W. G. W. and R. Stecker (2004). "Motivational consequences of environmental stress." Journal of Environmental Psychology **24**(2): 143-165.

Exposure to uncontrollable stimuli produces deficits in task performance linked to learned helplessness. It is not widely appreciated, however, that many of these stimuli are environmental stressors. Both acute and chronic exposure to noise, crowding, traffic congestion, and pollution are capable of causing learned helplessness in adults and children. Pre-exposure to brief, acute environmental stressors that are uncontrollable produces learned helplessness wherein participants manifest difficulties in learning a new task because of their mistaken belief that they are incapable of influencing their environment. Another index of learned helplessness, less persistence in the face of challenge also follows acute exposure to uncontrollable environmental stressors. Finally depressed affect may co-occur with learned helplessness under certain circumstances. Field studies of chronic environmental stressors reveal parallel trends. Chronic environmental stressors also heighten vulnerability to the induction of learned helplessness by acute, uncontrollable stimuli. The potential pathway linking chronic environmental stressor exposure to helplessness and then, in turn, to mental health is an important area for future research. Furthermore, the generalizability of environmental stressor-induced motivational deficits, as well as their longevity, particularly among children, remains to be investigated.

Evans, J. B. (2004). "Designing for better sound in schools: understanding and implementing the new classroom acoustics standard." Texas Architect **54**: 52-58.

Farmer, L. (2009). Library e-learning spaces. WORLD LIBRARY AND INFORMATION CONGRESS: 75TH IFLA GENERAL CONFERENCE AND COUNCIL. Milan, Italy**:** 10.

This paper analyzes the state of learning spaces as they impact library education. Specifically, it reviews the literature about current trends in designing learning environments that facilitate e-learning. The report also lists cited examples of good practice in contemporary university library e-learning spaces.

Feldman, A. F. and J. L. Matjasko (2005). "The Role of School-Based Extracurricular Activities in Adolescent Development: A Comprehensive Review and Future Directions." Review of Educational Research **75**(2): 159-210.

This article reviews the contemporary literature on school-based activity participation, focusing on patterns of participation, academic achievement, substance use, sexual activity, psychological adjustment, delinquency, and young adult outcomes. Also, the authors discuss possible mediators and moderators of extracurricular activity participation in regard to adolescent development. The review indicates that the associations between school-based activity participation and these outcomes are mostly positive but that the picture becomes mixed once moderator variables are included. The authors suggest areas for future research that include using new methods for measuring activities and applying an overarching theoretical framework to investigations of extracurricular activities and adolescent development. Finally, to move toward a causal model of activities and adolescent functioning, future research must consider the mechanisms through which activities exert their influence on development. The authors propose several

possible mechanisms of participation in terms of adjustment during adolescence and young adulthood.

Feldman, R. S., R. D. Saletsky, et al. (1983). "Student locus of control and response to expectations about self and teacher." Journal of Educational Psychology **75**(1): 27-32.

85 female undergraduates with either an internal or external locus of control (LOC) (Rotter's Internal-External Locus of Control Scale) were used to investigate the relationship between LOC and responsivity to expectations regarding their own and their teacher's competence. Internal and external Ss, acting as students, were led to expect that they would perform well or poorly on a lesson and independently to expect that their teacher was competent or incompetent. After receiving a standardized lesson from a confederate acting as teacher, Ss' attitudes and performance were assessed. As predicted, internal Ss were more receptive to the expectation regarding self than external Ss. In contrast, the teacher expectation manipulation had no differential effect on internal and external Ss. Results suggest that students respond both to expectations about themselves and about their teacher and that LOC plays an important role in determining how an individual responds to such expectations.

Ferrer-Wreder, L., A. Palchuk, et al. (2008). "Identity and Adolescent Adjustment." Identity: An International Journal of Theory and Research **8**(2): 95 - 105.

This article is the report of an investigation of relations among identity coherence/identity confusion, the ego strength of competence, antisocial behavior, academic competence, and perceptions of school environment in a sample of 574 adolescents. The primary results of this cross-sectional study suggest significant associations between identity-related constructs and indicators of adolescent adjustment. Study implications are discussed in terms of identity-related interventions.

Fickes, M. (1998). "Balancing Permanent and Portable Buildings." School business affairs **64**(7): 36-37.

A brief narrative description of the journal article, document, or resource. Many districts are using portables as relatively permanent installations. Although permanent buildings are more expensive to construct, their operating cost is only $1.30 per square foot, compared to $5 for portables. The overall cost of using portable classrooms to solve long-term problems eventually surpasses costs of building permanent structures. Portables also deteriorate more quickly.

Fielding, M. (1997). "Beyond school effectiveness and school improvement: lighting the slow fuse of possibility." Curriculum Journal **8**(1): 7 - 27.

This paper argues that both school effectiveness and school improvement are importantly flawed and that we should be developing alternative approaches which connect more explicitly and more imaginatively with the dilemmas and possibilities facing education in and for democracy at the end of the twentieth century. The first half of the paper (sections 1-3) begins by expressing a number of dissatisfactions with the school effectiveness movement as a prelude to exploring the positive nature and potential of 'mapping' change in the school improvement process. The second half (sections 4-5) articulates a number of reservations about both school effectiveness and school improvement and begins to explore the possibility of an alternative, namely, 'transformative education'.

Fielding, M. (2009). "Public Space and Educational Leadership: Reclaiming and Renewing Our Radical Traditions." Educational Management Administration Leadership **37**(4): 497-521.

Among the most important features of a democratic way of life is public space within which we collectively make meaning of our work and lives together and take shared responsibility for past action and future intentions. This article looks briefly at the argument for democratic public space within political and educational theory before focusing on its central importance for contemporary school leadership. In seeking to ground the enormous potential of democratic public space in schools it then looks to the radical traditions of state education for compelling exemplification in the pioneering work of Alex Bloom, headteacher at St George-in-the-East Secondary School, Stepney, London. The article concludes with a three-fold analytic nexus of interrelated practices and orientations that support the development of inclusive public spaces in 21st-century schools.

Fielding, R., J. Lackney, et al. (2006) Master classroom: designs inspired by creative minds. Edutopia Magazine

Filardo, M. (2008). "Good Buildings Better Schools " Economic Policy Institute **Briefing Paper 216**

Argues the case for greater government investment in public schools (97,000) due to deteriorating conditions which have become the norm and subject of legal cases and as a focus of stimulus spending. Defines infrastructure as more than transit, roads, bridges and schools and reservoirs, parks. Instead should be understood as the services this infrastructure supports –"Mobility, safe and reliable sources of water; sustainable development, knowledge creation and transfer; and personal security" (p. 4) Issue is not buildings but public benefits gained from knowledge creation and transfer. Cites Weiss 2004 Public Schools and Economic Development that examines research linking educational investment to national productivity and correlation educational quality and quantity to work, productivity and social equity. (p. 5) Building deficiencies are seen to impair quality of teaching and learning and contribute to health and safety problems of staff and students. Also associated positively with teacher motivation and student achievement. Classroom lighting and thermal comfort are cited by teachers as determinants of morale and engagement of students (Corororan,Walker and White 1988, Jago and Tanner 1999) Lemasters identifies 53 studies linking design features to

student achievement. Lewis 2000 and Buckley, Schneider and Shang 2004 in LA and Milwaukee respectively "directly observed school conditions and controlled for public and neighbourhood socio economic characteristics, schools size and students reported motivation levels. Facility conditions and maintenance variables including conditions of lockers, visible graffiti, and frequency of cleaned classrooms. The studies found higher reading scores among elementary and high schools student sin better –maintained schools. After accounting for other influences' (p. 65)

Fisher, K. The new learning environment: Hybrid designs for hybrid learning, Woods Bagot**:** 8.

Fisher, K. "Schooling Issues Digest: The Impact of School Infrastructure on Student Outcomes and Behaviour." Schooling Issues Digest. Retrieved 7 May 2010, from http://www.dest.gov.au/sectors/school_education/publications_resources/schooling_issues_digest/schooling_issues_digest_building.htm.

This Digest reviews a range of research studies which examine the possible causal linkages between building design and student outcomes. It sets out those findings that are agreed and those areas where research to date is relatively inconclusive. Considerable rigorous and academically sound empirical quantitative research work has been carried out in the United States. However, the sample sizes vary between studies as do the levels of correlation between achievement and building conditions which suggests that more studies need to be carried out in this field to fully validate the findings. Conversely, in Europe, the findings appear to be based more on qualitative studies derived from social science methodology. In these cases direct causality is more difficult to establish, although newer narrative and ethnographic research approaches are being increasingly pursued. These qualitative studies have provided a deeper analysis and understanding of the more classical scientifically based quantitative findings. Taking the above factors into account, the research indicates that : student academic achievement improves with improved building condition; individual factors, such as lighting levels, air quality and temperature and acoustics, have an effect on student behaviour and outcomes, although there is limited quantitative evidence available on some of these factors; and new and emerging trends in school building planning and design and their impact on student outcomes and behaviour have yet to be evaluated using a rigorous research methodology.

Fisher, K. (2002). Building better outcomes: The impact of school infrastructure on student outcomes and behaviour. Schooling Issues Digest. S. a. T. Department of Education. Canberra.

Research indicates given qualifications of linking outcomes to built environment that: Student academic achievement improves with improved building condition; Individual factors, such as lighting levels, air quality and temperature and acoustic, have an effect on student behaviour and outcomes, although limited quantitative evidence; New and emerging trends in school planning and design need to be evaluated through rigorous research methodology. Evidence clear about the poor effects of bad buildings in terms of outcomes (e.g. health behaviour, attendance, discipline, maintenance). Other evidence that colour, acoustics, impact on behaviour as does class and school size. Lists a range of socio-spatial factors that do impact on behaviours, e.g. dedicated spaces, flexibility of furniture and space, privacy and openness, specialist areas, aesthetics. transitional spaces.

Fisher, K. (2002). Re-voicing the classroom: a critical psychosocial spaciality of learning, Rubida Research.

Why is the physical environment largely ignored by teachers as a key influence on learning? The individual classroom has seemingly remained unchanged since the Industrial Revolution, with spatiality playing an almost sinister, silent and subconscious role in schooling. Yet school buildings do reflect power relations as is evident in the stark contrast between elite private schools set in leafy grounds within wealthy suburbs compared with the instantly recognisable, institutional, and prisonlike public schools in less well-off areas.

Fisher, K. (2004). "Revoicing classrooms: a spatial manifesto." Forum **46**(1): 36-38.

Fisher, K. (2005). Linking pedagogy and space: proposed planning principles. proposed planning principles, Department of Education and Training [Victoria]**:** 42.

Fisher, K. (2005). Research into identifying effective learning environments. Evaluating Quality in Educational Facilities, OECD/PEB**:** 9.

The evaluation of school learning environments has for decades traditionally focused on the technical performance of the facilities with little attention being paid to their pedagogical performance or effectiveness. There are a range of 'top down' imperatives which have driven such an approach, including the need to sustainably finance educational infrastructure and show evidence as to how this money is being spent successfully. This need is emerging following the funding approaches now being taken by such bodies as the European Investment Bank and in Public Private Partnerships. On the other hand 'bottom up' imperatives have considered the pedagogical performance of learning environments as a means of providing feedback to authorities especially in the process of procurement. This in turn has influenced the development of planning and design guidelines. This paper examines more closely the educational learning environment and the qualitative and quantitative research measure that have been used in recent times to determine their effectiveness. It explores some of the pedagogy and environment performance measures that have evolved and views these in the context of emerging research and evidence which attempts to relate pedagogy

(including student and teacher attitudes) to space. It examines some case studies and focuses on the recently developed DET Victoria pedagogy-space strategies. Finally some conclusions are drawn and suggestions made for possible future research directions.

Fisher, K. (2007). "Space and place: learning environments for the ne(x)t generation." Teacher (Camberwell, Vic.)(185): 4-6,8.

Fisher, K. (2010). "Pedagogy and Architecture."
Refers to changing attitudes to pedagogy and government school renewal as focus of school redesign. Victoria governments focus on individualized learning, innovative teaching , new technology , and being environmentally sustainable and supporting community involvement. Sees a key aspect being teach teaching, often resisted because of perceived failure of 1970s open plan approaches, but now driven by new CT and focus on professional development. Also recognition that in discrete pedagogical settings these flexible learning environments need to be acoustically and visually screened. Also need to provide for a range of pedagogies including directive, collaborative, applied, communicative and decisionmaking. Wireless computing also liberates teachers as well as students from physical boundaries. He summarises the features and diversity of educational provision:- different organisational features 9 early years, primary secondary, multicampus, age based); and meeting specific needs of Middle years eg. Learning being engaging, self directed, co constructed, collaborative and outcomes based. Also develop students to be flexible thinkers and cooperative team players…. Funded through different approaches e.g. PPPs in NSW. Queensland in Southbank following NSW model.—based on more collaborative approaches to teaching and learning- socially oriented, peer to peer, student centred. He looks at a number of design possibilities wrt furniture….based on five pedagogical activities e.g. delivering, applying, creating, communicating and decisionmaking linked to 5 spatial icons.

Fisher, R. (2004). "Embedding the literacy strategy: snapshots of change." Literacy (formerly called Reading) **38**(3): 134-140.
This paper considers the government's initiative to change the teaching of literacy in primary schools in England. It draws on evidence from a one-year ESRC-funded project that observed teaching in the first year of the NLS and a two-year follow-up study that revisited and re-interviewed several of the teachers from the original study. It proposes that, although substantial changes have been made to the organisation and procedures of literacy teaching, deeper pedagogical change is less obvious in some classrooms. It further argues that for teachers to have the freedom to develop their pedagogy, the climate of coercion and outcome-led education must change.

Flutter, J. (2006). "'This place could help you learn': student participation in creating better school environments." Educational Review **58**(2): 183-193.
This paper examines the role of student consultation and participation in the process of improving the physical environment in schools. Although quantitative studies suggest that there are some links between the learning environment and school performance, direct causal relationships between these factors remain unclear. However, as Clark points out: '... qualitative research on the indirect influences of school buildings on student learning and behaviour is of use in enhancing our understanding of the factors involved' (Clark, 2002, p. 11). Evidence from qualitative studies of students' perspectives on the school environment is presented to illustrate the important insights that can be gained through listening to the student voice. The argument for student voice is taken further through a discussion of recent projects and initiatives in which students are given an active role in designing and improving school buildings and facilities. The paper concludes with a discussion of the problems and benefits in involving students in the process of improving their learning environments.

Flygt, E. (2009). "Investigating architectural quality theories for school evaluation: a critical review of evaluation instruments in Sweden." Educational Management Administration Leadership **37**(5): 645-666.
This article presents a critical review of instruments used to evaluate compulsory schools in Sweden and is part of a doctoral programme project investigating the relationship between school architecture and learning. In Sweden, as in many countries, evaluation instruments are used both to improve school quality and as a means to provide accountability according to new public management policies. Since the early 1990s, the Swedish municipalities have been responsible for compulsory schools and, despite a strong evaluative tradition in Sweden, current reports indicate that many school buildings do not fit the activities of teachers and pupils. Existing evaluative efforts do not seem to be effective. A basic assumption of this article is that 'quality' is an elusive concept and that instruments for evaluation of schools need an adequate theoretical framework in order to be feasible. Drawing on both theoretical and empirical literature the article explores this theoretical framework. The findings suggest that relevant criteria for the evaluation of school architecture should be motivated on a local level to reflect actual needs of end users in a specific learning context. The article concludes that the theoretical foundation of instruments for evaluation of schools could be reconsidered using architectural quality theories.

Focke, J. (2001). "The evolution of school design: thirty years of change in public classrooms." Texas architect **51**: 24-27.

Folkestad, J. and J. Banning (2009). " Promoting collaboration: the physical arrangement of library computers." Library Hi Tech News **26**(1/2): 18 - 19.
Purpose – The purpose of this conceptual paper is to highlight the increasing need for libraries to support collaborative

learning and to review possible physical arrangements of computer laboratories that are supportive of collaborative learning. Design/methodology/approach – A review of the literature was conducted to look at the interface of the concepts of collaborative learning and physical arrangements of computer laboratories. Findings – The review of the literature surfaced four suggested physical arrangements of computers for collaborative work; kidney-shaped tables, trapezoid tables and half-circle tables, and Center for Science, Mathematics and Technology Education sociopatial workstations. After reviewing these arrangements, the paper suggest an additional arrangement with increased potential for face to face collaboration; full-circle with recessed monitors. Originality/value – As new libraries are built and others renovated, these five physical arrangements provide for ways that computer laboratories can be designed to meeting the increasing need for user collaboration.

Forest Research (2007). Forest School: a marvellous opportunity to learn. F. Commission.

Foster, A., S. Percival, et al. (2006). Designing school grounds. D. o. E. a. Skills. UK**:** 124.
This guide is full of information, guidance and ideas to inspire the best possible designs for school grounds, as well as examples of schools that have used the development of their grounds to enhance the formal, informal and hidden curricula. The framework document *Every Child Matters*2 aims to ensure that every child and young person has the opportunity to fulfil their potential. It identifies five overarching outcomes that all Government departments with a vested interest in children's development should be working towards. These are: be healthy; be safe; enjoy and achieve; make a positive contribution; achieve economic well-being. School grounds can play a significant role in delivering these outcomes, providing safe, stimulating environments where children and young people can learn, explore, play and grow, regardless of their educational needs. As a society, we recognise that our young people are being offered ever fewer opportunities for safe, challenging, active and collaborative play. Lack of these opportunities can lead to health issues, apathy, social and behavioural issues. School grounds can help raise achievement and self-esteem, improve behaviour and health, and help children and young people develop a wide range of skills.

Foucault, M. and J. Miskowiec (1986). "Of other spaces." Diacritics **16**(1): 22-27.
The great obsession of the nineteenth century was, as we know, history: with its themes of development and of suspension, of crisis and cycle, themes of the ever-accumulating past, with its great preponderance of dead men and the menacing glaciation of the world. The nineteenth century found its essential mythological resources in the second principle of thermodynamics. The present epoch will perhaps be above all the epoch of space. We are in the epoch of simultaneity: we are in the epoch of juxtaposition, the epoch of the near and far, of the side-by-side, of the dispersed. We are at a moment, I believe, when our experience of the world is less that of a long life developing through time than that of a network that connects points and intersects with its own skein. One could perhaps say that certain ideological conflicts animating present-day polemics oppose the pious descendents of time and the determined inhabitants of space. Structuralism, or at least that which is grouped under this slightly too general name, is the effort to establish, between elements that could have been connected on a temporal axis, an ensemble of relations that makes them appear as juxtaposed, set off against one another, implicated by each other-that makes them appear, in short, as a sort of configuration. Actually, structuralism does not entail a denial of time; it does involve a certain manner of dealing with what we call time and what we call history.

Franceschi, C. "Community schools soften tough neighbourhoods." Educational Facility Planner **39**(3): 5.
Research shows that community schools improve student performance by involving families and by developing stronger peer relationships and enhances school design through an inclusive process that brings the insight, leadership, and resources of the community to the design team. It also simply makes good sense, particularly in urban areas where resources are scarce and public support and a sense of ownership are critical to a facility's success. This article provides insight into the essential elements for achieving a successful school and community partnership and outlines a number of planning, design and implementation issues that should be considered. Case studies describing two successful urban community schools are presented.

Fraser, B. J. and D. L. Fisher (1983). "Use of actual and preferred Classroom Environment Scales in person-environment fit research." Journal of Educational Psychology **75**(2): 303-313.
Used the Classroom Environment Scale (CES) to aid in investigating the person-environment fit hypotheses of whether the relationship between achievement and actual classroom environment varies with the environment preferences of the class. Students in 116 8th and 9th grade science classes were the Ss. Achievement on several cognitive and affective outcome measures was related to interactions between the actual classroom environment and that preferred by the class. Regression surface analyses revealed numerous cases in which the actual-preferred interaction on a CES scale accounted for a significant amount of criterion variance beyond that attributable to corresponding pretest, general ability, and actual environment. In each case, the person-environment interaction was supported in that the relationship between achievement and an actual environment dimension was more positive for classes whose students had a higher preference for that dimension than in classes whose students had a lower preference.

Frenzel, A. C., T. Goetz, et al. (2009). "Emotional Transmission in the Classroom: Exploring the Relationship Between Teacher and Student Enjoyment." Journal of Educational Psychology **101**(3): 705-716.

In this study, the authors examined the relationship between teacher and student enjoyment. Based on social-cognitive approaches to emotions, they hypothesized (a) that teacher enjoyment and student enjoyment within classrooms are positively linked and (b) that teacher enthusiasm mediates the relationship between teacher and student enjoyment. Self-reported enjoyment of mathematics classes was available from 1,542 students from 71 classrooms at 2 time points (Grades 7 and 8). At Time 2, mathematics teachers' reports of their enjoyment of teaching were available (N = 71), as well as student ratings of teacher enthusiasm. The findings were in line with theoretical expectations. Multilevel structural equation modeling showed that teacher and student enjoyment were positively related even when the authors adjusted for students' previous-class levels of mathematics enjoyment, and that the effect of teacher enjoyment on student enjoyment was mediated by teacher enthusiasm. Discussion centers on the practical implications for affective interactions in the classroom.

Fried, M. (2000). "Continuities and discontinuities of place." Journal of Environmental Psychology **20**(3): 193-205.

Early studies and observations of working-class communities reveal the physical environment itself as a very meaningful aspect of urban social life, a finding strongly borne out by the study of the relocation of several thousand people from the West End of Boston (1958-1961). Attachment to place is a characteristic feature of life in many poor, ethnic, immigrant communities. The development of a sense of spatial identity is a critical component of attachment experiences in such local areas. As a consequence of such spatial identity, built on the convergence of physical places and social relationships, displacement from the community entails widespread grief and mourning. But life, even in these relatively stable and enclosed communities, is not simply continuous: people change, communities change, social discontinuities are inevitable. And the stable forms of attachment which are so highly adaptive to the first or second generation ethnic community inhibit progression to new urban environments and to new conditions of social life when these become desirable or necessary. While community ties are often of importance at all social class levels and serve as stabilizing forces, the transition to new statuses, wider opportunities, and new conditions of life implies a more attenuated form of place attachment. However, many people remain addicted to encompassing forms of continuity in community attachments. Spatial identities which are highly functional at one point can thus become dysfunctional. These commitments can become the basis for contagious violence and bloodshed especially after the demise of long-term autocratic controls which leave a political hiatus and present us with pathologies of community attachment, visible in the territorial conflicts of recent decades.

Frith, K. and D. Whitehouse (2009). "Designing learning spaces that work: a case for the importance of history. [Paper in special issue: Work! Work! Work!: Work and the History of Education! Allender, Tim (ed.).]." History of Education Review **38**(2): 94-108.

Fry, P. S. and J. Addington (1984). "Comparison of social problem solving of children from open and traditional classrooms: A two-year longitudinal study." Journal of Educational Psychology **76**(2): 318-329.

Examined the hypothesized relation between open classrooms and children's social problem-solving performance by comparing, over a 2-yr period, the social problem-solving cognitions of 2 groups of children who had attended open and traditional classrooms, respectively, for 3 yrs. Ss in Phase 1 were 60 children (average age 9.5 yrs) from open classrooms and 60 matched children from traditional classrooms; 40 Ss from open classrooms and 40 Ss from traditional classrooms who had participated in Phase 1 were eligible to serve in Phase 2. The 8 open and 8 traditional classrooms used in the study were found to be different treatment groups based on ratings of openness and restrictiveness. The prediction of a relation between the open classroom and greater social problem-solving cognitions in children was based on previous research suggesting that the social-cognitive climate of the open classroom is more conducive to children's independent decision making and initiative. Multivariate analyses of repeated measures showed that open-classroom Ss had higher scores in social problem-solving cognitions and correspondingly higher scores in self-esteem and ego-strength. Educational implications of the findings are discussed in terms of the social-cognitive climate of open and restrictive classrooms and their effect on children's social-cognitive development. Limitations of the nonequivalent, nonrandomized group design used in the present study are also discussed. (48 ref) (PsycINFO Database Record (c) 2006 APA, all rights reserved)

Fuller, B., L. Dauter, et al. (2009). "Building schools, rethinking quality? early lessons from Los Angeles." Journal of Educational Administration **47**(3): 336-349.

Purpose – Newly designed schools for centuries have projected fresh ideals regarding how children should learn and how human settlements should be organized. But under what conditions can forward-looking architects or education reformers trump the institutionalized practices of teachers or the political-economic constraints found within urban centers? The purpose of this paper is to ask how the designers of newly built schools in Los Angeles – midway into a $27 billion construction initiative – may help to rethink and discernibly lift educational quality. This may be accomplished via three causal pathways that may unfold in new schools: attracting a new mix of students, recruiting stronger teachers, or raising the motivation and performance of existing teachers and students. Design/methodology/approach – We track basic indicators of student movement and school quality over a five-year period (2002-2007) to understand whether gains do stem from new school construction. Qualitative field work and interviews further illuminate the mechanisms through which new schools may contribute to teacher motivation or student engagement. Findings – Initial evidence shows that many students, previously bussed out of the inner city due to overcrowding, have returned to smaller schools which are staffed by younger and more ethnically diverse teachers, and benefit from slightly smaller classes.

Student achievement appears to be higher in new secondary schools that are much smaller in terms of enrolment size, compared with still overcrowded schools. Originality/value – We emphasize the importance of tracking student movement among schools and even across neighborhoods before attributing achievement differences to specific features of new schools, that is, guarding against selection bias. Whether new schools can hold onto, or attract new, middle-class families remains an open empirical question. Future research should also focus on the magnitude and social mechanisms through which new (or renovated) schools may attract varying mixes of students and teachers, and raise achievement.

Galton, M., L. Hargreaves, et al. (1999). Inside the primary classroom: 20 years on, Routledge.

García-Acosta, G. and K. Lange-Morales (2007). "Definition of sizes for the design of school furniture for Bogotá schools based on anthropometric criteria." Ergonomics **50**(10): 1626 - 1642.

The current paper deals with the definition of sizes for the design of school furniture for schools in Bogotá, Colombia, based on an analysis of available anthropometric data on Latin American children. State-of-the-art anthropometric, national and international standards were considered, in order to define the anthropometric variables that were to be used for defining the furniture. Matrices relating age and specific anthropometric dimensions were constructed, as a visualization method for establishing the dimensional differences between children of the same age and the ranges that should be covered by the items of furniture. Dimensional data were grouped by establishing the minimum sizes and general dimensions of furniture needed to cover the 5–95th percentile of school children between the ages of 5 and 18 years. The distribution of the furniture in the different school grades was also indicated. Apart from the need for an adequate match between child anthropometry and school furniture dimensions, this study shows the importance of a proper distribution of furniture sizes in the different school grades, as a complementary and decisive aspect to be considered in order to meet the heterogenic, anthropometrical requirements of children of the same age and school grade.

Gee, L. (2005). Human-Centered Design Guidelines. Learning Spaces. D. Oblinger. Boulder, Educause.

Gee, L. and T. Hajduk (2005). Importance of Informal Spaces for Learning, Collaboration, and Socialization.**:** 37.

Illustrates principles that are central to the importance of informal learning spaces: 1) The entire campus is a learning environment that provides opportunities for further learning. 2) Informal spaces for learning, collaboration, and socialization are critical components of both scheduled and unscheduled campus spaces. 3) Space drives behaviors and behaviors need to change for our society to realize its learning goals. The presentation explores these principles across a range of institutional examples.

Geen, R. G., E. J. McCown, et al. (1985). "Effects of noise on sensitivity of introverts and extraverts to signals in a vigilance task." Personality and Individual Differences **6**(2): 237-241.

Forty Ss, previously classified as introverts or extraverts on the basis of scores on the Eysenck Personality Inventory, performed a visual vigilance task while being stimulated with noise at an intensity level of either 65 or 85 dB. Introverts given noise of 65 dB intensity showed an improvement in detection rate across trials, whereas introverts given noise of 85 dB intensity showed a decline in detection rate. Extraverts responded to noise of 65 dB intensity with a slight decrease in detection rate, but showed an improvement in detection over trials when noise of 85 dB intensity was given. When noise of the lower intensity was given, introverts showed greater sensitivity to signals than extraverts. When noise of the higher intensity was given, introverts and extraverts were equal in sensitivity. The results are discussed in terms of a hypothesized relationship between stimulation and arousal, with E-I as a moderator variable.

Germeten, S. (2000). Early Childhood Education in Norway: Time as an indication for Pedagogical space? 10th European Conference on Quality in Early Childhood Education (EECERA). London**:** 8.

This paper is about discourses in teaching in Early Childhood Education, and the core question is if, and eventually how, time is disciplining and controlling the life of the classroom. What teachers do in classroom can be looked upon as constructing and deconstructing reality and knowledge for children and youths. The purpose of this study was therefore to inquire and examine different teachers in their work, to see how discourses were constituted, and to see how time influenced on the activities. The arena presented is the classroom for the 6 year olds, the first grade in school in Norway. By a new law and a new national curriculum in 1997, the so-called Reform 97, the 6 year–olds were moved from kindergarten to school. Data presented in this paper is based on an evaluation research project carried out in 1998-99 (Germeten 1998, 1999a, 1999b, 1999c). Why do I think that time is so important in school today? Curriculum, calendars, timetables, clocks, lessons and leisure time are all central words in school discourse. Pupils rush to and from school, in and out of classrooms, ”on and off” subjects, as if time was scarce. Instantly we see that activities connected to time governs the day in the traditional school. Many of the observations in this evaluation also showed that governmentally of time was central in the disciplinary process (Foucault 1972, 1990, 1999).

Gibson, C. and C. Eatough (1968). The Portable Classroom Impact on Educational Programs and School Facility Financing in California., California State Department of Employment, Sacramento, CA.

A discussion of portable classrooms in California includes statements on the extent of their use, the reasons for their

purchase, public attitudes toward them, some possible limitations, and the policy regarding their use. The paper concludes that before policy implementations are imposed on portable classrooms, a new survey must be undertaken which would assess their benefits in terms of educational goals and establish their true and total costs. (FPO) Note: The following two links are not-applicable for text-based browsers or screen-reading software.

Gifford, R. (2002). Environmental psychology: Principles and practice, Optimal Books,.

In this book Gifford attempts to explain the field of environmental psychology through a synthesis of thousands of research studies and articles on the subject. He outlines the practices and theoretical frameworks of EP and underlines the complexities of the sites of study which make EP an imprecise although necessary field of study.

Giles, J., D. A. J. Ryan, et al. (2006). "Teaching style and learning in a quantitative classroom." Active Learning in Higher Education **7**(3): 213-225.

Education research over the last few decades has focused on the debate over which classroom pedagogies best encourage learning: teacher-centred or student-centred. Although research appears to support the philosophy that student-centred teaching provides for better learning, the supporting research is frequently limited to observational studies or limited in experimental design. Despite this, the trend has been to encourage teachers to adopt a more student-centred approach both in the teaching of the course material and as a model for future teachers. A pilot study was conducted in an introductory university statistics course using a Latin Square Design to experimentally collect both quantitative and qualitative data pertaining to student performance. The purpose of this study was to examine the impact of teaching style on learning, assess these approaches in quantitative courses, and establish protocols for such studies using a statistically controlled design.

Gilstrap, S. C. (2003). An Evaluation of the Effectiveness of Federal Class Size Reduction in the Los Angeles Unified School District: Does Class Size Influence Teacher-Student Interaction in Secondary Classrooms?, Los Angeles Unified School District CA. **Mar:** 43.

The federal Class Size Reduction Program, first implemented in California's Los Angeles Unified School District in 1999-2000, included a component targeting eighth grade language arts classrooms for mandatory reduction to a minimum of 20 students per classroom. Implementation evaluation showed that average class size was below 20. This study examined levels of instructional feedback quality, discussion quality, and student-centered learning in a sample of middle school classrooms. Teachers described their learning goals for activities planned during the observation and how they had planned to assess the extent to which the goals had been met, then researchers observed them teaching. Data collected from 55 middle school English classes indicated that incidents of high quality instructional feedback and individualized instruction occurred in a small number of smaller classrooms and never occurred in larger classrooms. Teacher qualifications (years of experience and credential status) were unrelated to teaching practice in smaller and larger classrooms. Reduced class sizes did not directly impact the nature of teacher practice observed in these secondary classrooms, consistent with research on class size reduction in elementary classrooms. Two appendices present rubrics used to rate lesson quality in observed classrooms and to assess instructional orientation. (Contains 15 references.) (SM)

Gislason, N. (2009). "Mapping School Design: A Qualitative Study of the Relations Among Facilities Design, Curriculum Delivery, and School Climate." Journal of Environmental Education **40**(4): 17-34.

The author conducted a 3-week qualitative case study at the School of Environmental Studies (SES), a senior public school with an environmental studies focus. He argues that SES's physical design facilitates collaborative, multidisciplinary teaching practices especially suited to the school's environmental studies curriculum. He also shows that the school's open plan architecture positively contributes to the social climate at SES. Students who were interviewed as part of the study expressed a preference for the open plan setting over conventional classrooms because the open design helps them socially connect with a larger number of peers than would be possible in a more enclosed environment. Students consequently felt more socially accepted at SES and better enjoyed their time in school in comparison with other high schools they had attended.

Glass, G. and M. Smith (1979). "Meta-analysis of research on class size and achievement." Educational Evaluation and Policy Analysis **1**(1): 1.

Goddard, T. (2009). "Consider the Australians." from http://www.building.co.uk/story.asp?storycode=3143432&encCode=4322312881BC660468708JTBS737226611.

Good, M. and G. R. Adams (2008). "Linking academic social environments, ego-identity formation, ego virtues, and academic success." Adolescence **43**(170): 221-236.

This study used Structural Equation Modeling to test an Eriksonian conceptual model linking academic social environments (relationships with faculty and fellow students), ego-identity formation, ego virtues, and academic success. Participants included 765 first-year students at a university in southern Ontario, Canada. Results indicated that supportive relationships with faculty was directly related to higher average grades and perceived academic ability, whereas positive relationships with fellow students was indirectly related to academic success through ego virtues. Positive ego-identity formation (identity achievement) was also indirectly related to academic success through ego

virtues.

Gordon, T. and E. Lahelma (1996). "`School is Like an Ant's Nest' : spatiality and embodiment in schools." Gender and Education **8**(3): 301-310.

Processes of differentiation and formation of subjectivities in schools have embodied and spatial components. This article illustrates the significance of what is termed the physical school by a discussion of space and embodiment organised through one of several metaphors that school students have used to describe their schools : an ants ' nest. The metaphor tells a tale about the lack of spatial and embodied autonomy school students experience. Gendered meanings of the metaphor are also questioned. Gender is seen as dynamic and processual. The article is based on a collective work on `Physical school' by the Gender and Education research network in Finland (1992 ± 94). Theoretical concepts are elaborated further within another project in secondary schools 'citizenship, difference and marginality in schools with special reference to gender' that was in its preliminary phase when the article was written.

Graetz, K. (2005). The Psychology of Learning Environments. Learning Spaces. D. Oblinger. Boulder, Educause.

This chapter focuses on the psychological effects of learning spaces. "The areas of psychology that relate most directly to classroom design and learning environments are environmental, educational, human factors (engineering), and social psychology. Previous research on the effects of such environmental variables as light, temperature, and noise on learning has yielded some predictable results that are addressed through traditional classroom design. Learning appears to be affected adversely by inadequate light, extreme temperatures, and loud noises—variables maintained within acceptable ranges in most college classrooms. Other results, however, reflect the often complex, subtle, and surprising interplay between the learner and the learning environment. Years of research on the impact of environmental variables on human thoughts, feelings, and behaviors indicate that other variables often moderate the effects of environmental variables. In a summary of the research on educational environments, Weinstein2 concluded that environmental variables can impact learners indirectly and that the effects of different physical settings often depend on the nature of the task and the learner. For example, distracting noises appear to slow reaction time and degrade performance to a greater degree in older versus younger adults3 and for introverts to a greater degree than extraverts.4" (6.3) Focuses on virtual environments and also how attention is effected by new mobile technologies. Makes specific reference to collaborative learning and the factors impacting on that in terms of spatial density, and how crowding can impact on personal relations. Also refers to how individuals use and perceive space different and have particular environmental preferences.

Grannis, J. C. (1983). "Ecological Observation of Experiential Education Settings: A Quantitative-Qualitative Instrument." Environment and behavior **15**(1): 21-52.

An instrument was developed for observing selected physical, social, and intellectual features of experiential education settings and of participants' performances in these settings. The procedure of each observation entails taking structured notes for a brief time span, coding this segment retrospectively while remaining in the setting, and subsequently interviewing the focal participant. The article presents data collected for two consecutive years in both the classroom and the work settings of a secondary school experiential education program in a hospital. Contrasts between the classroom and work-setting data, and continuities and changes between the two years, illustrate the instrument's capabilities and pose problems for further research.

Grasha, A. F. (1972). "Observations on relating teaching goals to student response styles and classroom methods." American Psychologist **27**(2): 144-147.

Contends that instructor perceptions of student ability differences are partly influenced by class design favoring instructor rather than student needs. Analysis of different approaches to teaching undergraduate psychology courses indicates that instructor need-oriented classes encouraged avoidant, competitive, and dependent response styles. Dominant causes were: (a) uncertainty in and disenchantment with class activities, (b) competitive rewards and collaborative sanctions, (c) authority fixations, and (d) few transfer activities. Teaching goals attempting to attentuate these styles featured a classroom model with small group projects, class and small group student "teachers of the day," and instructor content study guides. Questionnaire and response style assessment data reveal that students exposed to this design liked the method, and reported their behaviors as more participatory, collaborative, and independent than those taught by traditional methods.

Graue, E., K. Hatch, et al. (2007). "The Wisdom of Class-Size Reduction." American Educational Research Journal **44**(3): 670-700.

In this study, the authors explore the implementation of a statewide class-size reduction program in nine high-poverty schools. Through qualitative methods, they examined how schools used class-size reduction to change staffing patterns and instructional programs. Requiring changes in space allocation, class-size reduction was accomplished through attention to pupil:teacher ratio, with classes ranging from 15:1 to 30:2 team taught. Most partner classes used tag-team teaching, with one teacher leading and the other doing clerical work. Working without specific professional development to enhance teaching in smaller classes, it made sense that teachers continued to solo practice. Class-size reduction is both a programmatic and instructional reform, and as such, it requires specific professional development to promote change.

Green, D. and P. Turrell (2005). "School building investment and impact on pupil performance. ." Facilities **23**(5/6): 253-261.
This study provides information on a small-scale study that explores the impact on pupil performance of the recent significant government investment in school buildings in a single county of England. The design approach was to focus on the schools and those involved in teaching in order to explore their perspective of the link between investment and improved pupil performance. The methodology chosen was qualitative and consisted of questionnaires to a selected sample of state schools together with interviews with the Local Education Authority and a case study of a single school, all within Derbyshire. The results clearly indicate that although direct benefits are difficult to measure accurately, the schools perceive a benefit of investment which can be illustrated in pupil attainment, motivation and pupil behaviour, with an additional benefit to staff, who find that better environments improve teacher morale and motivation.

Greene, B. A., R. B. Miller, et al. (2004). "Predicting high school students' cognitive engagement and achievement: Contributions of classroom perceptions and motivation." Contemporary Educational Psychology **29**(4): 462-482.
Path analysis was used to test predictions of a model explaining the impact of students' perceptions of classroom structures (tasks, autonomy support and mastery and evaluation) on their self-efficacy, perceptions of the instrumentality of class work, and their achievement goals in a particular classroom setting. Additionally, the impact of self-efficacy, instrumentality, and goals on students' cognitive engagement and achievement was tested. There were 220 high school students who completed a series of questionnaires over a three-month period in their English classes. Data strongly supported the model demonstrating that student perceptions of classroom structures are important for their motivation. Also supported was the importance of perceiving the current class work as being instrumental for future success. Implications were discussed.

Griffiths, J., M. Podirsky, et al. (2002). "Children's Learning Environments [Australia]."
This explores how different environments influence a child's learning and how best to use and design these environments for optimal learning. It features information about the design and layout of Australian classrooms in the past and the different types of classroom layout currently used. Discusses learning environments, factors to consider, and different types of learning including collaborative learning, cooperative learning, groups, individualistic learning, and competitive learning. Includes numerous photographs of classroom settings from the past and present, showing rows, groups, and alternative arrangements

Gronna, S. and S. Chin-Chance (1999). Effects of school safety and school characteristics on grade 8 achievement: A mulitlevel analysis, Paper presented at the Annual Meeting of the American Educational Research Association (Montreal, Quebec, Canada, April 19-23, 1999). 20.
This paper reports on a statewide study that examined the extent to which a safe school influences individual student achievement. The study used a two-level hierarchical model that included student characteristics and school conditions used in prior research. The statewide analysis was based on 46 of the 50 schools with grade 8 classes in one western state. The study used scores from the Stanford Achievement Test, along with data obtained from state department of education data bases for the school years 1993 through 1996. The findings suggest that school safety has statistically significant effects on students' grade 8 reading and mathematics achievement. Controlling for student background characteristics and differences in school conditions, students who are in safer schools have higher grade 8 achievement scores than students who are in less-safe schools. The results suggest that schools with lower levels of school violence provide better learning environments for students in middle-level schools. Additionally, there was a statistically significant negative effect on student achievement associated with increased school disciplinary infractions after controlling for student background characteristics and school conditions. Since students who are in safer schools have higher grade 8 achievement scores than students who are in less-safe schools, school safety should receive increased attention from policymakers.

Group, H. M. (1999). Daylighting in schools: An investigation into the relationship between daylighting and human performance, Heschong Mahone Group, Fair Oaks, CA**:** 29.

Gruenewald, D. A. (2003). "Foundations of Place: A Multidisciplinary Framework for Place-Conscious Education." American Educational Research Journal **40**(3): 619-654.
This article provides educators at all levels with a theoretical rationale for place-conscious education; it also discusses pedagogical pathways, and institutional challenges, to place-consciousness. Drawing on insights from phenomenology, critical geography, bioregionalism, ecofeminism, and other place-conscious traditions, the author gathers diverse perspectives on "place" to demonstrate the profoundly pedagogical nature of human experience with places. Five "dimensions of place" are described that can shape the development of a socio-ecological, place-conscious education: (a) the perceptual, (b) the sociological, (c) the ideological, (d) the political, and (e) the ecological. After discussing these, the author reframes several place-conscious educational traditions. The article concludes with an analysis of the possibilities for place-conscious education in an era that defines institutional accountability by standards and testing.

Gulwadi, G. B. (2006). "Seeking Restorative Experiences: Elementary School Teachers' Choices for Places That Enable Coping With Stress." Environment and behavior **38**(4): 503-520.
Teacher stress and coping research and restorative environments research were converged in this study to explore how

elementary school teachers in Chicago seek out everyday places in their milieu to implement restorative coping strategies. Seventy-one survey responses revealed that teachers' spontaneous place choices are related to sources of stress and that the restorative potential of a place was related to its ability to support teachers' inward or outward coping strategies. Teachers implemented effective strategies in places such as home, nature, city places, third places, and church. The ways these places were experienced differed according to teachers' perceptions of frequency and type of stress and how the place enabled the inward or outward strategy as needed. Findings suggest directions for exploring restorative design interventions in teachers' environments, especially within school environments.

Gur, R. C., H. A. Sackeim, et al. (1976). "Classroom seating and psychopathology: Some initial data." Journal of Abnormal Psychology **85**(1): 122-124.

Investigated the relation between classroom seating and psychopathology in 228 undergraduates. Ss were administered the Manifest Symptom Questionnaire, which consists of 124 questions eliciting self-reports on 65 psychiatric disorders. Mean scores were computed for males and females sitting on the left and right sides of the classroom. Males sitting on the right side reported greater psychopathology than males sitting on the left. On the other hand, females sitting on the left side reported more psychopathology than females sitting on the right. Results support a tie between hemisphericity and self-reported psychopathology.

Gur, R. E., R. C. Gur, et al. (1975). "Classroom Seating and Functional Brain Asymmetry." Journal of Educational Psychology **67**(1): 151-153.

This study examined the relationship between functional brain asymmetry, as measured by the characteristic direction of eye movements in response to face-to-face questioning, and sitting on the left or the right side of a classroom: 74 undergraduate students, whose laterality had previously been ascertained, participated. As predicted, left movers preferred to sit on the right side, and right movers on the left. A significant proportion of the subjects who indicated a differential seating preference for hard compared to soft topics, placed themselves more to the left for the former. The results are congruent with other findings comparing right movers and left movers on a variety of personality measures.

Hackmann, D. G. and D. M. Schmitt (1997). "Strategies for Teaching in a Block-of-Time Schedule." NASSP Bulletin **81**(588): 1-9.

Secondary schools throughout the nation are fashioning creative alter natives to traditional six and seven-period days, in the form of block- of-time schedules. Although varying tremendously in format, block-of- time schedules have an overarching commonality: They significantly depart from the traditional 45 to 55-minute class period.

Hadjioannou, X. (2007). "Bringing the Background to the Foreground: What Do Classroom Environments That Support Authentic Discussions Look Like?" American Educational Research Journal **44**(2): 370-399.

Authentic discussions are dialogically oriented classroom interactions where participants present and consider multiple perspectives and often use others' input in constructing their contributions. Despite their instructional effectiveness, authentic discussions are reportedly rare in classrooms. This qualitative case study examines the features of the environment of a fifth-grade classroom community where authentic discussions were frequent. The examination used recorded class sessions, interviews, and field notes to identify seven aspects of the classroom environment that appeared to be essential to the presence of authentic discussions: physical environment, curricular demands and enacted curriculum, teacher beliefs, student beliefs about discussions, relationships among members, classroom procedures, and norms of classroom participation.

Hahn, D., R. Shangraw, et al. (2007). Does Visualization Affect Perceptions of Ethically Complex Policy Decisions: An Experimental Study.

Explores what happens when laypeople are allowed to make a decision about an ethically challenging, human experiment and how age, race, gender, and communication mediums may influence this decision making process. Preliminary results indicate visualization environments are better than print media in communicating risks; older or more educated participants are less likely to approve scientific studies involving human subjects; race nor ethnicity are significant indicators of decision outcome. Direction of future research around each of these areas is discussed.

HAINES, M. M., S. A. STANSFELD, et al. (2001). "The West London Schools Study: the effects of chronic aircraft noise exposure on child health." Psychological Medicine **31**(08): 1385-1396.

HAINES, M. M., S. A. STANSFELD, et al. (2001). "Chronic aircraft noise exposure, stress responses, mental health and cognitive performance in school children." Psychological Medicine **31**(02): 265-277.

Background. Previous research suggests that children are a high risk group vulnerable to the effects of chronic noise exposure. However, questions remain about the nature of the noise effects and the underlying causal mechanisms. This study addresses the effects of aircraft noise exposure on children around London Heathrow airport, in terms of stress responses, mental health and cognitive performance. The research also focuses on the underlying causal mechanisms contributing to the cognitive effects and potential confounding factors. Methods. The cognitive performance and health of 340 children aged 8–11 years attending four schools in high aircraft noise areas (16h outdoor Leq>66dBA) was compared with children attending four matched control schools exposed to lower levels of aircraft noise (16h outdoor Leq<57dBA). Mental health and cognitive tests were group administered to the children in the schools.

Salivary cortisol was measured in a subsample of children. Results. Chronic aircraft noise exposure was associated with higher levels of noise annoyance and poorer reading comprehension measured by standardized scales with adjustments for age, deprivation and main language spoken. Chronic aircraft noise was not associated with mental health problems and raised cortisol secretion. The association between aircraft noise exposure and reading comprehension could not be accounted for by the mediating role of annoyance, confounding by social class, deprivation, main language or acute noise exposure. Conclusions. These results suggest that chronic aircraft noise exposure is associated with impaired reading comprehension and high levels of noise annoyance but not mental health problems in children.

Hall, E. and S. Higgins (2002). "Embedding Computer Technology in Developmentally Appropriate Practice: Engaging with Early Years Professionals' Beliefs and Values." Information Technology in Childhood Education Annual **2002**(1): 301-320.

The use of computers in early years has become a contentious issue, with advocates calling for more Information and Communications Technology (ICT), more machines, better software, and more training for professionals, while other groups call for "a moratorium on the further introduction of computers in early childhood and elementary education" (Cordes & Miller, 2000). The authors of this article would like to declare their allegiances here: they are in favour of computers in the same way that they are in favour of books, pencils, worksheets, Lego, jigsaws, junk modelling, role play, and circle time. Activities and equipment in early years are, in themselves, neither positive or negative: it is the way in which they are used which is meaningful. Any of the things on their list can (and have) been criticised as retarding or limiting children's development. They believe that children need opportunities to interact with the world at developmentally appropriate levels, to "own" the interactions, forming personal, relevant "mental furniture," organising their learning in partnership with peers and sensitive, scaffolding adults. Such activities are appropriate in that they actively engage learners and developmental in the sense that they help to support the development of children's learning. ICT has a place in this, and the burning questions are not whether computers should be used but where and how ICT can be used to enlarge and enrich young children's experience of learning.

Hall, I. and S. Higgins (2005). "Primary school students' perceptions of interactive whiteboards." Journal of Computer Assisted Learning **21**(2): 102-117.

Students involved in the interactive whiteboard (IWB) evaluation, sponsored by the Centre for British Teachers (CfBT), were interviewed in regard to their perceptions about IWBs. Twelve group interviews (72 students) were conducted between January and Easter 2004 with Year 6 students (between 10 and 11 years of age) in six Local Education Authority (LEA) areas located in the North and South of England. Students were very enthusiastic about particular aspects of IWBs, such as their versatility in the classroom, multimedia capabilities and the fun and enjoyment they brought to learning. Students also highlighted, however, technical problems, teacher and students' information and communication technology skills and students' lack of access to the technology as negative aspects.

Han, K.-T. (2009). "Influence of Limitedly Visible Leafy Indoor Plants on the Psychology, Behavior, and Health of Students at a Junior High School in Taiwan." Environment and behavior **41**(5): 658-692.

There is growing evidence to support the notion that contact with nature is helpful for emotional states, attention, mental fatigue, behavior, and personal health. This study adopts a quasi-experimental approach to investigate the effects of limitedly visible indoor plants on students' psychology, physiology, and behavior and uses a control-series design covering one semester. Two classes of sophomores at a Taiwanese junior high school (eighth grade, N = 76), of which one served as the experimental group and the other as control, were surveyed once every 2 weeks. After six plants were placed at the back of the classroom, the experimental group had immediately and significantly stronger feelings of preference, comfort, and friendliness as compared to the control group. Also, the experimental group had significantly fewer hours of sick leave and punishment records due to misbehavior than the control group. In addition to the visual and psychological mechanisms that contributed to restoration, there may have been other factors at work.

Hansen, J. M. and J. Childs (1998). "Creating a school where people like to be." Educational Leadership **56**(1): 14.

Highlights the efforts of several schools in the United States to improve the environmental condition inside their campuses to allow teachers to teach better and students to learn more. Discouraging features of schools; Characteristics of a good school; Common features of schools; Factors to consider in developing school policies; School programs in Orem High School in Orem, Utah, that requires student's participation.

Hare, A. P. and R. F. Bales (1963). "Seating Position and Small Group Interaction." Sociometry **26**(4): 480-486.

The analysis of several sets of data from five-man laboratory groups tends to support the hypothesis that both centrality of seating position and distance between members can be used to predict the interaction pattern. This pattern only appears in a "task" session. In a "social" session for the same type of group, members tend to talk more to the person next to them as they turn away from the group for a more intimate conversation. Personality variables are also related to seating choice and to interaction rate. More dominant subjects tend to choose the central seats and to do the most talking.

Harrison, S. and P. Dourish (1996). Re-place-ing space: The roles of place and space in collaborative systems. Proceedings of the 1996 ACM conference on Computer supported cooperative work, Boston, Massachusetts, United States.

Many collaborative and communicative environments use notions of “space ” and spatial organisation to facilitate and structure interaction. We argue that a focus on spatial models is misplaced. Drawing on understandings from architecture and urban design, as well as from our own research findings, we highlight the critical distinction between “space” and “place”. While designers use spatial models to support interaction, we show how it is actually a notion of “place” which frames interactive behaviour. This leads us to re-evaluate spatial systems, and discuss how “place”, rather than “space”, can support CSCW design.

Hart, P. M. (2000). Understanding organisational health. Perspectives on education, Department of Education, Victoria.

Hastings, N. and K. Wood (2002). Reorganizing Primary Classroom Learning., Open University Press, Philadelphia, PA
This book addresses the issue of classroom organization in primary education, explaining evidence that it asserts should prompt primary schools to re-think the contexts in which children are expected to concentrate and learn. New ways of arranging classrooms are illustrated through case studies of teachers who take a flexible and strategic approach to the organization of learning. These are intended to demonstrate how children's attention and behavior can benefit from creating a better match between working contexts and tasks. Suggestions and resources are provided to help teachers review how they and their children work, and to plan and evaluate ways of using their classrooms more effectively to support learning.

Hathaway, W. E. (1995). "Effects of school lighting on physical development and school performance." Journal of Educational Research **88**(4): 228.
Examines the physical development and school performance effects of different types of school lighting on elementary students. Types of artificial light sources used; Biologic and medical effects of light; Effects of supplemental ultraviolet light on development of dental caries; Effects of types of lighting on average attendance, achievement and physical development.

Hattie, J. (2003). Teachers Make a Difference: What is the research evidence? , Australian Council of Educational Research.
As has been noted in the USA in recent years, it is by such a focus on the attributes of excellent teachers that more faith is being restored in the public school system - which has taken a major bashing. The typical redress has been to devise so-called “idiot-proof” solutions where the proofing has been to restrain the idiots to tight scripts - tighter curricula specification, prescribed textbooks, bounded structures of classrooms, scripts of the teaching act, and all this underpinned by a structure of accountability. The national testing movements have been introduced to ensure teachers teach the right stuff, concentrate on the right set of processes (those to pass pencil and paper tests), and then use the best set of teaching activities to maximise this narrow form of achievement (i.e., lots of worksheets of mock multiple choice exams).

Instead, we should be asking where the major source of variance in student’s achievement lie, and concentrate on enhancing these sources of variance to truly make the difference. There have been many studies over the past few years that have asked this question about wherein lies the variance. Most have been conducted using Hierarchical Linear Modelling, which decomposes the variance of many influences such as what the student brings to the task, the curricula, the policy, the principal, the school climate, the teacher, the various teaching strategies, and the home. Ignoring the interaction effects, which are too often, minor, then the major sources of variance are six-fold.

Hay, R. (1998). "Sense of place in developmental context." Journal of Environmental Psychology **18**(1): 5-29.
Sense of place differs from place attachment by considering the social and geographical context of place bonds and the sensing of places, such as aesthetics and a feeling of dwelling. Insider status and local ancestry are important toward the development of a more rooted sense of place. Three contexts are used to examine the development of sense of place: residential status in the place (superficial, partial, personal, ancestral, and cultural senses of place); age stage, as in development across the life cycle, using a psychodynamic model (after Erikson and Vaillant); and development of the adult pair bond, most often in marriage. Being raised in the place affected feelings of rootedness, particularly for Maori peoples who have ties to tribal territory. Interactions were found among place and pair bonds, and multigenerational patterns were noted for ancestral and cultural senses of place, with sense of place styles passed from parent to child. Modern society, due especially to high levels of residential mobility, tends to develop more of a partial or personal sense of place among its members. Sequential stages in the development of a sense of place were most evident among those who were raised in the place and spent most of their lives there: embryonic (childhood to adolescent); commitment (early to mid adulthood); and culmination (mid adulthood to old age). These became apparent in phenomenological and statistical analyses of responses from 270 adult residents of Banks Peninsula, New Zealand, of both Maori and European descent. Additional interviews were conducted with 80 adult out-migrants from the Peninsula; brief surveys were also done of tourists, long-term campers, holiday home owners, and resident school children on Banks Peninsula. Models of place attachment need to be reconsidered, as does the value of developing a sense of place based more on ancestral and cultural connections. Such a sense of place is considered to be of benefit to individuals and to modern society.

Hearn, G. (1957). "Leadership and the spatial factor in small groups. ." The Journal of Abnormal and Social Psychology **54**(2): 269-

272.

The present study extends the hypothesis that "persons tend to interact more in group discussion with persons sitting opposite them than they do with their neighbors." This effect seems to be manifested most strongly in groups with no designated leader. "It will tend to disappear in groups where group direction is shared about equally by the members and the designated leader, and it will be reversed in situations where the designated leader gives very strong direction."

Hebert, E. A. (1998). "Design matters: How school environment affects children." Educational Leadership **56**(1): 69.

Highlights the effects of classroom environment to learning abilities of students. How school buildings affect the behavior of students; Architectural design of Crow Island School in Winnetka, Illinois; Effects of the Crow Island school's architectural design to its students; Features of the age-level playgrounds of the school.

Heine, C. and W. Williams (2007). "Where should my client sit? Can location help classroom listening?" ACQ: ACQuiring Knowledge in Speech, Language and Hearing **9**(2): 60-3.

Accurate speech perception in classrooms is imperative for academic learning. In many classrooms, speech perception is impeded by a poor acoustical environment. Those mostly disadvantaged by poor acoustical conditions in classrooms include young children who have neurologically immature auditory systems, children with hearing loss, (central) auditory processing disorder or whose home language differs to the language used in the classroom. Speech perception problems in classrooms are exacerbated by poor classroom acoustics due to excessive background noise, increased reverberation time and large distances between the teacher and students. Acoustic control and modifications can be made to enhance classroom listening and maximise educational access. (author abstract)

Helm, J. H., S. Turckes, et al. (2010). "A Habitat for 21st Century Learning." Educational Leadership **67**(7): 66-69.

The article discusses design and building of 21st century learning habitats, or schools, in Peoria, Illinois. These are defined by continuity of education experience and services, shared ownership and responsibility with community members and stakeholders, and round-the-clock use of resources. They include space to support families, space available to multiple groups, and physical flexibility in classrooms. Classroom clusters, called villages, each have teacher planning space, conference rooms and storage as well as flexible classroom space. Furniture is lightweight and multipurpose. Walls can be moved. Wired and wireless technology systems are integrated with wall-mounted interactive whiteboards. Integrated Learning Areas (ILAs) provide space for art, cooking and gross motor activities.

Heluish, C. (2009). Pilot Study: Qualitative Evaluation of Students' Experience of New Learning Spaces, InQbate-CETL D, Universities of Sussex and Brighton**:** 20.

Hempel, J. (2006). "Space Matters." Retrieved 3 May 2010, 2010, from http://www.businessweek.com/innovate/NussbaumOnDesign/archives/2006/07/jumps_new_space.html.

Henderson, J. M. (1999). Architecture For The Imagination Study Of An Elementary Educational Environment. , Virginia Polytechnic Institute and State University. **Master of Architecture:** 74.

This thesis seeks to create an environment that encourages the learning process by addressing issues of emotional and physical well-being. The concept implies that success in learning can be linked to the environment of an elementary school. The building does not have to teach by itself, but merely facilitate the learning process through the making of a comfortable environment. Designing an elementary school demands that the architect look at the world through the eyes of a child. If the architect considers the scale of the building, both in terms of size and perception, the school becomes an oasis of security for the child that inspires intellectual growth. By integrating environmental design issues that are traditionally ignored in contemporary schools, like natural ventilation or daylighting, the school becomes less of an institution and more like a home.

Heppell, S., C. Chapman, et al. (2004). Building learning futures: a research project at ultralab within CABE/RIBA 'Building Futures' programme. London, CABE**:** 48.

Fundamentally, the UK is not building a broad enough, or brave enough, variety of schools. It needs to. Many of the schools that are being built are unsuited to the changing future pedagogy, curriculum and learner expectations that we can already anticipate. They also lack the agility to cope with further anticipated changes that we cannot yet know in detail. This exploration requires a substantially increase research effort, but this research will not put the learners involved at risk. There is a confidence that, through engaging learners in the research design process, it will universally enrich their learning and in doing so will progress school standards. Some simple pragmatic changes could make a substantial difference to the effectiveness of the existing stock too. The increasing pace of change means that this is already a problem; this research project confirms that it will rapidly become a crisis tomorrow without immediate action in line with the project's recommendations. The recommendations do not provide a menu for choice; each is interdependent and necessary. Globally there is much good, but isolated work exploring the future shape and design of schools. A better dialogue is needed with and between these research explorations. School buildings do not exist in a vacuum. The way that teachers are developed professionally, the school curriculum, assessment and testing systems, parental engagement, expectations and entitlements all intermesh with the design of schools. No one ever said that designing exceptional learning environments was going to be easy and indeed a primary finding from the research is

that building appropriate, engaging, challenging, seductive, ambitious, effective, world class schools is highly complex. That complexity is neither well understood nor well documented; it is thus not well implemented either. Importantly, there is sufficient political commitment and creative imagination in place; that provides grounds for optimism.

Herman Miller Inc. (2009). Adaptable Spaces and Their Impact on Learning: Research Summary, Herman Miller Inc.
Research reveals the divide between what is known about the learning experience and the spaces built to support them. This has prompted exploration of new types of spaces. The goal is to understand the role of adaptable spaces in supporting the learning experience. Just as important is an examination of the impact technologies, pedagogies, and, yes, furniture has on these spaces.

Higgins, S., E. Hall, et al. (2005). The impact of school environments: a literature review, The Centre for Learning and Teaching, School of Education, Communication and Language Science, University of New Castle**:** 47.
"The science of designing learning environments is currently remarkably under-developed', argued architext and CABE Commissioner Emeritus the late Richard Feilden in 2004. In a similar vein, Professor Stephen Heppell argued at the expert seminar held to inform this literature review that 'whereas, traditionally, we have designed for productivity, processing large numbers of children through the effective use of buildings, designing a room for learning is very complex. No one knows how to prevent 'learning-loss' when you desing a room "pedagogically", whereas we know lots about designing for minimum heat loss'. The first thing that will strike you as you read this literature review is the relative paucity of research on effective learning environments. Not only is the evidence incomplete, particularly in areas such as the systems and processes and communicaiton approaches that schools need to underpin their physical environment, but the research that has been done seems to be largely predicated on a traditional view of 'chalk and talk' learning in standardised 'one size fits all' institutions.

Hill, F. (2008). Patterns for Small Learning Communities at the Elementary Level.**:** 7.
Promotes the "L" shaped classroom as a model to accommodate small learning communities within elementary schools. Suggestions for creating zones within such a classroom are included.

Hill, F. and S. Cohen (2005). School Design Impacts upon Cognitive Learning: Defining "Equal Educational Opportunity" for the New Millennium.**:** 6.
Describes some design and planning impacts on cognitive learning and student performance. The classroom design impact discussion focuses on the relationship of students to instructional media at the front of the room. Extreme viewing angle or distance from the display results in distorted or missing information. Suggestions for educationally appropriate options are included. The site design discussion involves a school with a campus built on both sides of a ravine. The distribution of the educational program across these two halves resulted in a learning gap between gifted and traditional students, which was resolved by reorganizing the campus into team teaching neighborhoods.

Hill, K. (2004). "Networked learning communities and out of school hours learning: two portraits." Forum **46**(1): 7-8.

Hill, P. (2001). Teaching and school effectiveness. Perspectives on Education, Department of Education, Victoria**:** 28.

Hill, P. W. and C. A. Crévola (1999). Key features of a whole-school, design approach to literacy teaching in schools. Improving Literacy Learning: ACER Research Conference**:** 14.

Hines, E. (1996). Building Condition and Student Achievement and Behavior. , Virginia Polytechnic Institute and State University, Blacksburg, VA. **Doctoral of Education** 154.
This study, involving selected Virginia urban high schools, examines the relationship between school facility condition and student achievement and behavior. The study determined student achievement by using the Test of Academic Proficiency for grade eleven during the 1992-93 school year; student behavior was determined by the ratio of the number of expulsions, suspensions, and violence/substance abuse incidents to the numbers of students in each school. The study's findings show that student achievement scores and disciplinary incidents are higher in schools that have better building conditions. Science achievement scores also are higher in schools that have better science laboratory conditions. Finally, the varying of climate control, locker, and graffiti conditions are factors in improving student achievement scores. Appendices contain statistics on student population and demographics, a copy of the survey used to assess a facility's physical status, documents pertaining to the study sample, and research questionnaires.

Honigsfeld, A. (2010). An interview with Cynthia Uline, Delta Kappa Gamma Society International. **76:** 32-36.
An interview with Cynthia Uline, a scholar in school environments and a faculty at San Diego State University (SDSU), is presented. She described her career path in the field of educational facility design. She also described the condition of educational facilities in the U.S., along with an outlook for educational infrastructures. When asked if environment matters, she said yes and cited the influence of the quality of school facilities to student outcomes.

Horne, M. (2004). "Breaking down the school walls." Forum **46**(1): 6.

Horne-Martin, S. (2002). "The classroom environment and its effects on the practice of teachers." Journal of Environmental Psychology **22**: 139-156.

This study concerns the design of classroom environments and the impact of these environments on the practices of teachers. It involves the data gathered from primary and secondary schools, using lesson observations and teacher interviews. Behavioural mapping instruments were developed for the school-based data collection, and subsequent analysis is both qualitative and quantitative. A number of constructs have been developed, defined and used to evaluate what happens within classrooms. Some of these constructs are physical (modes of layout), some are pedagogic (child-centred), and some involve combinations of data. The findings from the analysis of teachers' classroom behaviour have been related to the issues emerging from their interviews. This enabled examination of behaviour alongside statements of attitudes and beliefs about the role of the classroom environment. These data inform questions about teachers' awareness of their surroundings; the extent to which this awareness impacts on their teaching, and the extent to which teachers feel they have control over the features of their classrooms. The article concludes by making the case for the importance of environmental awareness in the training and retraining of teachers. Environmental competence is an important constituent of the skilled teacher.

Hoyle, J. (1977). "Organizational and spatial characteristics of urban learning environments." Journal of Educational Administration **15**(1): 124 - 132.

This study takes as its theoretical basis the models of Murray and Stern, Getzels and Thelen which hold that institutional characteristics interact in schools and determine student learning. Data obtained through observation, interview and completion of the Learning Climate Inventory (LCI) are provided by 867 teachers in 30 elementary and secondary schools. Analysis of the data revealed inter alia that (i) learning environments with 20–85 percent open instructional space contained 25–50 percent more instructional modes, student grouping patterns, team teaching and controlled student movement in the classrooms; (ii) teachers in learning environments with at least 20 percent open instructional space viewed the learning climate as significantly more open on four of five LCI factors; (iii) learning climate is generally more open in schools where student achievement is classed as high; (iv) the larger the school the more closed the learning climate tended to be; (v) teachers in schools with more frequent human relations programs perceived greater freedom to teach.

Hughes, S. (2006). The relationship between school design variables and student achievement in a large urban Texas school district. Department of Education, Baylor University, United States -- Texas. **Dissertation**.

The purpose of this study was to determine if a relationship existed between school facility design variables and student achievement as determined by the Texas Assessment of Knowledge and Skills. The Design Assessment Scale for Elementary Schools designed by Kenneth Tanner (1999a) was used to evaluate 21 schools in a large urban district. The design variables included movement patterns, large group meeting places, architectural design, daylighting and views, psychological impact of color schemes, building on student's scale, location of the school, instructional neighborhoods, outside learning areas, instructional laboratories, and environmental. The 2003-2004 Texas Assessment of Knowledge and Skill 5th grade scores on reading, math, and science were used to determine student achievement. T-tests were used to determine the relationship between design variables and student achievement within TEA designated rating categories (Exemplary, Recognized, and Academically Acceptable). An ANOVA was used to determine if a relationship existed between Texas Education Agency school categories and building design variables. The major finding of this study supports the literature. This study concluded all building design variables had a statistically significant relationship with student achievement within each school category. However, there was not a statistically significant relationship between building design variables and school ratings.

Hunley, S. and M. Schaller (2005). Assessing Learning Spaces. Learning Spaces. D. Oblinger. Boulder, Educause.

Hunley, S. and M. Schaller (2009) Spaces that promote learning. Educause Review **March/April**, 26-34

Learning spaces in higher education environments have received much attention in the last several years due to innovative architectural design,1 the movement to connect campus spaces with learning,2 and assessment technologies that allow for both qualitative and quantitative evaluation of relevant information.3 Our research has focused on the connections among learning space, learning, and pedagogical methods and on the characteristics of successful programmatic change linked to learning spaces. Beginning in the fall of 2004, we instituted a multiyear study to (1) develop a system for assessing physical learning spaces on college and university campuses; (2) explore the relationship between learning and the characteristics of learning spaces; (3) gather and examine data and information regarding satisfaction and engagement for faculty and students in learning environments; and (4) define the relationship between innovative pedagogy and learning spaces. In addition, we began work on developing a model for encouraging strategic change to match programming with expectations for learning spaces. The ultimate goal in this ongoing study is to create environments that promote learning.

Hygge, S. (2003). "Classroom experiments on the effects of different noise sources and sound levels on long-term recall and recognition in children." Applied Cognitive Psychology **17**(8): 895-914.

A total of 1358 children aged 12–14 years participated in ten noise experiments in their ordinary classrooms and were

tested for recall and recognition of a text exactly one week later. Single and combined noise sources were presented for 15 min at 66 dBA L[sub eq] (equivalent noise level). Single source presentations of aircraft and road traffic noise were also presented at 55 dBA L[sub eq] . Data were analysed between subjects since the first within-subjects analysis revealed a noise after-effect or a asymmetric transfer effect. Overall, there was a strong noise effect on recall, and a smaller, but significant effect on recognition. In the single-source studies, aircraft and road traffic noise impaired recall at both noise levels. Train noise and verbal noise did not affect recognition or recall. Some of the pairwise combinations of aircraft noise with train or road traffic, with one or the other as the dominant source, interfered with recall and recognition. Item difficulty, item position and ability did not interact with the noise effect. Arousal, distraction, perceived effort, and perceived difficulty in reading and learning did not mediate the effects on recall and recognition.

Hygge, S., G. W. Evans, et al. (2002). "A Prospective Study of Some Effects of Aircraft Noise on Cognitive Performance in Schoolchildren." Psychological Science (Wiley-Blackwell) **13**(5): 469-474.

Before the opening of the new Munich International Airport and the termination of the old airport, children near both sites were recruited into aircraft–noise groups (aircraft noise at present or pending) and control groups with no aircraft noise (closely matched for socioeconomic status). A total of 326 children (mean age 5 10.4 years) took part in three data–collection waves, one before and two after the switch–over of the airports. After the switch, long–term memory and reading were impaired in the noise group at the new airport and improved in the formerly noise–exposed group at the old airport. Short–term memory also improved in the latter group after the old airport was closed. At the new airport, speech perception was impaired in the newly noise–exposed group. Mediational analyses suggest that poorer reading was not mediated by speech perception, and that impaired recall was in part mediated by reading.

Hygge, S. and I. Knez (2001). "Effects of noise, heat and indoor lighting on cognitive performance and self-reported affect." Journal of Environmental Psychology **21**(3): 291-299.

Theoretical and practical concerns guided the design of an experiment on how ventilation noise (38 and 58 dBA), air temperature (21 and 27°C), and illuminance (300 and 1500 lx) combine or interact in their effects on cognitive performance. Self-reports of affective states were taken with an affect circumflex measure (Larsen & Diener, 1992; Knez & Hygge, in press) to study the mediation from the environmental variables over affect to cognitive performance. Arousal models (e.g., Broadbent, 1971) would predict that increased levels of noise and luminance increase activation and/or affect levels and that mild heat decreases it. The inverted U-hypothesis would further predict that intermediate levels of perceived arousal improve attention, memory and problem solving performance. A distinction was made between synergetic and antagonistic interactions in order to differentiate arousal and nonarousal mediated effects on cognitive performance. The results showed that attention worked faster in noise but at the cost of lesser accuracy, which supports the Speed-Accuracy-Trade-Off hypothesis (Hockey, 1984). Interactions were found between noise and heat on the long-term recall of a text, and between noise and light on the free recall of emotionally toned words. These effects on cognitive performance could not be explained as mediated by the affective states, and were not consistent with an arousal model and the inverted-U hypothesis.

Illinois Facilities Fund (2000). Great Spaces, Fresh Places: How-To Improve Environments for School-Age Programs.**:** 26.

Demonstrates simple but effective solutions to the common problems many out-of-school time programs face regarding facilities and other space-related issues. The guide also highlights the importance of integrating facilities and programs in a coordinated effort, and it teaches school-age care providers how to approach facilities problems and implement realistic solutions within a budget. Chapters address how to think about the relationship between facilities programs; how to makeover classrooms; and how to consider all other aspects of space, including space planning and layout, color, traffic, noise, light, and furniture. The final section includes a resource list and selected bibliography.

Indoor Air (2002). A Compilation of Papers for the Indoor Air 2002 Conference In Memory of Joan M. Daisey. Indoor Air 2002 Conference, Indoor Environment, Department Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, University of California, Berkeley, CA.

InformeDesign (2009). "InformeDesign Releases Implications on Designing Spaces for Active Learning." Interiors & Sources **16**(5): 12-12.

The article discusses a study on human behavior that investigated how space design affects teaching and learning and the consequences for student learning outcomes. The study revealed that space design affects learning and teaching and showed that students preferred more open, socially interactive environments that encourage collaboration and group formation. Instructors on the other hand, prefer smaller and traditional classrooms that gives them a sense of control.

Insight SRC (2004). Evaluation of the Implementation of the Enhanced School Review Program, Department of Education and Training**:** 53.

Interiors & Sources (2009). "InformeDesign Releases Implications on Designing Spaces for Active Learning." Interiors & Sources **16**(5): 12-12.

The article discusses a study on human behavior that investigated how space design affects teaching and learning and

the consequences for student learning outcomes. The study revealed that space design affects learning and teaching and showed that students preferred more open, socially interactive environments that encourage collaboration and group formation. Instructors on the other hand, prefer smaller and traditional classrooms that gives them a sense of control.

Jacklin, H. (2004). "Discourse, interaction and spatial rhythms: locating pedagogic practice in a material world." Pedagogy, Culture & Society **12**(3): 373 - 398.

This article draws on Lefebvre's rhythmanalysis to interrogate and extend Bernstein's theory of pedagogic framing. It develops a typology of modes of pedagogic practice differentiated in terms of the dominance of one of three potential organising referents. These are (a) the grammar of the instructional discourse configured by a regulative discourse, (b) conventions or models of practice circulated within, or generated through participation in, a practice community, and (c) habituated coordinations of contextual time/space and technology use as practice rhythms. The typology constitutes an analytic frame for classroom observation data drawn from a study conducted in two schools. On a theoretical level, the study concludes that pedagogy is a hybrid practice involving a variable and contingent relationship between its three organising referents: discourse, conventions or models within a practice community, and space/time technology practices.

Jamieson, P., K. Fisher, et al. (2000). "Place and Space in the Design of New Learning Environments." Higher Education Research & Development **19**(2): 221 - 236.

The development of online and virtual teaching and learning environments to augment formal face-to-face environments raises questions about the way the new communication and information technologies (CITs) are being incorporated into the on-campus environment. More importantly, this development challenges the meaning of the on-campus student learning experience. The new CITs require institutions, teachers and researchers to reconsider the relationship of the physical setting to the student learning experience. This paper highlights examples of recent developments of new learning environments which have been enhanced by the contribution of educational developers at several Australian universities. It also proposes a set of pedagogically informed principles to guide the development of on-campus teaching and learning environments which may feature the use of CITs.

Jarman, D., L. Webb, et al. (2004). A beautiful school is a caring school. School business affairs. **June**.

Jeffrey, B. (2006). "Creative teaching and learning: towards a common discourse and practice." Cambridge Journal of Education **36**(3): 399-414.

There has recently been a call for more pedagogic comparative research to counter the dominance of structural and policy led studies. At the same time there is also a necessity to provide alternative comparative research to that concerned with global standardizing performance and performativity strategies. The research, on which this paper is based, fulfils both these aims by investigating creative teaching and learning in nine European countries at classroom level using ethnographic methods in a small number of sites for each partner. The research partners share a common discourse of pedagogy that we are calling creative teaching and learning, a common humanitarian discourse and the ethnographic methodology for the research was a strong framework to counter differing cultural approaches to research. The article analytically characterizes some significant strategies used by teachers, the creative learning experienced and the meaning that the experiences had for the students involved. We conclude that this research has laid the basis for a common discourse for further research in a comparative approach that will investigate commonalities to build an understanding of international creative pedagogy and investigate differences to enhance the conceptualization of it.

Jenkins, J. M. and J. W. Keefe (2001). "Strategies for Personalizing Instruction: A Typology for Improving Teaching and Learning." NASSP Bulletin **85**(629): 72-82.

It is often difficult to classify instructional approaches. To best serve the diverse needs of today's students, a personalized instruction approach is suggested. Nine representative strategies for personalizing instruction are discussed in relation to their interaction level and thoughtfulness level.

Jensen, G. E. (1955). "The social structure of the classroom group; an observational framework." Journal of Educational Psychology **46**(6): 362-374.

Describes a seven-dimensional framework that can be used to analyze productivity and cohesiveness in the classroom. These dimensions represent the different kinds of relationship that members of a classroom group need to establish among themselves. They enable the teacher to identify those problems induced by the social structure of the classroom group. (PsycINFO Database Record (c) 2006 APA, all rights reserved)

Jewitt, C. (2005). "Classrooms and the Design of Pedagogic Discourse: A Multimodal Approach." Culture Psychology **11**(3): 309-320.

This paper offers a social semiotic analysis of the school classroom, in this case the subject English classroom, as a material instantiation of pedagogic discourse. The classroom is looked at as a multimodal sign: the semiotic residue' or sediment' of discursive practices over time. In particular it discusses how visual displays and spatial design in the English

classroom can be thought of as signs of school English. From this perspective a teacher's classroom can be understood as a sign of how she or he mediates official' government and school discourse. Drawing on three illustrative examples of English classrooms from three different schools, the paper argues that the variation between these classrooms can be understood in part as a consequence of the complex web of social relations that mediate and institutionally frame pedagogy.

JISC (2006) Designing Spaces for Effective Learning.

Designing Spaces for Effective Learning was launched at the JISC Conference 2006. A visually-rich publication, it is designed to promote better understanding of what makes an effective design for the 21st century and to summarise the key points to consider when approaching a refurbishment or new-build project.

This publication takes the reader on a 'walk through' of an educational institution, exploring the relationship between learning technologies and innovative examples of physical space design at each stage of the journey. Discussion of the key points is illustrated by 10 case studies from further and higher education, and floor plans from AMA Alexi Marmot Associates, architects and space planners, which provide up-to-date guidelines on the integration of technologies into teaching and learning accommodation.

JISC (2009) Learning Landscapes and Critical Pedagogy – Space as Social Science. Innovating e-Learning 5

Johnson, C. (2005). Sustaining and Supporting Learning Spaces. Learning Spaces. D. Oblinger. Boulder, Educause.

Johnson, C. and C. Lomas (2005). "Design of the learning space." Educause Review **40**(4): 16-28.

Kanea, P. J., M. Pilcherb, et al. (2006). Development of a furniture system to match student needs in New Zealand schools, International Ergonomic Association**:** 6.

Kaplan, S. and R. Kaplan (1982). Cognition and environment: Functioning in an uncertain world. New York, Praeger.

If we are stepping out of windows, what are we stepping into? We suggest it is into cooperative buildings. For the foreseeable future, at least, we can identify two major characteristics of the cooperative building. The spaces of the building will be augmented in various ways, providing an ambient environment that bridges spatial discontinuities in workgroups and provides a continuous window into the state of the virtual world. Secondly, the ways in which the spaces themselves are used will evolve to be more congruent with the fluid, dynamic and distributed nature of the work taking place in the building. These two characteristics are deeply interconnected. This evolution need not happen entirely in the physical world; the essence of a cooperative building will become the way in which it mixes both physical and virtual affordances to support the workaday activities of its inhabitants. 1.

Kaplan, S. and R. Kaplan (2009). "Creating a larger role for environmental psychology: The Reasonable Person Model as an integrative framework." Journal of Environmental Psychology **29**(3): 329-339.

We argue that the environment, broadly construed, has a profound effect on human cognition, action, and well-being. If this is true, then the field of environmental psychology has a far larger potential to aid humanity than is generally realized. We suggest that the field would be more likely to achieve this potential if it viewed environments from the perspective of human informational needs, and focused on environmental/informational patterns that have the potential to make it easier for people to help themselves. Further, achieving such benefits could be greatly enhanced by taking advantage of the many opportunities available for collaborating with researchers in other areas of psychology. The reasonable person model is offered as a perspective that could facilitate moving in these various new directions while taking advantage of the considerable existent knowledge about human-environment interactions that is currently underappreciated.

Karlsson, J. (2004). "An uneasy future: spatial changes at one school in South Africa." Forum **46**(1): 9-12.

Katchen, M., A. LaPierre, et al. (2001). "Evaluating Potential Health Risks in Relocatable Classrooms." Journal of School Health **71**(4): 159-161.

Only limited data exist describing potential exposures to chemical and biological agents when using portable classrooms or outlining how to assess and reduce associated health risks. Evaluating indoor air quality involves examining ventilating rates, volatile organic compounds, and microbiologicals. Open communication among key stakeholders is essential. Guidelines for successful health evaluation in relocatable classrooms are presented.

Kaya, N. and B. Burgess (2007). "Territoriality: Seat Preferences in Different Types of Classroom Arrangements." Environment and behavior **39**(6): 859-876.

Students' degree of territoriality based on gender and seat preferences in different types of classroom arrangements was studied. The types of classroom arrangements included rows of tablet-arm chairs, U-shaped, clusters, and rows of tables with individual chairs. The study was carried out through a survey at a large public institution in the southeast region of the United States. Results indicate that students who preferred seats at the end of rows of tables with

individual chairs and tablet-arm chair arrangements had higher scores on claiming a particular seat than those who preferred middle seats in a row. In the rows of tables with individual chair arrangement, students who preferred seats at the end of rows also had more need to define their own territory than students who preferred middle seats in a row. No significant results were found in the U-shaped and cluster layouts. Females had higher scores on claiming a particular seat than males regardless of seating arrangement.

Keating, J. and S. Lamb (2004). Public education and the Australian community. Education Symposium, The case for change in Australian schooling arrangements: A way forward**:** 67.

Keating, S. and R. Gabb (2005). Putting learning into the learning commons: A literature review, Postcompulsory Education Centre, Victoria University.

Keep, G. (2002). "Buildings that teach." *The Educational Facilities Planner* **37**(2).

Kelly, F. S. (2005). "The relevance of project-based instruction." Education Facility Planner **40**(3&4): 19-23.
Project-based instruction teaches students the process of solving problems. While educators may not always find architects convincing evidence for the merits of project-based instruction, the nature of our work explains the approach and its relevance for students in the 21st century.

Kennedy, M. (2000). "Protection for portables." American School & University **72**(9): C17.
Discusses the security issues and measures associated with the use of portable classrooms in campuses in the United States. Benefits of portable classrooms for school districts; Selection of a location for the portable classroom; Security promotion techniques used in portable classrooms.

Kephart, N. C. and W. Floyd (1954). "Classroom environment and pupil welfare." Journal of Educational Psychology **45**(1): 52-59.
Pupils in two classrooms which had been re-painted and refurnished according to the room design of the "coordinated classroom" recommended by Harman were compared with pupils in classrooms refinished with traditional coloring, furnishings and arrangement. Those who spent the school year in the experimental environment were found to be superior in achievement quotient and to show a slightly greater reduction in extraneous body movements or nervous habits. Head-tilt, which was taken as a sign of posture, was present in fewer of the children in the experimental group.

Khedari, J., B. Boonsri, et al. (2000). "Ventilation impact of a solar chimney on indoor temperature fluctuation and air change in a school building." Energy and Buildings **32**(1): 89-93.
The aim of this research was to investigate, experimentally, both the feasibility of a solar chimney to reduce heat gain in a house by inducing natural ventilation and the effect of openings (door, window and inlet of solar chimney) on the ventilation rate. The study was conducted using a single-room school house of approximately 25 m3 volume. The southern wall was composed of three different solar chimney configurations of 2 m2 each, whereas, the roof southern side included two similar units of 1.5 m2 each of another solar chimney configuration. Those configurations were built by using common construction materials. Experimental observations indicated that when the solar chimney ventilation system was in use, room temperature was near that of the ambient air, indicating a good ability of the solar chimney to reduce house's heat gain and ensuring thermal comfort. The air change rate varied between 8-15. Opening the window and door is less efficient than using solar chimneys, as temperature difference between room and ambient was higher than that obtained with solar chimneys.

Killeen, J. P., G. W. Evans, et al. (2003). "The Role Of Permanent Student Artwork In Students' Sense Of Ownership In An Elementary School." Environment and behavior **35**(2): 250-263.
The objective of this study is to determine if the physical design of learning environments can foster a sense of student ownership in the learning process. Accommodation of permanent student artwork to school interior spaces may enhance student ownership. Sense of ownership incorporates personalization, sense of control, territoriality, and involvement. The authors uncover a significant association between school design and students' sense of ownership. Furthermore, within a school incorporating permanent artwork, the stronger students' perceptions are that their artwork can be permanently displayed, the greater their sense of ownership is.

Kintsch, W. and E. Bates (1977). "Recognition memory for statements from a classroom lecture." Journal of Experimental Psychology: Human Learning and Memory **3**(2): 150-159.
Research on memory for classroom lectures provides an interesting means for testing psychological theories of memory in a natural setting. Two experiments with 101 undergraduates were performed on recognition memory for statements in a lecture, varying the instructions and the response format. Three types of statements were tested: topic statements, details, and such extraneous remarks as jokes and announcements. In both studies, memory for meaning was significant in all 3 categories. With a 2-day delay, there was still verbatim memory for all 3 types of statements; with a 5-day delay, verbatim memory was greatly reduced. In both studies, extraneous remarks were remembered best. Contrary to predictions, there were no differences in memory for topics vs details. Results are discussed in terms of macrostructures in text memory.

Kitchens, J. (2009). "Situated Pedagogy and the Situationist International: Countering a Pedagogy of Placelessness." Educational Studies: A Journal of the American Educational Studies Association **45**(3): 240-261.

Among the avant-garde organizations in Europe during the middle of the twentieth century, a few of them combined in 1957 to form the Situationist International (SI). This article locates relevant aspects of their theory in the increasingly visible constellation of Critical Geography and educational scholarship, both in the foundations of education and curriculum theory. After a brief introduction to the SI, a situated pedagogy is presented in past and present educational literature and is complemented with various theoretical constructs of the SI. These considerations are presented to address and, perhaps, remedy a pedagogy of placelessness that appears to be prevalent in public schools today. A situated pedagogy connects the curriculum to the everyday lives of students and is interested in identity and self-formation, but also social-formation and the relationships between the two, and asks students to pay attention to their environment, and listening to what places have to tell us. It also asks students to read the world and to decode it politically, socially, historically, and aesthetically. A situated pedagogy attends to place, not only as the focus of student inquiry or academic study, but as the spaces for performative action, intervention, and perhaps transformation. As such, education moves beyond schools to their communities as students participate in remapping their material and curricular landscapes.

Kitsantas, A., H. W. Ware, et al. (2004). "Students' Perceptions of School Safety:: Effects by Community, School Environment, and Substance Use Variables." The Journal of Early Adolescence **24**(4): 412-430.

An important element of the context in which children are educated is the safety in their schools. The purpose of the present study was to examine the relationships among student perceptions of community safety, school environment, substance use, and school safety with a total of 3,092 sixth, seventh, and eighth graders. Data were used from the School Safety and Discipline component of the National Household Education Survey. Path analyses provided evidence that the strongest predictors of student perceptions of safety and substance use in school were perceived safety in the school relative to their neighborhood, community safety, and school climate. We also found that actions taken by the school to enhance school safety were the weakest predictor of student perceptions of school safety and substance use. These findings offer implications for the initiatives to be taken by schools and the community to improve school safety.

Kluth, P. and D. Straut (2003). "Do as We Say and as We Do: Teaching and Modeling Collaborative Practice in the University Classroom." Journal of Teacher Education **54**(3): 228-240.

Researchers contend that to be effective in collaborative work, teachers need opportunities to practice and learn about shared decision making, communication, and planning. For this reason and countless others, teacher-preparation programs have recently been called on to include models of collaboration in their programs. This article provides a description of one collaborative partnership between a special education professor and a general education professor. Our program description specifically highlights the integration of two college courses: Academic Curricular Adaptations and Elementary Social Studies Methods and Curriculum. In this article, we have included details about our coteaching model as well as information related to our integrated curriculum and assessments. We also offer recommendations for those considering the implementation of coteaching partnerships and collaborative models in higher education institutions.

Knapp, E. (2007). School building in developing countries: is quantity the only relevant dimension of the problem. School building design and learning performance with a focus on schools in developing countries: proceedings of the 12th Architecture and Behaviour Colloquium, Lausanne, Switzerland.

It is necessary to focus more closely on the relevance of the topic under discussion for developing countries and for the respective decision-makers. This would, obviously, also include the multitude of donors who annually invest huge sums of money in the educational sector worldwide. It is not least in this context that an understanding of the full role of educational architecture can impact strongly ont he way in which donor-funds are spent and on the efficiency achieved in aid-programmes funded by international donors.

Knez, I. and C. Kers (2000). "Effects of Indoor Lighting, Gender, and Age on Mood and Cognitive Performance." Environment and behavior **32**(6): 817-831.

The impact of indoor lighting, gender, and age on mood and cognitive performance was examined in a between-subject experiment. It was hypothesized that indoor lighting is an affective source that may convey emotional meanings differentiated by gender, age, or both. A two-way interaction between type of lamp and age on negative mood showed that younger adults (about 23 years old) best preserved a negative mood in the "warm" (more reddish) white lighting while working with a battery of cognitive tasks for 90 minutes; for the older adults (about 65 years old), "cool" (more bluish) white lighting accounted for the identical effect. The younger females were shown to preserve the positive mood as well as the negative mood better than the younger males, and a main effect of age in all cognitive tasks revealed the superiority of younger to older adults in cognitive performance.

Kolb, A. Y. and D. A. Kolb (2005). "Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education." Academy of Management Learning & Education **4**(2): 193-212.

Drawing on the foundational theories of John Dewey and Kurt Lewin, we examine recent developments in theory and

research on experiential learning and explore how this work can enhance experiential learning in higher education. We introduce the concept of learning space as a framework for understanding the interface between student learning styles and the institutional learning environment. We illustrate the use of the learning space framework in three case studies of longitudinal institutional development. Finally, we present principles for the enhancement of experiential learning in higher education and suggest how experiential learning can be applied throughout the educational environment by institutional development programs, including longitudinal outcome assessment, curriculum development, student development, and faculty development.

Koneya, M. (1976). "Location and Interaction in Row-and-Column Seating Arrangements." Environment and behavior **8**(2): 265-282.

The verbal behavior, physical locations, and seat preferences of members of large groups assembled in row-and-column seating arrangements were investigated. In several trials of the experiment subjects had been categorized a priori as "high," "moderate," or "low" in respect to verbalization rates and then were randomly assigned to seats without regard for these rates. Subsequent research procedures revealed that location significantly affected the verbalization rates of the "highs" and the "moderates." Centrally located seats were associated with significantly higher verbalization rates on the part of their occupants than were noncentrally located seats. These findings confirmed the observations of previous investigators that there is an "ecology of participation" in classrooms which may make it possible to predict from which locations most verbalizations would emanate. Through the administration of a projective procedure it was also revealed that "high" verbalizers chose central seats to a greater degree and extent than did "low" verbalizers. The seat preferences of "high" and "moderate" verbalizers also differed significantly; "high" verbalizers preferred central seats to a greater extent than did "moderate" verbalizers. Some aspects of coping theory were offered as a possible explanation of this behavior.

Koshland, E. (2005). Launch of equity, excellence and effectiveness: Moving forward in schooling arrangements in Australia, Education Foundation**:** 5.

Koth, C. W., C. P. Bradshaw, et al. (2008). "A Multilevel Study of Predictors of Student Perceptions of School Climate: The Effect of Classroom-Level Factors." Journal of Educational Psychology **100**(1): 96-104.

A positive school climate is an important component of successful and effective schools and thus is often an aim of schoolwide initiatives. Climate has traditionally been conceptualized as a school-level factor and is often assumed to be related to other school-level factors (e.g., school size). The current study examines variation in perceptions of climate based on individual-, classroom-, and school-level factors to determine the influence of predictors at multiple levels. Data come from 2,468 5th graders from 37 public elementary schools. Two aspects of students' perception of school climate, order and discipline, and achievement motivation are examined. Multilevel analyses in hierarchical linear modeling indicate that individual-level factors (race and sex) accounted for the largest proportion of variance in perceptions of school climate. School-level factors (e.g., school size and faculty turnover) and several classroom-level factors (e.g., characteristics of the teacher, class size, and the concentration of students with behavior problems) were also significant predictors of perceptions of climate. These findings suggest that characteristics of the classroom environment are important to consider when aiming to improve school climate.

Krawitz, K. (1987). Effects of portable, temporary, and permanent classrooms on student achievement and teacher morale at the second-, fourth-, and sixth-grade level. Department of Education. **University of Kansas, Lawrence, KS**.

The purpose of this study was to determine the effects of portable, temporary, and permanent classrooms facilities upon student achievement and teacher morale. A research design was developed to test five major hypotheses. One was that there would be no significant differences in student achievement as measured by the Iowa Tests of Basic Skills among 4th- and 6th-grade students housed in portable classrooms and those occupying permanent classrooms. A second hypothesis stated that there would be no difference in student achievement as measured by the Kansas Minimum Competency Tests among 2nd-grade students housed in temporary classrooms and those occupying permanent classrooms. The other three hypotheses state that there would be no significant difference in teacher morale between teachers who occupied portable, or temporary, or permanent classrooms as measured by the Purdue Teacher Opinionnaire. Student achievement data were obtained from a random sample of 40 elementary students from each of the three grade levels (2nd, 4th, and 6th) housed in each of the three environmental settings. Teacher morale data were collected from a stratified random sampling of 20 teachers occupying portable and temporary classrooms and 40 teachers housed in permanent classroom settings. An analysis of variance (ANOVA) of the data relative to student achievement disclosed that there was no significant difference concerning the superiority or inferiority of portable or temporary classrooms as opposed to permanent classrooms. In a similar manner, an analysis of variance relative to teacher morale indicated that there were no differences in the morale of teachers housed in either portable, temporary, or permanent classrooms. The conclusion was reached that while there were differences in design, structure, and utilization of the three environmental settings (portable, temporary, permanent), there were no differences in student achievement and teacher morale. The immediate implications of the findings is that the environment overall seems to have little effect on learning or teachers. Further investigations, however, to ascertain the preferences of teachers for given types of classroom environments were recommended. Also proposed was a series of conferences to establish a dialogue between the producers of modular educational facilities and the makers of

instructional systems.

Küller, R. and C. Lindsten (1992). "Health and behavior of children in classrooms with and without windows." Journal of Environmental Psychology **12**(4): 305-317.

The aims of the study were to assess the effects of light on the production of stress hormones, classroom performance, body growth, and sick leave, of school children. About 90 children were investigated in their school environment for a duration of one school year. The children were situated in four classrooms differing in respect to the access to natural daylight and artificial fluorescent light. The results indicated the existence of a systematic seasonal variation with more stress hormones in summer than in winter. The children situated in the one classroom lacking both natural daylight and fluorescent daylight tubes demonstrated a marked deviation from this pattern. High levels of morning cortisol were associated with sociability, while moderate or low levels seemed to promote individual concentration. Annual body growth was smallest for the children with the highest levels of morning cortisol. Possibly, the production of cortisol had some influence on sick leave. It may be concluded, that windowless classrooms should be avoided for permanent use.

Kumar, R., P. M. O'Malley, et al. (2008). "Association Between Physical Environment of Secondary Schools and Student Problem Behavior: A National Study, 2000-2003." Environment and behavior **40**(4): 455-486.

This article examines various aspects of school physical characteristics relating to problem behavior among students. We hypothesize that an attractive physical environment will be associated with less truancy, cigarette, alcohol, and marijuana use, whereas a negative physical environment will be associated with higher levels of these behaviors. Analyses use data from nationally representative samples of 8th-, 10th-, and 12th-grade students who participated in annual surveys conducted by the Monitoring the Future project from 2000 to 2003. Analyses also use data collected from principals and field interviewers of the same schools. Results based on multilevel logistic and linear regressions indicate that students are sensitive to schools' ambience and that the association of various aspects of the school's physical environment with students' problem behaviors is greater for 10th-grade students than for 8th and 12th-grade students. The implications of these findings for school policies and practices are discussed.

Kunter, M., J. Baumert, et al. (2007). "Effective classroom management and the development of subject-related interest." Learning and Instruction **17**(5): 494-509.

This article examines the effect of classroom management strategies on students' interest development in secondary school mathematics classes. Two studies using student questionnaire data (one cross-sectional, with data from 400 students; the other longitudinal, with 1900 students) are reported. Results show that students' perceptions of rule clarity and teacher monitoring are positively related to their interest. Hierarchical linear modeling was used to examine the effect of classroom management on interest development over one school year, revealing that only individually perceived classroom management strategies and none of the class-level teaching characteristics (aggregated student data) affected interest development.

Lackney, J. (1999). Assessing school facilities for learning/assessing the impact of the physical environment on the educational process, Mississippi State, Mississippi: Educational Design Institute**:** 36.

A brief narrative description of the journal article, document, or resource. This presentation explores a theoretical framework and a practical procedure for assessing an urban school physical environment to identify its perceived impacts on the educational process, and reviews and critiques assessment models identified in the literature for assessing the quality of the physical environment. The Baltimore City Public Schools Environment Quality Assessment Project, which included five post-occupancy evaluations, is used to illustrate the potential use of the assessment procedure in practice. Project outcomes highlighted include student academic performance, student social development, and teacher instructional performance. Concluding comments emphasize the value of institutionalizing an on-going process of environmental quality assessment that has implications for integrating facilities management and educational decisions for the benefit of the educational process. The Powerpoint presentation is included.

Lackney, J. (1999). A history of the studio-based learning model**:** 5.

Studio-based instruction and learning has become a hot topic in K-12 education today. Knowing the origins of studio-based learning in education, as well as in art and architectural education can provide us with a deeper understanding of the purposes and goals of studio-based methods. Much can be gained by educators taking a second look at previous education system models developed prior to the turn of the century for guidance in translating the new popular studio-based learning model developed in architectural education.

Lackney, J. (2001). Classrooms of the Future: Thinking Out of the Box.**:** 18.

This presentation on educational facilities design emphasizes the overarching strategy of observing the activities of learning that take place in and out of the classroom setting, and the importance of taking a fresh look at what children do in school so that new ways can be found of approaching school design. The presentation addresses these questions: (1) Where is educational practice headed? In other words, what is or are the emergent paradigms of education that should be designed for? (2) How has the classroom changed over time to accommodate educational change? (3) What strategies can be used to start anticipating educational change? and (4) What are the big trends in school planning that designers should be aware of? The presentation also contains 14 school design case studies illustrating examples of

"out-of-the-box" responses to 21st-century educational change.

Lackney, J. (2003). 33 principles of educational design. Wisconsin**:** 14.

Lackney, J. (2010). "12 Design Principles Based on Brain-based Learning Research." Retrieved 6 May 2010, from http://www.designshare.com/Research/BrainBasedLearn98.htm.

Lackney, J. and P. Jacobs (2002). Teachers as Placemakers: Investigating Teachers' Use of the Physical Learning Environment in Instructional Design.**:** 9.

This paper summarizes research conducted to assess how and to what extent teachers actively use and manipulate the physical classroom learning environment as part of their instructional design. A structured interview and participant observation were used to gather data from several teachers at all grade levels, including national board certified teachers. Preliminary findings include the design principles used by various teachers, which indicate that rather than receiving education on research-based design principles during their formal education, teachers have relied on trial-and-error methods.

Lackney, J. and J. PJ (2002). Teachers as Placemakers: Investigating Teachers' Use of the Physical Learning Environment in Instructional Design, US Department of Education, Educational Resources Information Centre. **(ERIC) ED463645**.

Lang, D. (2002). Teacher Interactions within the Physical Environment: How Teachers Alter Their Space and/or Routines Because of Classroom Character., University of Washington, Seattle**:** 101.

Through questionnaires, observations, and interviews, this study revealed the degree to which 31 high school teachers altered their classroom spaces and/or adjusted their routines to meet their pedagogical goals at a temporary school site. Teachers emphatically desired: (1) an appropriate amount of space to rearrange student furniture, enabling them better interaction with students for planned activities; (2) an ability to control the location and amount of lighting during those activities; and (3) access to adequate computing tools for their students. The ability to control noise, temperature, and ventilation was also important. Teachers' mediation of classroom spaces appeared to be closely associated with individual teaching goals rather than physiological responses to the environment, although there was evidence of the importance of accommodating teachers' perceptions of their own physical wellbeing. The study also disclosed a noticeable social-cultural need for meeting places within the school for teacher peer interactions and equally negative responses to sharing teaching spaces with those with dissimilar tastes and goal aspirations. Four appendixes include consent forms and approval letters; questionnaire, observation form, and interview questions; data results; and classroom physical measurements.

Lang, D. (2003). Volume, Scale, and Shape.**:** 4.

The terms volume, scale, and shape help to define a classroom space. This article discusses how children perceive space and how room volume or size may affect the process of learning based on the number of students and their activities. If furniture and classroom elements are thoughtfully considered for a child's scale, a more positive learning attitude can result. Room shapes, such as the L-shaped classroom or ones with alcoves, can also affect a child's learning process.

Langer, K. (2005). "Innovative financing for new green school projects." Education Facility Planner **40**(3&4): 9-13.

This paper describes how future (projected) energy savings associated with new green schools can be guaranteed by an energy service company (ESCo). This guarantee can be sued to trigger commercial financing to cover the incremental capital costs associated with the design and construction of the school project. The paper also presents various grant mechanisms that can be used to buy down the incremental capital cost of new green school projects.

Latham, P. (2002). Teaching and learning primary mathematics: the impact of interactive whiteboards, North Islington Education Action Zone RM Easiteach Mathematics Project.

Summary - The North Islington Education Action Zone (NIEAZ) RM Easiteach Mathematics Project began in 2000. In the spring term of 2002 the project was evaluated to examine the impact of interactive whiteboards as a resource for teaching and learning in Years 6 and 7. The focus of the evaluation was i) to identify the impact of the NIEAZ RM Easiteach Mathematics Project on the quality of teaching and learning for all pupils involved ii) to measure how effective the project's training and support programme was in preparing teachers who use RM Easiteach to provide appropriate, high-quality teaching and in developing their practice This report is based on five lesson observations made using NIEAZ Lesson Observation Criteria (appendix i) and two training session observations; interviews with six teachers; and questionnaire responses from seven teachers (the results of which appear in appendices ii and iii), all of whom were involved in the first year of the project, 2000–2001 (except one teacher from the second year of the project), and fourteen children from their classes (appendix iv). Interviews were also carried out with the Numeracy Project Leader. Use of interactive whiteboards as a resource was seen to be effective in the following ways: providing potential for all pupils to be actively involved in teaching; learning; providing potential for teachers to structure and manage interactive teaching and learning, with improved levels of concentration and fewer distractions Observation showed that for the potential of the interactive whiteboard to be fulfilled, teachers needed to have: confidence in using the resource and familiarity with its practical potential; good knowledge of the mathematics curriculum; secure

understanding of the key principles and rationale of interactive teaching; appropriately high expectations of pupils' abilities and their capacity to learn independently

Lau, S. and Y. Nie (2008). "Interplay Between Personal Goals and Classroom Goal Structures in Predicting Student Outcomes: A Multilevel Analysis of Person-Context Interactions." Journal of Educational Psychology **100**(1): 15-29.

This study examined cross-level interactions between personal goals and classroom goal structures, as well as their additive contributions to predicting math achievement, engagement, interest, effort withdrawal, and avoidance coping, using a sample of 3,943 Grade 5 students from 130 classrooms. Results of hierarchical linear modeling showed that classroom performance goal structures exacerbated (a) the negative association between personal performance-avoidance goals and engagement and (b) the positive relations of personal performance-avoidance goals to effort withdrawal and avoidance coping. Moreover, both classroom performance goal structures and personal performance-avoidance goals had maladaptive patterns of relations to outcomes at their respective levels of analysis, whereas classroom mastery goal structures and personal mastery goals showed adaptive relations. Our findings underscore the importance of a multilevel interactionist perspective in understanding achievement motivation and making recommendations for educational practices.

Leaf, J. B., W. H. Dotson, et al. "The effectiveness of a group teaching interaction procedure for teaching social skills to young children with a pervasive developmental disorder." Research in Autism Spectrum Disorders **4**(2): 186-198.

Deficits in social skills are characteristic of children with autism. Clinicians often include teaching these skills as part of comprehensive curriculum. One method of developing social skills for children with autism is the teaching interaction procedure. This procedure involves describing the behavior, providing a rational and cues when to use the behavior, dividing the skill into smaller steps, demonstrating the behavior, having the learner role play the behavior, and providing feedback. This study implemented a teaching interaction procedure as part of group social-skills instruction for five children diagnosed with an autism spectrum disorder. A multiple-probe design across behaviors and replicated across participants was used. All five participants acquired the social skills taught to them and generalization was promoted.

Leamann, A. and B. Bordass (2000). Productivity in buildings: the "Killer" variables. Creating the Productive Workplace D. Clements-Croome, London E and FN Spon.

Leander, K., N. Phillips, et al. (2010). "The Changing Social Spaces of Learning: Mapping New Mobilities." Review of Research in Education **34**: 329-394.

Lee, N., J. Dixon, et al. (2008). A comprehensive learning space evaluation model. Priority Projects, Swinburne University of Technology**:** 15.

Lee, T. (2007). "Transforming learning spaces to personalise learning." Retrieved 27/5/2010, from http://www.futurelab.org.uk/resources/publications-reports-articles/web-articles/Web-Article262.

Lefebvre, H. (1991). The production of space. Oxford, OX, UK ; Cambridge, Mass., USA, Blackwell.

Legendre, A. (1999). "Interindividual Relationships in Groups of Young Children and Susceptibility to an Environmental Constraint." Environment and behavior **31**(4): 463-486.

It was investigated whether the behavioral reactions of young children to modifications of the playroom arrangement were modulated as a function of their relationships with peers. Interpersonal relationships between 21-month-old and 36-month-old children were observed in three groups. Hierarchical cluster analysis led to seven types of dyadic relationships among peers. In each group, the arrangement of the furniture was modified to compare visually open to visually restricted playroom arrangements. The type of arrangement did not change the joint use of play areas and the social interactions for the peers whose relationships were weak. In contrast, for children showing an emerging relationship, the playroom arrangement affected the quantity and the quality of their social interactions. The presence of major visual obstacles also markedly hindered their joint use of adult-distant areas, except for some children showing a particularly tight relationship. Results are discussed with regard to the development of relationships among young children.

Leithwood, K. and B. B (2008). Leading with teacher emotions in mind. Thousand Oaks, CA Corwin Press.

Lemasters, L. (1997). A synthesis of studies pertaining to facilities, student achievement, and student behavior, Blacksburg, Virginia Polytechnic and State University. **Doctor of Education**.

Leonard, R. (2007). "Spaces for learning [Urges architects to embrace the new education pedagogies and to use the physical environment as a major reform element.]." Architecture Australia **96**(5): 59-60,62-64,66.

Leslie, E., P. Sparling, et al. (2001). " University campus settings and the promotion of physical activity in young adults: lessons

from research in Australia and the USA." Health Education **101**(3): 116-125.

Describes the decreasing prevalence of physical activity participation over the young adult years and the patterns of difference in the physical activity habits of young men and young women. Physical activity habits during the young adult years are likely to be important influences on habitual physical activity during overall adult life and, consequently, have significant implications for long-term health outcomes. Tertiary-education campuses are settings where there exist important yet partially neglected opportunities to influence the physical activity habits of young adults. Uses examples from Australia and the USA are used to characterise relevant contextual and practical aspects of the campus setting and the physical activity promotion opportunities that it may provide. Reviews findings from two campus-based physical activity intervention studies. In conclusion, identifies a set of issues that require further research.

Leung, S. and B. McPherson (2006). "Classrooms for children with developmental disabilities: sound- field and public address amplification systems compared." International Journal of Disability, Development and Education **53**(3): 287-99.

Background noise poses adverse effects on speech sounds and affects student learning, especially for children with developmental disabilities. Sound-field and public address amplification systems can help to solve this problem by amplifying speech sounds relative to background noise. This study surveyed school classrooms for children with special needs, and compared the performance of a sound-field and a portable public address system in classroom environments. Unoccupied room noise levels and reverberation times were measured in eight classrooms at four Hong Kong schools for children with special needs. Speech levels in each classroom were measured under three conditions: without amplification, with public address system amplification, and with sound-field amplification. Speech-to-noise ratios were calculated for each condition. Noise and unamplified speech-to-noise ratio values exceeded recommended acoustic standards in all classrooms. When sound- field and public address amplification systems were installed, speech- to-noise ratios improved considerably. When either amplification system was used, a uniform sound-field resulted. The applicability of both types of amplification system and their relative merits in special education classrooms are discussed.

Lightburn, M. E. and B. J. Fraser (2007). "Classroom environment and student outcomes among students using anthropometry activities in high-school science." Research in Science & Technological Education **25**(2): 153-166.

The main purpose of this research was to evaluate the use of anthropometric activities among a sample of 761 high-school biology students in terms of student outcomes (achievement and attitudes) and classroom environment (assessed with the Science Laboratory Environment Inventory, SLEI). Data analyses supported the SLEI's factorial validity, internal consistency reliability and ability to differentiate between classrooms. The efficacy of using anthropometric activities was supported by pretest-posttest differences in achievement, as well as by a comparison with a control group's attitudes and perceptions of classroom learning environment. Overall, results provide a degree of support for the positive influence of using anthropometric activities in terms of students' attitudes and the classroom learning environment.

Lim, M. and A. C. Barton "Exploring insideness in urban children's sense of place." Journal of Environmental Psychology **In Press, Corrected Proof**.

This study, informed by phenomenology and ethnography, explores urban children's relationship with their urban environment: In what ways do urban children exhibit "insideness" in their sense of place? This study proposes "insideness" as a conceptual construct to understand urban children's sense of place in its ecological and dynamic nature. Employing qualitative research methods, the study explores place stories of urban children who live in low-income, immigrant neighborhoods in New York City. The study finds that as children cultivate their sense of place, they construct "insideness" in their sense of place including 1) environmental understanding (i.e., contextualized, comprehensive, and critical understanding of a place), 2) environmental competence (i.e., knowing how to navigate and engage in a place), and 3) diverse, strong affective relationships with a place. Using "insideness" as a conceptual tool, this study discusses children's emplaced understanding and active and dialogical positionality in the development of their sense of place.

Lindle, J. C. (2008). "School Safety: Real or Imagined Fear?" Educational Policy **22**(1): 28-44.

The image of schooling tends to be benign, lulling parents and guardians into an assumption of safety for at least 6 hours each weekday. The complement to safety as an imagined state of schooling contains incidents of school violence and tragedy that feed communities' and parents' primeval fears about the well being of their children. The consequences of imagined safety, along with panic resulting from incidents of school violence or other lapses in school safety, yield school policies and rules that, perversely, may exacerbate community fears. Under the 2001 federal law known as No Child Left Behind (NCLB), the consequences of a public accounting for school safety may have generated more opportunities for public fear and panic as opposed to increasing conditions for school safety and security. The article concludes with strategies, rather than the blunt legislative approach to policies, for mediating public fears by ensuring genuine school safety.

Lippincott, J. (2005). Linking the Information Commons to Learning. Learning Spaces. D. Oblinger. Boulder, Educause.

Lippincott, J. (2009). Learning spaces: involving faculty to improve pedagogy. Educause Review. **March/April:** 16-25.

New—and newly renovated—classroom buildings, libraries, and computing labs can become highlights of campus tours for prospective students. The freshly painted interiors, the new furniture and lighting, and above all, the availability of wireless networking, up-to-date hardware and projection equipment, and other technology send a message that the campus is modern and in synch with the needs of incoming students. Classrooms boast smart podiums, giving instructors access to presentation technologies and the Internet; libraries offer computer workstations and laptop loans for use in group-study rooms; and labs feature multimedia production facilities. Touring these facilities, prospective students may imagine a curriculum in which the use of technology is seamlessly integrated into teaching and learning. This is key because, according to at least one report, students say that technology is an "important" or "very important" factor in their choice of which college or university to attend.1 But will these buildings, and the technologies they hold, deliver on the promise of enhancing the teaching and learning program of the college or university? Although a significant investment in the construction and renovation of physical facilities and in the installation of networking capability, hardware, and software may improve students' overall *satisfaction* with facilities, it is not clear that this investment will lead to changes in pedagogy or student learning.

Little, J. (1990). "The Persistence of Privacy: Autonomy and Initiative in Teachers' Professional Relations." Teachers College Record **91**(4): 509-536.

Teaching has endured largely as an assemblage of entrepreneurial individuals whose autonomy is grounded in norms of privacy and non-interference and is sustained by the very organization of teaching work. This article examines prominent forms of collegiality and discusses their prospects for altering the fundamental conditions of privacy in teaching.

Locker, F. (2007). Future-Proofing Schools: Strategies and Implementation, Part 2.**:** 2.

Offers specific design suggestions to ensure adaptability of a learning space to future educational delivery. Advice on how to create a suite of connected and varied learning spaces, convert circulation space to learning space, and create flexible casework are accompanied by examples of where these strategies have been implemented.

Locker, F. and S. Olsnen (2003). "Flexible School Facilities. Part I." Retrieved 6 May 2010, from http://www.designshare.com/research/locker/flexibleschools.asp.

Locker, F. and S. Olsnen (2003). "Flexible School Facilities. Part II." Retrieved 6 May 2010, from http://www.designshare.com/Research/Locker/FlexibleSchools2.asp.

Lodge, C. (2005). "From hearing voices to engaging in dialogue: problematising student participation in school improvement " Journal of Educational Change **6**(2): 125-146.

This article explores the value of student voice to school improvement, suggesting that it is often assumed to be a good thing. The article describes six trends that have contributed to this unexamined assumption. It is suggested that two dimensions of any claim that student voice can contribute to school improvement need to be analysed: the degree to which students are regarded as being active in participation in school life, and the purposed for which their voice is being used. A distinction is drawn between those that are for community purposes, such as the improvement of learning, and institutional purposes such as improvement in the appearance of the school. The various ways in which student voice can be used to coerce teachers of students into compliance are identified. An analytic matrix is presented. A dialogic model is proposed as the form of participation that will contribute most towards improvement. The article concludes with accounts of three projects in which student participation has been encouraged through dialogue about learning.

Loi, D., P. Burrows, et al. (2002). The pea project - Design stimulus. Participatory Design Conference (PDC 2002), Malmo, Sweden.

Loi, D. and P. Dillon (2006). "Adaptive educational environments as creative spaces." Cambridge Journal of Education **36**(3): 363-381.

This paper integrates theoretical perspectives and practical insights to offer a conceptualization of adaptive educational environments as creative spaces for fostering certain intellectual abilities associated with creativity, notably transference and synthesis in cross-disciplinary situations. When educational environments are modeled as systems, mechanisms that maintain stability or lead to change in the system can be described. Educational systems in stasis may be good for promoting some kinds of learning, but not so good for promoting intellectual abilities associated with creativity. It is proposed that designed interventions may change the system so that it is more conducive to certain outcomes. Such designed interventions may involve the use of facilitating technologies and pedagogies that change situational and social dynamics. The potential of digital tools in this context is considered. Examples of designed interventions are drawn from work on 'Playful Triggers' and 'eccentric objects and odd experiences' and independently-derived theoretical constructs are used to account for the creative outcomes of interventions. While outlining intentions for future research, the paper highlights some educational challenges of conceptualizing adaptive environments as creative spaces and their implications for practice.

Lomas, C. and D. Oblinger (2005). Student Practices and Their Impact on Learning Spaces. Learning Spaces. D. Oblinger and J. Oblinger. Boulder, Educause.

Long, M. (2005). Setting the Pace: A report on aspects of education, training and youth transition prepared for the Dusseldorp Skills Forum in association with the Education Foundation and the Business Council of Australia, Centre for the Economics of Education and Training, Monash University - ACER.

Long, P. (2005) Learning Space Design in Action. Educause Review **40**, 60

Long, P. and S. Ehrmann (2005). "Future of the learning space." Educause Review **40**(4): 42-58.

Lonsdale, M. (2003). Impact of School Libraries on Student Achievement. A review of the research. Melbourne, Australian Council for Educational Research.

Review of literature on school libraries since 1990. It argues that changing context in which school libraries and librarians operate characterised by decline in number of qualified libraries in public schools, explosion of ICT and changes in educational philosophy and practice. Research since 1990 indicates positive relationship between school libraries and student achievement (reading scores and generally), much is overseas in the following ways: Adequately staffed, resourced and funded library regardless of ses and adult community educational levels; Stronger computer network connecting library's resources to classroom ; Quality of collection; Higher test scores; correlated to higher use of library; Teacher-librarian collaboration in curriculum planning improves; Print rich environment leads to more reading(countart) which is best predictor of comprehension, vocabulary growth, spelling and writing; Integrating information literacy can improve student mastery of content and study skills; Libraries make a positive difference to student's self esteem , confidence, independence and sense of responsibility.

Lopez, O. S. (2007). "Classroom Diversification: A Strategic View of Educational Productivity." Review of Educational Research **77**(1): 28-80.

This article advances a theory of educational productivity based on a paradigm of classroom diversification that defines a strategic view of the education production process. The paradigm's underlying premise is that classroom student performance, and the instructional interactions that produce such outcomes, depend on economies derived from the learning relationships that exist across and among students in a classroom and on the technological fit between students' learning needs and a teacher's capacity. In addition to the conceptual classroom diversification framework, measures of classroom student diversity and teacher capacity are presented, followed by a discussion of the implications of the proposed classroom diversification paradigm for educational research, policy, and practice.

Lundquist, P., A. Kjellberg, et al. (2002). "Evaluating effects of the classroom environment: Development of an instrument for the measurement of self-reported mood among school children." Journal of Environmental Psychology **22**(3): 289-293.

The aim of this study was to develop a mood-rating instrument primarily aimed at identifying effects of noise and other aspects of the classroom environment, that probably are of importance, for the children's scholastic performance. None of the existing mood questionnaires was found to be directly applicable to the target group, viz., children in upper compulsory school in Sweden. An adjective checklist containing 45 mood-describing adjectives was constructed and answered by a group of 280 students. Thirteen of the items had a non-response rate above 10 per cent and were excluded. The remaining 32 items were subjected to factor analyses, and another group of 443 students were used to cross-validate the obtained factor structure. The analyses showed that the adjective checklist reflected two slightly negatively correlated latent factors. One factor described task orientation, the other inattentiveness. A questionnaire was constructed containing 12 items covering the content of these two factors. This instrument reflects important aspects of the classroom climate. It is easy to administer, quickly completed, and should be useful in studies of the classroom environment.

Lyons, J. (2002). "The Learning Environment: Do School Facilities Really Affect a Child's Education?" Learning By Design **11**(Theme issue titled "Design 2002: A Lesson in Excellence."): 10-13.

Explores how the physical condition and design of school facilities can shape a child's learning experience. Discusses school environments' connection to asthma, heating and ventilation problems, noise problems, full-spectrum lighting, trends in teaching methods requiring different building designs, optimum school size, portable classrooms, and the now-substantiated link between a school's physical environment and learning.

Macdonald, D. (1999). "Teacher attrition: a review of literature." Teaching and Teacher Education **15**(8): 835-848.

Teacher attrition is generally positioned within research addressing teacher shortage, the wastage of resources and expertise, as well as that concerning teachers' lowly status and poor working conditions. As such the research is fragmented and diverse. This paper attempts to draw together contemporary international attrition research in order to consider: how teacher attrition may be defined; patterns of attrition; influences upon attrition; the impact of attrition; and strategies employed for decreasing attrition. It concludes that research concerning teacher attrition requires the development of more comprehensive databases on teaching personnel and increased clarity of how

attrition is being framed and investigated.

Malcolm, B. and P. Long (2005). Trends in Learning Space Design. Learning Spaces. D. Oblinger. Boulder, Educause.

Manning, M., R. Homel, et al. (2010). "A meta-analysis of the effects of early developmental prevention programs in at-risk populations on non-health outcomes in adolescence." Children and Youth Services Review **32**(4): 506-519.

We present the results of a meta-analytic review of early developmental prevention programs (children aged 0-5: structured preschool programs, center-based developmental day care, home visitation, family support services and parental education) delivered to at-risk populations on non-health outcomes during adolescence (educational success, cognitive development, social-emotional development, deviance, social participation, involvement in criminal justice, and family well-being). This review improves on previous meta-analyses because it includes a more comprehensive set of adolescent outcomes, it focuses on measures that are psychometrically valid, and it includes a more detailed analysis of program moderator effects. Seventeen studies, based on eleven interventions (all US-based) met the ten criteria for inclusion into the analysis. The mean effect size across all programs and outcomes was 0.313, equivalent to a 62% higher mean score for an intervention group than for a control group. The largest effect was for educational success during adolescence (effect size 0.53) followed by social deviance (0.48), social participation (0.37), cognitive development (0.34), involvement in criminal justice (0.24), family well-being (0.18), and social-emotional development (0.16). Programs that lasted longer than three years were associated with larger sample means than programs that were longer than one year but shorter than three years. More intense programs (those with more than 500 sessions per participant) also had larger means than less intense programs. There was a marginally significant trend for programs with a follow-through component into the early primary school years (e.g. preschool to Grade 3) to have more positive effects than programs without a follow-through. We conclude that the impact of well-conducted early development programs on quality of life in adolescence can be substantial for social policy purposes.

Manzo, L. C. (2003). "Beyond house and haven: toward a revisioning of emotional relationships with places." Journal of Environmental Psychology **23**(1): 47-61.

An extensive and ever-growing body of literature exists that explores the nature and nuances of people's emotional relationships to place. This includes writings on sense of place, place attachment and place identity. A review of this literature suggests that while these concepts are broadly defined and discussed in theory, their application in research does not fully embrace all of the important dimensions they suggest. Empirical research, influenced by the notion of [`]home', consequently focuses on residential settings, positive affect and a depoliticized view of individual experiences. This has limited our understanding of a complex and multi-faceted phenomenon. Recent literature demonstrates a need to better incorporate the full magnitude of human experiences into the current discourse on people-place relationships. Recent research that works toward this end is discussed here. Consequently, this paper focuses on several strengths in the literature that warrant further investigation: First, people's emotional relationships to places encompass a broad range of physical settings and emotions. Second, people's relationships to places are an ever-changing, dynamic phenomenon, and as such, they can be a conscious process in which people are active shapers of their lives. Third, people's emotional relationships to places exist within a larger socio-political milieu.

Marsh, H. W., A. J. Martin, et al. (2008). "A Multilevel Perspective on Gender in Classroom Motivation and Climate: Potential Benefits of Male Teachers for Boys?" Journal of Educational Psychology **100**(1): 78-95.

Are boys better motivated by male than female teachers in high school math, science, and English classes, and can these differences be explained by classroom climate? Using a cross-classified multilevel model with 5 levels (school, teacher, class, student, subject), the authors found little or no support for this contention. In general (except in terms of anxiety and persistence), girls were better motivated than boys, and these differences tended to generalize over student age and school subject in classes taught by both male and female teachers. Student perceptions of classroom climate were more specific to the group of students within a particular class than to the teacher who taught the class and had moderate to large effects on the motivation of individual students. The surprisingly small amounts of variance explained in motivation by student gender and age, teacher gender, school subject, and their interactions support a gender invariance and similarities model but not theoretical predictions based on gender stereotype, gender intensification, and gender matching perspectives.

Massey, D. (1994). Place, Space and Gender Cambridge, Polity Press.

Massey, D. (1997). The spatial construction of youth cultures. Cool Places: Geographies of Youth Cultures. T. Skelton and G. Valentine, Routledge**:** 121 - 129.

Massey, S. (2004). The benefits of a Forest School experience for children in their early years., Forest school in Worcestershirelea**:** 10.

Massie, R. (2006). "The impact of sound-field amplification in mainstream cross-cultural classrooms: Part 1: Educational outcomes." Australian Journal of Education **50**(1): 62-77.

Maxwell, L. and E. Chmielewski (2008). "Environmental personalization and elementary school children's self-esteem " Journal of Environmental Psychology **28**: 143-53.

Research indicates physical classroom environment has potential to affect children's behaviour, academic performance and cognitive development. Les is understood about socio-emotional development of children. This study investigates the potential role of personalization displays on children's self esteem using classroom intervention in a quasi-experiment. 36 kinder kindergarteners and first graders in 6 classrooms of 2 elementary schools in a rural community were assesses pre and post tests of Self Esteem Index scale and Children's Inventory of Self Esteem. Findings were mixed. On both measures there was significant positive effects of classroom personalization for first graders but only on measure for CISE. Findings suggest that young children's self esteem may be included and enhanced by specific aspects of the classrooms physical environment.

Maxwell, L. E. (1999). School Building Renovation and Student Performance: One District's Experience.**:** 13.

A brief narrative description of the journal article, document, or resource. A case study explores the importance of the educational setting and its affect on student learning, performance, attitude, and behavior. The study focuses on the facilities planner's perspective and raises important questions needing further study. Among the study's findings are the importance of timing in a school district's renovation projects, and a demonstrated positive relationship between upgraded school facilities and math achievement. Thoughts on facility/student relationship research needs and design conclude the article.

Maxwell, L. E. (2003). "Home and School Density Effects on Elementary School Children: The Role of Spatial Density." Environment and behavior **35**(4): 566-578.

School or classroom density is most often studied as social density, namely, the number of people in a space. The current study investigates classroom spatial density effects on elementary school children. Outcomes included a measure of academic achievement, social behavior/disturbance, and a self-reported measure of psychological stress. Second- and fourth-grade children in urban public schools were the participants. Findings indicate amount of space per child in the classroom may be just as important as the number of children in a classroom. Girls' academic achievement was negatively affected by less space per student; boys' classroom behavior was negatively affected by spatial density conditions. There was no interaction of school and home density on the outcome measures; however, children in crowded homes were more likely to report more psychological stress than their less crowded peers. Home density also negatively affected academic performance.

Maxwell, L. E. (2007). "Competency in Child Care Settings: The Role of the Physical Environment." Environment and behavior **39**(2): 229-245.

A rating scale is developed for preschool classrooms to assess the physical environment's role in children's development of cognitive and social competency. The scale is tested in 98 classrooms, and children are assessed on two measures of competency in a subsample of these classrooms. Findings indicate that the physical environment is related to measures of competency, one of which is a self-perception measure. Younger children's competency, those in the 3-year-olds' classrooms as opposed to the 4-year-olds' classrooms, is most affected by the physical environment. Assessment of quality child care must include thorough assessment of the physical environment.

Maxwell, L. E. and G. W. Evans (2000). "The effects of noise on pre-school children's pre-reading skills." Journal of Environmental Psychology **20**(1): 91-97.

Previous research has shown a link between chronic noise exposure and reading skills. Elementary school-age children are thought to be negatively affected by such exposure. A limited amount of work has been done on the effects of chronic noise on pre-school children, and such work has primarily focused on attentional skills. A cohort model was used in this study to examine the effects of chronic noise on pre-school children's pre-reading skills. All of the children attended the same child care center. Ninety 4 and 5-year-old children were tested on cognitive measures of pre-reading skills and were rated by classroom teachers on their understanding and use of language. Children were tested in year one, before sound attenuation work in the classrooms, and in year two, after the installation of sound absorbent panels. In the quieter condition, children scored higher than their noisier cohort on the letter-number-word recognition measure and were rated higher by their teachers on the language scale. In addition, children in the quieter classrooms were less susceptible than those in the noisy classrooms to induced helplessness.

Mayo Clinic (2006). "Classroom of the Future.". from http://www.mayoclinic.org/feature-articles/levine-classroom-future.html.

Mayo clinic doctors asked a simple question: do children really need to sit at desks while they learn? To find the answer they have designed what they believe to be the first chairless school -- complete with "standing" desks and a host of sophisticated learning technologies. Includes a slide show of an experimental classroom designed to keep students active while they are learning

McClintock, E. and J. A. Sonquist (1976). "Cooperative task-oriented groups in a college classroom: A field application." Journal of Educational Psychology **68**(5): 588-596.

A large college class with 84 students was restructured into small task-oriented groups either randomly or by sociometric choice. Under individual reward conditions, sociometric groups were more likely than random groups to

function outside the classroom; under shared reward conditions, both types of groups were equally viable. Working in groups did not affect subsequent individual test performance; however, on a joint project, teamwork resulted in better performance than individual efforts. The overall ability of students to cope with the course was not affected by group participation. A subgroup of students who performed poorly on the 1st individual task subsequently worked in groups and performed significantly better on a 2nd individual task than comparable students who did not participate in groups during the course.

McCormack, A. (1997). "Classroom Management Problems, Strategies and Influences in Physical Education." European Physical Education Review **3**(2): 102-115.

Both nationally and internationally the quality of education is a major concern and governments continue to address this need through reforms and policies aimed at im proving the quality of teaching and teacher education. Classroom studies of effective teaching have focused on the behavioural aspects of teaching and highlighted classroom management as one of the most important features of good teaching. This article investigates classroom management problems, strategies and influences as identified by a group of 75 pre service physical education teachers - after the completion of a four week practicum experience - and a group of 65 in-service physical education teachers with varying years of teaching experience. Variables such as gender and mastery of the teaching situation gained through years of teaching experience will be analysed to detect any significant differences or trends. Results of the study gained through quantitative analysis will be outlined and interpreted. Recommendations will be made for the provision of more relevant pedagogical programmes and strategies to assist future preservice physical education teachers develop competence in classroom management.

Mceachron, G., B. A. Bracken, et al. (2003). "What Classroom Environments Tell About the Pedagogical Aspects of Subject Matter: A Cross-Cultural Comparison." School Psychology International **24**(4): 462-476.

This study presents a cross-cultural comparison of United States, English and Welsh students' perceptions of secondary classroom environments in six academic disciplines-English, mathematics, science, history, geography, and French. The purpose of this study was to investigate the relationship between classroom environment and subject matter (i.e. academic disciplines). This can be phrased as a question, Do academic disciplines have universal structural characteristics that influence classroom environment and the pedagogical interaction between students and teachers?' To gain insight into the relationship between an academic discipline and teacher/student interaction, classroom environments in six subject areas were investigated, using the Classroom Environment Scale (CES). CES protocols were completed by and collected from the following students in the US (n = 412); England (n = 152) and Wales (n = 232), ranging in age from 13 to 19 years. In addition to the CES, data collection included classroom observations, semi-structured interviews, and an examination of the cultural and political context of the schools. Variable differences in classroom environments were found to exist on the basis of academic discipline, nationality, age and gender across all CES subscales. Subject matter patterns suggest that the nature of the academic discipline may indeed influence teacher and student interactions and that these patterns are consistent across national boundaries.

McGregor, J. (2003). "Making Spaces: teacher workplace topologies." Pedagogy, Culture & Society **11**(3): 353 - 377.

Studies of the workplace of teachers commonly focus on the spaces of the classroom, staffroom and school as pre-given and bounded entities. This article explores the possibilities of moving beyond such topographies of enclosure, towards seeing space (-time) as recursively constructed with social relations and so made and remade. Boundaries are then far more porous than suggested by the egg-crate image of isolated classrooms or the individual school embedded in its local context. This article draws on an empirical study of two secondary schools in England to illustrate the utility of a spatial perspective in explaining patterns of association. We may see that the school is not fixed and static but the site for intersecting networks of relations, technology and practice which extend in complex interrelations beyond what is (variably) seen as the institution. If space-time is constantly remade, performed and produced by interconnecting social practices, then there are greater possibilities for understanding the topologies of the school as a workplace for adults.

McGregor, J. (2004). "Space, power and the classroom." Forum **46**(1): 13-18.

McGregor, J. (2004). "Spatiality and the place of the material in schools." Pedagogy, Culture & Society **12**(3): 347 - 372.

Drawing on a research study into the spatiality of teachers' workplaces, this article explores the 'concrete realities' of the artefact-filled world with which teachers, support staff and students interact, and considers the way in which networks of people and things order the spaces of the school. Spatiality is examined explicitly in terms of the relationship between different kinds of space and place, including the network space of relations and objects. In focusing on the relationship between the social and the material, and their implication in the construction of the everyday interactions that constitute the school, the article explores the utility of Actor Network Theories (ANT) as a means of reconciling the two without privileging one over the other or relegating objects to simple cultural or symbolic artefacts. A further challenge is to explore the spatialising force of objects as implicated in the active construction of social space, without resorting to simplistic behavioural determinism. The theoretical focus relates to the empirical concern: how particular spatial arrangements encourage or constrain ways of working together.

McKenzie, M. (2008). "The places of pedagogy: or, what we can do with culture through intersubjective experiences." Environmental Education Research **14**(3): 361 - 373.

Beginning by highlighting considerations of the intersections among social and ecological issues and the recent diversification of critical pedagogy, this paper suggests means by which approaches such as Gruenewald's (2003) "critical pedagogy of place" can be expanded to accommodate a broader range of possible places of pedagogy. The paper is centrally concerned with what happens when we consider socio-ecological learning, not as occurring via cognitive critique or embodied place-based experience, but rather as taking place in between the thought and the sensed via a range of intersubjective experiences. It suggests that these intersubjective locations that comprise the "where" of the learning of the student can be particular physical places, but can also be in and of experiences of friendship, art, literature, irony, cultural difference, community. By expanding our possible repertoire of "pedagogical arts," or the range of intersubjective places and spaces of pedagogy engaged, we are able to conceptualise and practise education in ways that enable a deeper connection to place but also opportunities for other modes and outcomes of student learning. In particular, the paper outlines the possibilities for learning and cultural formation enabled by spaces of collective youth engagement.

McLaren, P. (1999). Schooling as a ritual performance: toward a political economy of educational symbols and gestures. Boston, Rowman and Littlefield.

McMichael, C. (2004). Perspectives of school planners and architects and professional educators regarding elementary school facility design characteristics. C. Tanner**:** 37.

The purpose of this study was to collect and examine the perspectives of elementary school facility planners and architects, elementary school teachers, school district superintendents, and elementary school administrators regarding three progressively specific sets of school facility design characteristics and their influence on elementary education. These design characteristics included: six general design principles produced by the US Department of Education, 33 previously published broad education design principles, and 86 specific complementary design characteristics found in the Design Assessment Scale – Elementary (DASE) produced by the University of Georgia's School Design and Planning Laboratory. An electronic questionnaire, Perspectives of School Planners and Architects and Professional Educators Regarding Elementary School Facility Design Characteristics, was designed and distributed to educational professionals and elementary school facility planners and architects across the United States to gather information regarding their perspectives related to the three designated sets of design characteristics. By reporting where differences in perception exist among educators, planners and architects concerning the importance of school design characteristics, as well as their magnitude, the results of this study are expected to be helpful in underscoring and conveying the importance of the school environment. This will be of value to those that plan, develop, and use the learning environment. The analysis of the collected survey data indicated that there were statistical agreements among the four designated respondent groups regarding many of the selected categories of design principles. However, seven categories in which the perspectives of these four groups of professionals differed significantly were identified. These categories were: (a) involving stakeholders in the design process; (b) providing adequate health, safety, and security; (c) making effective use of all available resources; (d) employing specific design principles for primary education spaces; (e) recognizing the need for public areas; (f) understanding the importance of movement patterns; and (g) designing instructional neighborhoods.

McNamara, D. and D. Waugh (1993). "Classroom organisation." School Organisation **13**(1): 41-50.

Meehan, C. and M. O'Rourke (2002). Changing traditional learning boundaries in schools. No more bored kids: Real alternative for public schools Education Foundation**:** 1.

Meek, A. and S. Landfried Crow Island School: 54 years young. Designing Places for Learning. A. Meek. Alexandria, VA, ASCD**:** 51-59.

Mehrabian, A. and S. Diamond (1971). "Effects of furniture arrangement, props, and personality on social interaction. ." Journal of Personality and Social Psychology **20**(1): 18-30.

Explored the facilitating and inhibiting effects of various furniture arrangements and 2 types of objects on social interaction. 2 experiments with 144 male and 144 female undergraduates each included all possible combinations of 4 distances and 3 orientations for the seating of dyads who were left alone to wait in a room. Results show no main effects of distance on amount of affiliative behavior. However, both experiments showed that the less direct orientations were less conducive to conversation, and particularly inhibiting for the otherwise more sociable pairs. In the 1st experiment, which included a measure of relaxation, ss relaxed more as distance between them increased. A 3rd experiment with 88 male and 88 female ss explored the combined effects of a sculpture and a puzzle poster on affiliative behavior. Preoccupation with the puzzle was found to be an inverse correlate of affiliative behavior. Preoccupation with the sculpture was not a significant correlate of affiliative behavior, but did facilitate interaction between ss who were sensitive to rejection. These same ss spent significantly less time examining the puzzle than did ss who were insensitive to rejection.

Mendell, M. J. and G. Heath (2004). Do indoor environments in schools influence student performance? A review of the literature., Lawrence Berkeley National Laboratory: Lawrence Berkeley National Laboratory.

The goal of this paper was to critically review available evidence on relationships between indoor environmental quality (IEQ) in schools and student performance. Because available evidence from schools was limited, the review expanded to include studies on direct relationships between the performance of children and adults and the indoor environments in schools, workplaces, residences, and controlled laboratory settings. The most persuasive available evidence suggests that some aspects of IEQ, including low ventilation rate and less daylight or light, may reduce the performance of occupants, including students in schools. Other evidence identifies additional possible influences, such as pollen and some carpets. Substantial limitations in the quantity and quality of available research findings suggest many questions for future study. Sufficient evidence is available to justify (1) actions to safeguard IEQ in schools and (2) the conduct of focused, well-designed research to help guide future policies and actions regarding IEQ in schools.

Mendell, M. J. and G. A. Heath (2005). "Do indoor pollutants and thermal conditions in schools influence student performance? A critical review of the literature." Indoor Air **15**(1): 27-52.

To assess whether school environments can adversely affect academic performance, we review scientific evidence relating indoor pollutants and thermal conditions, in schools or other indoor environments, to human performance or attendance. We critically review evidence for direct associations between these aspects of indoor environmental quality (IEQ) and performance or attendance. Secondarily, we summarize, without critique, evidence on indirect connections potentially linking IEQ to performance or attendance. Regarding direct associations, little strongly designed research was available. Persuasive evidence links higher indoor concentrations of NO(2) to reduced school attendance, and suggestive evidence links low ventilation rates to reduced performance. Regarding indirect associations, many studies link indoor dampness and microbiologic pollutants (primarily in homes) to asthma exacerbations and respiratory infections, which in turn have been related to reduced performance and attendance. Also, much evidence links poor IEQ (e.g. low ventilation rate, excess moisture, or formaldehyde) with adverse health effects in children and adults and documents dampness problems and inadequate ventilation as common in schools. Overall, evidence suggests that poor IEQ in schools is common and adversely influences the performance and attendance of students, primarily through health effects from indoor pollutants. Evidence is available to justify (i) immediate actions to assess and improve IEQ in schools and (ii) focused research to guide IEQ improvements in schools. PRACTICAL IMPLICATIONS: There is more justification now for improving IEQ in schools to reduce health risks to students than to reduce performance or attendance risks. However, as IEQ-performance links are likely to operate largely through effects of IEQ on health, IEQ improvements that benefit the health of students are likely to have performance and attendance benefits as well. Immediate actions are warranted in schools to prevent dampness problems, inadequate ventilation, and excess indoor exposures to substances such as NO(2) and formaldehyde. Also, siting of new schools in areas with lower outdoor pollutant levels is preferable.

Metros, S. (2005) Learning Objects: A Rose by Any Other Name... Educause Review **40**, 12-13

Metzger, R. L., P. F. Boschee, et al. (1979). "The classroom as learning context: Changing rooms affects performance." Journal of Educational Psychology **71**(4): 440-442.

Studied the role of the classroom as a context that can affect memory, using a multiple time-series design. Two classes of 25 undergraduates each were given weekly quizzes in their regular classroom over a baseline period, were moved to a different room on separate target weeks, and finally were returned to their classroom. Moving had a significant deleterious effect, particularly on students doing well in the course.

Meulenbroek, L. F. P., G. Thomas, et al. (2010). "Biopsychosocial impact of the voice in relation to the psychological features in female student teachers." Journal of Psychosomatic Research **68**(4): 379-384.

Objective The aim of the study was to assess biopsychosocial impact of the voice in relation to the psychological features in female student teachers. Methods This research was a cross-sectional study in 755 student teachers using general questionnaires, the Voice Handicap Inventory (VHI), Type D Scale-16, Symptom Check List (SCL-90), and Utrecht Coping List (UCL). Student teachers with a relative high score on the VHI (>75th percentile) and students with a relative low score (<25th percentile) were compared. Results Type D student teachers had a 4× greater risk of a high VHI-score (OR 4.23) than the non-type-D group. The student teachers with relative high VHI scores scored significantly higher (P<.001) on the SCL-90 total and all subscales, compared to the student teachers with relative low VHI scores. Furthermore, the students with a relative high VHI score had significant high scores on the subscales passive attitude (P<.001), palliative reactions (P<.001), avoidance and a waiting attitude (P<.001), and expression of emotions (P=.003) of the UCL. Conclusion This study showed that a relative high biopsychosocial impact of the voice is related to the personality trait Type D, psychosomatic well-being and coping strategies in female student teachers. These features should be implemented in screening and training programs for students for a voice demanding profession. The students have to be prepared to cope with psychological, physical and vocal demands of the teaching profession. The speech therapist (of the vocational university) has to be aware of an important role in coaching the students into a more active coping attitude.

Millett, P. and N. Purcell (2010). "Effect of sound field amplification on grade 1 reading outcomes/Effet de l'amplification en

champ libre sur les performances de lecture des eleves de premiere annee.(Report)." Canadian Journal of Speech-Language Pathology & Audiology **34**(1): 17(8).

Sound field amplification provides mild amplification and even distribution of a classroom teacher's voice around the classroom as a strategy to improve listening and overcome effects of poor classroom acoustics. Research has documented improvements in attention, behaviour, speech understanding, academic outcomes and teacher vocal health, but few studies have focused on literacy outcomes. This study examined changes in reading outcomes for Canadian grade one students (N=486) in 24 classrooms, 12 with sound field amplification and 12 without, over one school year. Results indicated greater changes in the total percentage of students reading at grade level at the end of the school year in amplified classrooms vs unamplified classrooms, although results were not statistically significant. As well, positive trends were seen in improved reading outcomes for students identified at risk for reading difficulties, although again, not statistically significant.

Milne, A. (2005). Designing Blended Learning Space to the Student Experience. Learning Spaces. D. Oblinger. Boulder, Educause.

Milne, A. (2007). "Entering the interaction age." Educause Review **42**(1): 13-31.

Minguillón, J. (2007). "Education and pedagogy with learning objects and learning designs." Computers in Human Behavior **23**(6): 2581-2584.

Ministry of Education (2004). Best Practice in Classroom Design.**:** 174.

Presents detailed results of surveys of New Zealand teachers, students, principals, board members, and design agencies, regarding the effect of good school design on learning outcomes. Survey results, conclusions, and recommendations are presented on the topics of space, shape and layout flexibility; air flow and temperature control; lighting; acoustics and noise management; furnishings; technology; teachers support spaces; student spaces; and grounds and school layout.

Monahan, T. (2002) Flexible space & built pedagogy: Emerging IT embodiments. Inventio **4**,

This paper analyzes the convergence of information technology infrastructures and traditional educational spaces and proposes flexible criteria for material-virtual, hybrid learning environments. My analyses are informed by a year of ethnographic research with Los Angeles Unified School District (LAUSD), from 2000 to 2001, where I studied network infrastructure design projects across spatial, pedagogical, and political domains. I assume that built environments afford conditions of practice by their very design (Weisman 1992), and that these affordances embody political values that translate into learning activities.

Monk, D. (2006). An assessment of the quality and educational adequacy of educational facilities and their perceived impact on the learning environment as reported by middle school administrators and teachers in Humble Independent School District, Humble, Texas, Texas A&M University.

This quantitative study investigates the adequacy and quality of middle school facilities in Humble ISD middle schools as reported by the primary users of these facilities, the teachers and administrators. These middle school educators also provide an assessment of the impact that these facilities have on the learning environment. This study also assesses the quality and adequacy of these middle school facilities through a purely quantitative evaluation conducted by an unbiased assessment team. Humble ISD is undergoing unprecedented growth at all levels and has addressed the burgeoning elementary and high school aged growth occurring in the district by constructing and renovating these facilities. At the middle level, however, new facility construction is occurring at a slower pace. The purpose of this research is to ascertain which factors in each of these six facilities have the greatest quality and adequacy and the impact that they have on the learning environment. Furthermore, it is the purpose of this research to provide valuable and practical data, to which Humble ISD and others can refer in developing future building plans, renovating existing facilities, allocating funds, and creating student centered learning environments. This study also investigates the relationship between what educators perceive as adequate and quality facility factors and their perception of the impact that these factors have on the learning environment. Finally, this study reviews any congruency or agreement between educator's perception of adequacy and quality and architect assessment of adequacy and quality. Middle level students are the most influential group of adolescents and it is important that we provide facilities that meet their very specific needs. This research will ultimately and positively impact the learning environment for these children.

Montessori, M. (2009). "On the Decline in School Design." Abitare(490): 115-117.

The article discusses the decline in school furniture design. It states that height-adjustable chairs are rarely utilized for classrooms due to their cost and less durability. It notes that pedagogue and physician Maria Montessori developed a model that has an open pavilion-like school with light-weight natural furniture that was built in proportion to children. The author states that some employment-creation measures are being conducted to renew school structures as talks on outdated education models arise.

Montgomery, T. (2008). "Space matters: Experiences of managing static formal learning spaces." Active Learning in Higher Education **9**(2): 122-138.

Managing the space in which learning takes place is subject to ongoing debate. Spatial management and movement can impact upon the construction of meaning within education and upon the dynamic of learning. It is suggested that there are now different learning goals and expectations and consequently a need for different learning environments. We are urged to break out. Many constraints, however, result in everyday experience not being of high-tech, impressively designed formal and informal spaces. This article contributes to a navigation of the realities of learning space. It recognizes that the literature may be leaving the profession behind and that for many educators the opportunities of design are merely aspirations. Taking as its focal point the small seminar room with sparse furniture, it presents two studies to contribute ideas on how such non-ideal spaces might be managed; one looking at an alternative education space, the museum, and the second drawing on interviews with colleagues about their experiences.

Moore, D. (2004). "Many merits of a clean school." School Planning & Management **43**(6): 10-10.
Focuses on the need for standards for school cleanliness in the United States. Five-tiered system of expectations to help guide decision making in school cleanliness. Relationship of the condition of educational facilities to student achievement and perception of the school community; Goal of the National Center for Education Statistics Guide for Planning and Maintaining Schools.

Moore, D. P. (2001). "Make Facilities a Priority." School Planning & Management **40**(5): 11.
Focuses on issues on the funding of educational facilities in the United States. Survey on the magnitude of deficiencies and life-safety issues on school facilities; Importance of the design of classrooms in the student learning environment; Goal to provide good learning environment to increase student's achievements.

Moore, G. and J. Lackney (1993). "School Design: Crisis, Educational Performance and Design Applications." Children's Environments **10**(2): 99-122.
This paper explores the relationship between educational outcomes and the architectural design of educational facilities. Following a brief review of the crisis in school buildings in the United States, an attempt is made to clarify the issues involved in the research literature bearing on the relationship between educational performance and school facilities and to critically review some of that literature. Two physical environmental factors are found that directly impact academic achievement in elementary schools (school size and classroom size) and another two that impact "non-achievement" behaviors (location and secluded study spaces). Two of the 27 design patterns developed in response to these findings are presented and discussed. In conclusion, a mediational-interactional model of the relationship between the socio-physical environment and educational outcomes is presented.

Moore, T. A. and M. P. Kelly (2009). "Networks as power bases for school improvement." School Leadership & Management **29**(4): 391-404.
Although there is limited research into the success of primary school networking initiatives in the UK, there is a drive at national government level for promoting school collaborative working arrangements as a catalyst for whole-school improvement. This paper discusses the findings from research into two such initiatives: Networked Learning Communities and Primary Strategy Learning Networks. The research focused on a reliance on school networks as power bases for promoting a national standards agenda and explores the impact of power, authority and influence on the sustainability of networks. Various types of power partnerships observed in the research are explored further in this paper. Additionally, a suggested 'ideal' model for productive networking relationships among key stakeholders is offered for consideration to ensure a higher degree of success in implementing national models of collaborative working practices for school improvement.

Moos, R. (1976). The human context: Environmental determinants of behavior. New York, Wiley.

Moos, R. H. and B. S. Moos (1978). "Classroom social climate and student absences and grades." Journal of Educational Psychology **70**(2): 263-269.
Investigated the relationship between student and teacher perceptions of the social environments of 19 high school classes and student absenteeism rates and the average final grades given by the teacher. 19 classes of high school students were administered the Classroom Environment Scale. Results show that classes with high absenteeism rates were seen as high in competition and teacher control and low in teacher support. Classes in which teachers gave higher average grades were seen as high in involvement and low in teacher control. Results are discussed in light of their implications for understanding the differential effects of classes, as well as for identifying and changing high-risk classroom environments.

Morgan, J. (2000). "Critical pedagogy: the spaces that make the difference." Pedagogy, Culture & Society **8**(3): 273 - 289.
The recent literature of critical pedagogy has been rich in spatial references and metaphors. Indeed, McLaren (1999) recently called for the development of a 'critical pedagogy of space'. This article considers the implications of space for critical pedagogy. Drawing on recent debates about space in the geographical and sociological literature, it suggests that space must be seen as social construction. As such, space is involved in the production and reproduction of social relationships, and is linked to political struggles of inclusion and exclusion. The article suggests that space should not be seen simply as the product of capitalist social relationships, but is tied up with other axes of power, such as gender,

ethnicity and sexuality. The challenge is to develop a critical pedagogy of space that reflects the multiple and contested nature of space.

Morton, J. (1999). Telematics and Electronic Communication and Their Effect on Educational Space.**:** 16.
A report examines technology's influence on the educational process as well as the physical classroom, and the needs and concerns these new technologies bring to architects and educators in designing an adaptable classroom. Technology and the classroom are examined in the following areas: the use of television; microcomputers and computer terminals; power and communication cable distribution; voice and data distribution; heating and air conditioning needs; furniture requirements; and security issues.

Moulds, P. and L. Harper (2008). "What implications do learning spaces and ICT have for the curriculum?" Australian Journal of Middle Schooling **9**(1): 10-13.

Mulford, B. (2005). "Quality evidence about leadership for organizational and student learning in schools." School Leadership and Management **25**(4): 321-330.
Where do those in schools start sorting the wheat from the chaff, genuine growth potions offering long-term improvement from the elixirs, short-term opportunism and/or unrealistic expectations? The current and growing emphasis on evidence informed policy and practice is as good a place as any. The purpose of this article is to take up the issues of the complexity and predictive validity of evidence, that is, the need for evidence to be complex enough to come close to the reality faced by schools and evidence that seeks to link leadership and student outcomes. Arising from detailed qualitative and quantitative research, two models are presented for consideration that, it is argued, better reflect this complexity and predictive validity than previous work in the field.

Murray, R. and L. O'Brien (2005). 'Such enthusiasm - a joy to see' : An evaluation of Forest School in England, Forest Research, UK**:** 83.
This study builds on the six specific, positive outcomes identified in the Welsh study and presents the findings under eight themes that emerged from the analysis of the data collected from the four Forest School settings involved. These themes can be summarised under the following headings: 1. Confidence: This was characterised by self-confidence and self-belief that came from the children having the freedom, time and space, to learn, grow and demonstrate independence. 2. Social skills: The children demonstrated an increased awareness of the consequences of their actions on other people, peers and adults, and acquired a better ability to work cooperatively with others. 3. Language and communication: The children developed more sophisticated uses of both written and spoken language prompted by their visual and sensory experiences at Forest School. 4. Motivation and concentration: This was characterised by a keenness to participate in exploratory learning and play activities as well as the ability to focus on specific tasks for extended periods of time. 5. Physical skills: The children developed physical stamina and their gross motor skills through free and easy movement round the Forest School site. They developed fine motor skills by making objects and structures. 6. Knowledge and understanding: Increased respect for the environment was developed as well as an interest in their natural surroundings. Observational improvements were noted as the children started to identify flora and fauna, and they enjoyed the changing seasons. 7. New perspectives: The teachers and practitioners gained a new perspective and understanding of the children as they observed them in a very different setting and were able to identify their individual learning styles. 8. Ripple effects beyond Forest School: The children brought their experience home and asked their parents to take them outdoors at the weekend or in the school holidays. Parents' interest and attitude towards Forest School changed as they saw the impacts on their children.

Myers, N. and S. Robertson (2006). "Walking the Walk,ÄîJust Do It." School Planning & Management **45**(8): 14-14.
The article focuses on the planning professionals' role in student performance in the U.S. According to the authors, good educational facilities can enhance student performance. However, they question if it is the responsibility of the architect, planner and facilities persons to be in the student performance business.

Nair, C. (2002). Changing Learning Environments for Quality Tertiary Classes. 4th World Conference of the International Consortium for Educational Development (ICED) Perth, Australia
The purpose of this study was to investigate students' and lecturers' actual and preferred perceptions of their classroom learning environments. The study involved the modification and validation a new form of the College and University Classroom Environment Inventory (CUCEI). This study is distinct in that it is the first study utilising the modified CUCEI at the tertiary level. The reliabilities of the scales of the modified CUCEI ranged from 0.73 to 0.94. Student perceptions indicated a preference for a more favorable learning environment in all seven areas measured by the CUCEI. Female and male students perceived their classroom environments similarly. However, mature students perceived their classroom more positively on two scales, Task Orientation and Equity. Generally, lecturers perceived their environment more favorably than their students. Lecturers who employed the normal mode of course delivery, that is lecturing, were generally perceived less favourably by their students. Lecturers could find this new version of the CUCEI to be a valuable source of information, particularly for comparisons between their own and their students' perceptions. Further, this study also provides university lecturers information on how they can create a quality-learning environment to enhance student learning and satisfaction.

Nair, P. (2009). "Don't just rebuild schools - reinvent them." Education Week **28**(28): 3.
The Amercian Recovery and Reinvestment Act could be a boon to educational facilities, with its provisions to help reduce the interest on school construction and renovation bonds, and its permission for state fiscal-stabilization money to go for school modernization, repairs, and, as outlined in U.S. Education Department guidance, new construction. As communities gear up for the chance to utilize this much-needed help, let us remember that what may be great for bridges and highways may be exactly the wrong thing for schools.

Nair, P. and R. Fielding (2005). The language of school design: design patterns for 21st century schools, Designshare**:** 33.
It is clear that most school architecture tends to look at spaces in a linear way—that means we first decide what a space would be used for and then we design the space for that activity. This kind of thinking ignores the complexity and research about the human brain and human experience, resulting in the design of static spaces that inhibit learning. The reality is that the design of learning environments is a complex assignment. While the solutions may be simple or elegant, they can almost never be "simplistic." We need to understand the complexity of the human experience as noted above in order to understand what "learning" is about. We also need to recognize that it is almost impossible to solve a design problem unidimensionally. Everything we do as designers impacts the users of the space at many different levels. *Pattern Language* more than 25 years ago, he approached architecture from a unique perspective. He looked at the real world of people plus the buildings and spaces they inhabited in order to understand the connections between the built environment and the human psyche. Focusing on architectural and landscape attributes that worked, on places that felt pleasant or were spiritually uplifting and to which people were attracted rather than turned off, Alexander was able to identify many spatial "patterns" that nourish the human communities they support. Interestingly, the larger body of architectural work, in the period immediately following the publication of Alexander's ground-breaking book, does not appear to have affected the way we build our homes, our towns and cities. However, over time, Alexander's work has gained credibility as the ideas he presented have begun to enter the scientific realm of complexity theory, fractals and neural networks—disciplines on the cutting edge of science. The “connections" between the built environment and healthy communities that Alexander was pointing out are now more readily apparent. Today, we know that human brains are actually hardwired to understand and respond to patterns in all spheres of our life and, particularly, to those that exist within our built environments. Our book, *The Language of School Design,* does not claim to be scientifically based. The book draws upon our own experience as school planners and the best practice of school design from over 20 countries, represented by hundreds of innovative school designs that we have published at DesignShare.com.

Nair, P. and R. Fielding (2005). "Planning & designing schools for the conceptual age." Education Facility Planner **40**(3&4): 29-33.
How many of us would choose to spend many hours of the day in a 750 SF room with 25 others sitting on hard chairs? Or be watched closely in prison-like settings as we eat lunch or play games? The ramifications of the new global order on our education system and, by extension, on the school building industry need new solutions to old problems.

Nair, P. and A. Gehling "Accommodating an education revolution: how Victorian schools are reorganising for the 21st century." Professional Voice **5**(3): 4.
The Victorian government's Building Futures program is an opportunity to do far more than simply make school buildings nicer. Making the environment nicer is likely to temporarily raise student achievement but Victoria wants more. Several Victorian schools have therefore made the decision to go much further and create learning environments that are truly student-centred and geared to teh needs of the 21st century communities. To understand the new direction that the Victorian communities are taking, it will be useful to see why school look the way they do today in order to recognise the imperative for transformational change.

Nair, P. and A. Gehling (2008). "Democractic school architecture: the community center model." VUE(Spring): 8.
A new model of school design would eliminate the "binary" structure that divides formal learning from students' own time and would foster student motivation and learning. There's a definite and unfortunate divide in school time between formal lessons, during which students have limited control over their learning, and students' own time, which is generally spent on social activities. The design of a majority of school buildings clearly reflects this divide. Formal learning takes place in classrooms and specialty areas like science labs while social learning is relegated to unfurnished corridors, institutional cafeterias, and outside spaces of variable quality. Under this prevailing model of school, bells that signal the end of classroom time actually invite students to "switch off" from learning.

Napier, M. A., B. B. Brown, et al. "Walking to school: Community design and child and parent barriers." Journal of Environmental Psychology **In Press, Accepted Manuscript**.

National Centre for 21st Century Schoolhouse Improving the Physical and Social Environment of School: The Effects of Building Renovation on Teaching and Learning, San Diego State University, College of Education**:** 10.
This paper explores the interplay between quality facilities, school climate, and student achievement, charting the effects of facility improvements on student and teacher attitudes, behaviors, and performance within schools undergoing renovations in a large Southern California urban school district. The research applies a Leadership-School

Building Design model (Authors, in press) to explore how school climate (academic press, teacher professionalism, and community engagement) interacts with six characteristics of facility quality, mediating their combined influence on student learning and achievement.

National Research Council (2006). Green Schools: Attributes for Health and Learning, Committee to Review and Assess the Health and Productivity Benefits of Green Schools, National Research Council**:** 192.

National Research Council (2006). Review and Assessment of the Health and Productivity Benefits of Green Schools: An Interim Report, Committee to Review and Assess the Health and Productivity Benefits of Green Schools, National Research Council**:** 80.

Nations, S. and S. Boyett (2002). So Much Stuff, So Little Space: Creating and Managing the Learner-Centered Classroom.**:** 69.
This is a straightforward guide to help kindergarten through fifth grade teachers make the most out of the least space by efficiently and effectively keeping track of all their stuff, from paperwork and lesson plans. to art supplies and bulletin boards. Individual chapters address how to handle disorderly closets and libraries, preparing for absences, keeping student information organized, and more.

Naylor, C. (1999). Violence in British Columbia Schools: New Research from Simon Fraser University and the British Columbia Teachers' Federation: Directions and Dilemmas: Section III. Part of the BCTF Information Handbook, B.C. Teachers' Federation, Vancouver, BC.

Nespor, J. (2000). Topologies of masculinity. Masculinities at school. N. Lesko, Sage Publications, Michigan.
Studies of masculinity have been largely absent from educational research. This book presents a collection of current critical scholarship on the creation of masculinities in schools. Contributors examine experiences in North American, Australian and British schools at all levels from preschool to graduation, and from school settings such as computer labs to the football field. The result is a thoughtful analysis of how masculinities are related to competing definitions of masculinity and femininity. The chapters show how masculinities are constructed among teachers, students and administrators, and locates these analyses within broader social, economic and ideological contexts.

Nespor, J. (2002). "Studying the spatialities of schooling." Pedagogy, Culture & Society **10**(3): 483 - 491.

Nespor, J. (2004). "Educational scale-making." Pedagogy, Culture & Society **12**(3): 309 - 326.
The article explores the complexities of educational scalemaking. 'Educational scales' are defined as the spatial and temporal orders generated as pupils and teachers move and are moved through educational systems; scales are 'envelopes of spacetime' into which certain schoolbased identities (and not others) can be folded. Scale is thus both an object and a means of power in educational practice. Using data from life history interviews with an elementary teacher in the USA, the article illustrates the multiplicity of scale-making processes, and raises the question of how certain scale definitions become more widely accepted and authoritative than others.

New, R. (2007). "Reggio Emilia As Cultural Activity Theory in Practice " Theory Into Practice <http://www.informaworld.com/smpp/title~db=all~content=t775653706> **46**(1): 5-13.

Newell, P. B. (1997). "A cross-cultural examination of favorite places." Environment and behavior **v29**(n4): p495(20).
Subjects from Senegal, Ireland, and the United States were asked (a) to identify their favorite place and (b) to give the reason it was chosen. The purpose was to see whether people from different cultures share a preference for certain environmental forms or features, built or natural, that could indicate the existence of cultural universals. The study found far more similarity in place preferences among the different cultures than differences between them, with each country generating almost identical categories of favorite places. Overall, 38% of the subjects identified their own place, belongings, or family home, and 61% identified some part of the natural environment. As favorite places, built environments--particularly those offering social interaction, such as sports centers and places of entertainment--were more often mentioned by those from Senegal. The reasons given for the choice of favorite place fell into place-centered, person-centered, and interactive perspectives.

Nicklas, M. and G. Bailey (1993). "Student performance in Daylit schools."
Findings, a. the students in full spectrum light were healthier and attended school 3.2. to 3.8. days more per year, b. libraries with superior light resulted in significantly lower noise levels, c. full spectrum lighting induced more positive moods in students, d. because of addition Vitamin D received by students they have 9 times less dental decay and grew in height an average of 2.1 more over 2 years than with average light, e. outperformed in standardised tests students in normally lit schools by 5-14% in short and long term, f. were negative effects in a middle school, g. placing students in temporary mobile classrooms had significant negative effects

Nie, Y. and S. Lau (2009). "Complementary roles of care and behavioral control in classroom management: The self-determination theory perspective." Contemporary Educational Psychology **34**(3): 185-194.
This study examined how classroom management practices--care and behavioral control--were differentially associated

with students' engagement, misbehavior, and satisfaction with school, using a large representative sample of 3196 Grade 9 students from 117 classes in Singapore. Results of hierarchical linear modeling showed differential relations. After controlling for students' gender and socioeconomic status, both care and behavioral control were positively related to student engagement. Moreover, behavioral control was a significant negative predictor of classroom misbehavior and care was a significant positive predictor of satisfaction with school. Our findings underscore the importance of blending care and behavioral control to achieve multiple goals of classroom management.

Nigaglioni, I. (2005). "Reinventing the traditional classroom." Education Facility Planner **40**(3&4): 3-8.
Classroom designs have remained unchanged since the turn of the century, yet the delivery of education has changed over time. Designers need to rethink classroom designs to respond to changing educational delivery methodologies.

Noschis, K. (2007). School building design and learning performance: with a focus on schools in developing countries. 12th architecture & behaviour colloquium, Ascona, Switzerland, Comportements.
The XII Architecture & Behaviour Colloquium took place in Monte Verita (Ascona, Switzerland) from March 29 to April 1, 2006 and was a very productive meeting. Its theme was Architectural Quality in School Buildings: School Building Design and its Relevance to Students' Learning Performance – With a Specific Focus on the Planning and Design of Schools in Developing Countries.

NYC Department of Education (2009). School of One, Program Overview Video., NYC Department of Education.
Describes New York City's multi-faceted School of One teaching program that combines classroom, individual, and virtual learning customized to a student's skills and interests. This educational delivery system relies on a variety of teaching spaces and personnel.

Nye, B., L. Hedges, et al. (2001). "**The Long-Term Effects of Small Classes in Early Grades: Lasting Benefits in Mathematics Achievement at Grade 9** " The Journal of Experimental Education **69** (3).
Reducing class size to increase academic achievement is a policy option currently of great interest. Although the results of small-scale randomized experiments and some interpretations of large-scale econometric studies point to positive short-term effects of small classes, some scholars view the evidence as ambiguous. Project STAR in Tennessee-a 4-year, large-scale randomized experiment on the effects of class size-provided persuasive evidence that small classes have immediate positive effects on academic achievement. Unlike most other early education interventions, these effects persisted for several years after the children returned to regular-sized classes. The authors of the present article report analyses of a 6-year follow-up of the students in that experiment. Class-size effects persisted for at least 6 years and remained large enough to be important for educational policy. The results suggest that small classes in early grades have lasting benefits and that those benefits are greater for minority students than for White students.

Oblinger, D. (2005). Space as a Change Agent. Learning Spaces. D. Oblinger and J. Oblinger. Boulder, Educause.

Oblinger, D. (2006). Learning Spaces. D. Oblinger, Educause.
Space, whether physical or virtual, can have a significant impact on learning. Learning Spaces focuses on how learner expectations influence such spaces, the principles and activities that facilitate learning, and the role of technology from the perspective of those who create learning environments: faculty, learning technologists, librarians, and administrators. Information technology has brought unique capabilities to learning spaces, whether stimulating greater interaction through the use of collaborative tools, videoconferencing with international experts, or opening virtual worlds for exploration. This e-book represents an ongoing exploration as we bring together space, technology, and pedagogy to ensure learner success.

Oblinger, D., Ed. (2006). Learning Spaces, Educause.
Space, whether physical or virtual, can have a significant impact on learning. Learning Spaces focuses on how learner expectations influence such spaces, the principles and activities that facilitate learning, and the role of technology from the perspective of those who create learning environments: faculty, learning technologists, librarians, and administrators. Information technology has brought unique capabilities to learning spaces, whether stimulating greater interaction through the use of collaborative tools, videoconferencing with international experts, or opening virtual worlds for exploration. This e-book represents an ongoing exploration as we bring together space, technology, and pedagogy to ensure learner success.

O'Brien, L. and R. Murray (2006). A marvellous opportunity for children to learn: A participatory evaluation of Forest School in England and Wales, Forestry Commission**:** 54.

OECD (2001). Designs for learning: 55 Exemplary Educational Facilities, OECD**:** 169.

OECD (2005). Defining principles and criteria for assessing quality in educational facilities, 1ST AD HOC EXPERTS' GROUP MEETING ON EVALUATING QUALITY IN EDUCATIONAL FACILITIES, 1-3 JUNE 2005, LISBON, PORTUGAL**:** 22.

OECD (2005). Draft Report: 1st ad hoc experts' group meeting on evaluation quality in educational facilities. Lisbon, Portugal, OECD**:** 22.

The objectives and related themes of the *ad hoc* experts' meeting on evaluating quality in educational facilities were threefold: 1. *To define a set of international principles and criteria for assessing quality in educational facilities*. This theme explored the concept of "quality in educational facilities", as defined by current research, practice and policy. It also reflected on the constraints and possibilities of establishing universal principles and criteria of quality. 2. *To discuss methodologies used to measure these criteria in different countries*. This theme investigates the nature and effectiveness of existing methods by which quality has been measured in different countries, as it relates to educational facilities, and the transferability of these methods. 3. *To consider options for an international methodology for assessing quality in educational facilities.* While studies such as the OECD Programme for International Student Assessment (PISA) seek to define and measure quality learning environments, few international studies have focused on the importance of the built environment in providing quality learning environments. In this theme, experts were asked to make recommendations for international methodologies or research tools. This report summarises the findings of the experts' group on evaluating quality in educational facilities. It is organised in three parts. The first part provides a summary of the presentations from the first theme of the meeting, addressing the nature and international transferability of design principles and criteria for assessing quality in educational facilities. It concludes by presenting the conclusions of the first working group on this theme, outlining a preliminary framework of seven principles for assessing quality in educational facilities and factors to take into consideration when defining quality framework for educational buildings. The second part of the paper describes the different tools that have been used to assess quality in educational facilities, as presented by experts in the second theme of the meeting, and the results of the working group on this topic. The final part of the report makes a series of recommendations for further work in this area, in addition to presenting issues for further consideration.

OECD (2009). Creating Effective Teaching and Learning Environments: First Results from TALIS. Teaching And Learning International Survey, ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)**:** 305.

The principal objective of this manual is to provide a practical, user-friendly guide for those involved in the International Pilot Study o n the Evaluation of Quality in Educational Spaces (EQES): national coordinators and research teams, teaching staff, students, school principals and others. The purpose of the pilot project is to assist education authorities, schools and others to maximise the use of and investment in educational spaces. The manual describes four research tools, which countries are require to implement: 1. Priority-rating exercise for OECD quality performance objectives 2. Educational facility analysis 3. Student and teaching staff questionnaires 4. Focus groups - at least one staff and one student. The methodology for this pilot study will be guided by the CELE Organising Framework on Evaluating Quality in Educational Spaces. The Framework consists of two dimensions. The first dimension addresses how "quality" is defined within the context of policy issues. The second dimension presents important characteristics in the process of evaluating aspects of quality. The matrix in Annex 1 illustrates the relationship between these dimensions. The objective of the Framework is to demonstrate the interrelationships over a space's life cycle between the broad policy issues that both shape and respond to quality issues in educational spaces; current conception of what defines "quality" in education spaces; the demands and benefits of the space to its numerous users and other stakeholders; and appropriate methods that can be used to evaluate different aspects of quality. This framework is not intended to serve as a checklist. It is a multi-dimensional, policy-oriented tool that will be used in this and other OECD projects to help discern the most appropriate means by which to evaluate different aspects of quality in educational spaces in different countries at local, regional and/or national levels. It can also be used by individual countries to assess "quality" in terms of their own goals and priorities.

Ornstein, A. C. (1995). "Teaching Whole-Group Classrooms: What Principals Should Know." NASSP Bulletin **79**(570): 70-81.

There are many reasons for teaching to the whole group in the classroom. This synthesis of research explores these reasons and the research reports upon which they are based.

OSE (2004). OSE Principals' Meeting: Review of feedback. OSE Principals' Meeting. Melbourne Convention Centre, Office of School Education (OSE)**:** 23.

Ozdemir, A. and O. Yilmaz (2008). "Assessment of outdoor school environments and physical activity in Ankara's primary schools." Journal of Environmental Psychology **28**(3): 287-300.

Outdoor school environments are sites for play and physical activity for many children, and shortcomings within these environments are considered significant factors that contribute to children's inactive lifestyles and high levels of childhood obesity. This study explores the associations between the physical characteristics of schoolyards and the physical activity of third and fourth year students in five Turkish primary schools. Data were collected through multiple methods, including behavior mapping of student activities during recess, physical assessments of schoolyards, and interviews with students, teachers and administrations. The findings show similarities in the landscape features and physical qualities of schoolyards, particularly in the types of play and activities in which students engage. Results indicated that active students who walk to and from schools have lower body mass index (BMI) values than passive students, and students in schools with larger yards have lower BMI values. Most of the students prefer spacious and vegetated yards. A major concern is the crowdedness of the yards during recess that limit children's activity.

Schoolyards with advanced landscape features are preferred more, and this in turn affects students' positive satisfaction. Outdoor school environments have a correlation to health outcomes and should be designed to promote more activity. Improving the physical and landscape qualities of the public schoolyards should be the primary concern of the designers in order to increase awareness of natural environment and more important, increase the health of children.

Packer, S. (2008). Time to rebuild. Australian Educator. **Spring:** 4.
Evidence of the lack of capital investment in Australia's public schools is as stark as i is startling in a new, independent report commissioned by the AEU. The report reveals that between 2002 and 2005, annual investment in maintaining and improving school facilities barely moved from the national average of $540 per students. During the same years, private school capital spending on infrastructure increase from $1380 to $1560 per student.

Paechter, C. (2004). "Metaphors of space in educational theory and practice." Pedagogy, Culture & Society **12**(3): 449 - 466.
Space is largely ignored in both the theory and the practice of education. At the same time, however, there is an abundance of spatial metaphors that are used to describe schooling, the curriculum and educational processes. Some of these (top of the class, department) have their origins in spatial arrangements that once dominated schools and schooling, while others (curriculum area, field, baseline assessment) seem to derive from a spatial imagination that has crept into educational discourse despite its overt privileging of issues of time. This article examines the variety of spatial metaphors used in educational discourses and demonstrates how they are used in different ways for different aspects of and approaches to educational processes. The discourses around these various spatial metaphors both illuminate and constrain the ways in which we think about educational processes and learners' relationships with them.

Paechter, C. (2004). "Power relations and staffroom space." Forum **46**(1): 33-35.

Paechter, C. (2004). "Space, identity and education." Pedagogy, Culture & Society **12**(3): 307 - 308.

Paechter, C. (2004). "Spatialising power relations in education." Pedagogy, Culture & Society **12**(3): 467 - 474.
Lost Geographies of Power JOHN ALLEN, 2003 Oxford: Blackwell 232 pp., ISBN 0 631 207287 (paperback), £16.99

Pallas, A. M. "Meeting the Basic Educational Needs of Children and Youth." Children and Youth Services Review **In Press**.
This article examines policies and programs designed to meet the basic educational needs of American children and youth, with an emphasis on promoting cognitive skill development through K-12 schooling. Building on an appraisal of the weak technology for promoting cognitive development and the lack of a robust research literature on what works, I examine patterns in educational achievement across the nation, and their association with students' social characteristics, and follow with an assessment of the standing of the U.S. in international perspective. I then consider the federal role in K-12 education, particularly the legacy of the No Child Left Behind Act, and subsequent concerns with increasing teacher capacity and system-changing via increased school choice. Because these policy strategies lack a powerful theory of teaching and learning, their potential for enhancing student achievement remains more a matter of faith than of certainty.

Parnell, R., V. Cave, et al. (2008). "School design: opportunities through collaboration." CoDesign: International Journal of CoCreation in Design and the Arts **4**(4): 211 - 224.
This paper explores the process of involving the whole school community, especially teachers and students, in the design of schools. A series of semi-structured interviews were conducted with a range of professionals who have worked with target users in this development process. The interviews were transcribed and then common themes from each of the interviews were developed. Findings suggest that a host of opportunities arise from the special mix of different processes, professions and people involved in school design, but that these are not always being recognised or exploited. The need to acknowledge the opportunities which lie within the process and to not just be fixed on the product – the finished school – appears to be significant. It transpires that the perception of the process from the different perspectives of all involved has an impact on the way in which the process unfolds. The proposed outline model conceptualises the school design process as a collection of opportunities which can arise from collaborative working. Suggestions are made for further research.

Parsons, R. (1991). "The potential influences of environmental perception on human health." Journal of Environmental Psychology **11**(1): 1-23.

Pasalar, C. (2003). The effects of spatial layouts on students' interactions in middle schools: Multiple case analysis. Design, North Carolina State University. **PhD:** 293.
This research aims to indicate how small school environments are spatially organized and how spatial relationships influence students' behavior and interactions. Four school buildings with differing spatial layouts were selected. Selected cases were representative of both 'academic house' and 'finger plan' type school buildings. This study analyzes schools as a spatial organization; as a social organization; and as a set of interactive interfaces for social and educational activities. The 'space syntax' technique was used to develop the spatial data, which provided information on the spatial

layout attributes. The integrated and segregated areas of each school building were characterized by the syntactic variables. Behavioral mapping technique was used to identify students? activity and movement patterns with respect to the syntactic attributes of spatial layouts. Both findings from the analysis of students' behavior and the spatial layouts were related to students' perceptions about the social organization of their school communities and the role of the spatial characteristics. Overall analysis provides evidence suggesting that spatial layout and distribution of educational facilities in school buildings modulate patterns of use, movement, and the potentials for interactions. School building layouts, with higher accessibility, shorter and direct walking distances, and highly visible public spaces, generated higher rates of incidental interactions among students. The space occupancy rate in highly accessible areas was also correlated with students? movement and interaction rates. Students' ability to get to know others in the same grade through interactions was higher in academic house type school buildings. However, the rate to know students from different grade levels was higher in finger plan type schools, which offered better visual and physical access among the public areas. Overall findings indicated that single-story school buildings were the more advantageous for fostering social interactions among students. This study provides the impetus to further reconsider and develop innovative educational facilities and their spatial planning. The study concludes that spatial layout of school buildings is an important constituent of both formal and incidental interactions among students.

Pasalar, C. (2007). Spaces for learning through better social interaction. School building design and learning performance with a focus on schools in developing countries: proceedings of the 12th Architecture and Behaviour Colloquium, Lausanne, Switzerland.

Today's schools in US are facing new challenges as a result of the rapidly changing social and cultural values of communities. Increasing student enrolments in schools across US and spatial needs to accommodate changing educational practices have been facilitating the required changes in the design of school buildings. A growing number of researchers agree that building better designed school buildings generate more stimulating environments, for learning and social interaction. Students in stimulating school environments, who are socially engaged with their school community, tend to achieve better in class activities and gain skills. The need for more new school buildings to be constructed as well as the existing ones to be renovated increases the urgency of understanding how different school building designs function and respond to the needs of both students and teachers.

Patton, J., J. Snell, et al. (2001). A Survey Study of Elementary Classroom Seating Designs. Paper Presented at the Annual Meeting of the National Association of School Psychologists.**:** 8.

This paper presents the results of a two-part study that investigated classroom seating design preferences among elementary classroom teachers. In part one, the researchers mapped and classified seating arrangements that were in actual use across 294 regular classrooms (grades K-5) in 21 public elementary schools. Subsequently, the researchers asked 138 elementary regular classroom teachers (grades K-5) to describe, in a survey, the occasions and their rationales for the seating designs they typically employed. In contrast to outcomes from research conducted a decade ago, and irrespective of grade level and school socioeconomic status, results showed that small group cluster designs were now used pervasively (i.e., in 76 percent of observed classrooms, and by 94 percent of surveyed respondents), apparently because many contemporary teachers believe that this type of seating arrangement contributes directly to students' educational growth through the effects of socially facilitated learning.

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Payne, W. (2010). "Classrooms/Small Learning Spaces." School Planning & Management **49**(1): 80-81.

The article discusses the four characteristics of effective classroom designs. It says that continuing revelations in educational research and new curriculum trends have changed education in the U.S. It says that schools should strive to develop classrooms that can be instantly refigure and use movable chairs and tables to maximize agility. Moreover, it stresses the importance of daylighting to teaching and learning outcomes as well as the proper training for students on advanced technology.

Pellegrini, A. D., P. D. Huberty, et al. (1995). "The Effects of Recess Timing on Children's Playground and Classroom Behaviors." American Educational Research Journal **32**(4): 845-864.

Three field experiments were conducted to determine the effects of different recess timing regimens on children's classroom and recess behaviors. Experiment 1 involved children in Grades K, 2, and 4. The timing of their recess was experimentally varied by 30 minutes. Students' classroom behavior before and after recess was observed as was their

outdoor recess behavior. Children's prerecess inattention varied as a function of deprivation duration. Further, children, but especially boys, were more socially interactive on the playground following the long deprivation, compared to the short deprivation. Recess behaviors did not relate significantly to postrecess inattention. However, inattention rates were higher before recess than after. Experiment 2 utilized a similar paradigm with a sample of second and fourth graders from the same school. Experiment 2, generally, replicated results from Experiment 1. In Experiment 3, which utilized a replication sample design, children s recess was also manipulated, but the recess period was indoors. Results of the two samples replicated each other and the preceding experiments. Results are discussed in terms of play deprivation theory and massed versus distributed practice.

Penton Media (2010). Choosing Champions, Penton Media, Inc. **82:** 12-12.

Information about the considerations in judging the winning designs for education facilities, discussed at Overland Park in Kansas by the five jury members of the 2009 Architectural Portfolio competition is presented. Successful designs should meet the stated goal, enhance learning by inspiring creativity, and be sustainable while considering the facility as a learning tool.

Picus, L. O., S. F. Marion, et al. (2005). "Understanding the Relationship Between Student Achievement and the Quality of Educational Facilities: Evidence From Wyoming." PJE. Peabody Journal of Education **80**(3): 71-95.

A growing issue in school finance adequacy relates to the condition of school facilities and the roles that the condition of those facilities plays in student learning. Using the results of standardized test scores from Wyoming students and a detailed assessment of every school building in the state of Wyoming, it can be concluded that there is essentially no relationship between the quality of school facilities and student performance when other factors known to impact student performance are accounted for. This does not suggest investments in school facilities are not important - all children are entitled to attend school in safe, clean, and appropriate educational environments. However, policymakers should be aware that investments in facilities by themselves are unlikely to improve student learning.

Pivik, J. R. (2010). "The perspective of children and youth: How different stakeholders identify architectural barriers for inclusion in schools." Journal of Environmental Psychology **In Press, Corrected Proof**.

Recent inclusive policies are promoting the involvement of individuals with disabilities in identifying barriers that limit their full participation and inclusion in public spaces. The present two studies explored the contributions provided by different stakeholder groups in the identification of architectural barriers in elementary and secondary schools. In each school, the principal, special education resource teacher and a student independently identified architectural barriers using an observational walkthrough method. The first study consisted of 29 schools where the student evaluator had a physical disability and the second study consisted of 22 schools where the student evaluator did not have a disability. The results of both studies showed that students identified the greatest number of barriers and principals the least. The type and location of identified barriers are explored and the conclusions are examined in relation to person-environment congruence. The results highlight the efficacy of youth involvement and provide support for collaborative assessments that equitably involve all stakeholders in inclusive environmental assessments.

Plank, S., C. P. Bradshaw, et al. (2009). "An application of "broken-windows" and related theories to the study of disorder, fear, and collective efficacy in schools." American Journal of Education **115**(February): 227-247.

This article considers school climate and perceptions of social disorder. When a school is characterized by disorder or physical risk, basic educational goals and processes are jeopardized. We use survey data from 33 public schools serving grades 6-8 in a large mid-Atlantic city to examine relationships among physical disorder (e.g. broken windows and poor building conditions), fear, collective efficacy, and social disorder. Path analyses reveal a direct association between physical disorder and social disorder even when prior levels of collective efficacy are controlled - a finding consistent with traditional broken-windows theories. Further, there is evidence that the effects of physical disorder may be operating through increased fear and decreased collective efficacy to affect perceptions of threatening or violent interactions among people.

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Price Waterhouse Technical report: Building Schools of the Future UK Review of Evidence on the impact of school buildings on educational performance.

Review of literature indicates that school design affects learning. Design attributes such as noise. Heat. Cold light and

air quality impact on teaching and learning Negative impact of poor design on pupils and staff is clearly evident: there are clear links between poor quality of schools design and poor outcomes. Adequate temperature control; lighting, air quality and acoustics have negative impacts on attention, behaviour, attendance and ultimately attainment. The evidence suggest bringing poorer environments up to an adequate level. The additional benefit of good design for already adequate environment is less clear. There very limited evidence of the additionality of improving environments that are already adequate.: evidence points towards build quality (positive outdoor spaces and ease of movement) , light(daylight and ease of control of levels), colour, display and storage but the evidence is not equivocal. The condition of the school building affects learning: quantitative research shows a clear link exits between overall school building condition (as distinction from age) an d pupil attainment. Building age is not an indicator of a building's impact on pupil performance. Links building quality to improved student behaviours and attitudes and teacher morale. Some evidence that capital investment in school buildings has a positive impact on pupil performance . Modest evidence of a positive relationship between capital investment and increased educational outcomes. But physical variables are one of many, and wide range of other factors impact on pupil performance and school effectiveness. ICT investment has a positive impact on outcomes. It can have a positive effect on student motivation and engagement. However, higher pupil attainment as a result of using ICT could be an indicator of better teaching and contextual factors as opposed to use and impact of ICT per se. User participation in the process of school design is important. Involvement to users is important in design of buildings and pupils benefit when they are involved in building planning and design .

Price Waterhouse (2003). Building better performance: an empirical assessment of the learning and other impacts of schools capital investment, Department for Education and Skills**:** 71.

The quantitative research presented in the current report, 'Building Better Performance', develops the original research and, in particular, examines the relationship between different types of capital spending and pupil performance. The methodological approach involved collecting quantitative data, for the period 1990-2000, in relation to capital spending, pupil performance and a range of other factors across all schools in 3 local authorities in England. The final database contained information on more than 900 schools. The main focus of the analysis was on (a) whether a differential statistical association could be identified between the various types of capital spending and pupil performance, and (b) whether there was any evidence to suggest a causal relationship between any of the different types of capital spending and pupil performance. The key quantitative findings from the study are as follows: The research provides some additional evidence showing a positive and statistically significant association between capital investment and pupil performance; The most significant evidence, from a statistical point of view, is in relation to community primary schools. This is due to a number of issues relating to data quality and coverage for other types of schools; and In terms of the different types of capital investment, the strongest positive findings are in relation measures of investment which can be related directly to the teaching of the curriculum (e.g. ICT-related capital spending, science blocks etc, referred to by the DfES as 'suitability' investment).

Proshansky, H., A. Fabian, et al. (1983). "Place identity: physical world socialisation of the self." Journal of Environmental Psychology(3): 57-83.

Prue, C. (2003). "Classrooms for the Future: an adventure in design and research." ARQ: Architectural Research Quarterly **7**(3/4): 244-261.

In 2000, the UK Government Department for Education and Skills (DfES) piloted 27 new primary school projects around the country in an initiative called 'Classrooms of the Future'. Starting with a polemical question: what is "Classroom of the Future", it encouraged both a design-led approach and an exploration of where the theory of the classroom design meets teaching practice. David Miliband, the government minister involved, described the challenge as 'designing inspiring buildings that can adapt to educational and technological change' (DfES, 2002a). Chris Bissell from the DfES, the initiator of "Classrooms of the Future" summed up his expectations: to deliver the best and most effective education exploiting all the possibilities of the information age, school buildings need to reflect advances in technology. They need to provide a pleasant and comfortable environment for learning and to use architectural and design features to stimulate children's imaginations. And they need to be open to wider use, binding schools to their local communities.

Pykett, J. (2009). "Pedagogical power: Lessons from school spaces." Education, Citizenship and Social Justice **4**(2): 102-116.

While accounts of the so-called `Totally Pedagogised Society' (Bonal and Rambla) or `Public Pedagogy' (Giroux) have been important to our conceptions of civil society, democracy and education, lessons can be drawn from schooling which complicate this story and undermine any simple division between the state, civil society and non-governmental organizations, in relation to both formal education and the broader narratives of radical or critical pedagogy. This article develops an account of pedagogical power which values the inciting and enabling practices of pedagogy as the art of teaching. It then considers pedagogical forms of power both within formal state schooling in the UK and the pedagogical strategies employed by non-governmental organizations within and outside of the formal educational sphere -- arguing that the latter does not automatically promote values of social justice and democracy.

Rylmer, M. (2003). "Pedagogical furniture." Arkitektur DK **47**: 120-123.

A look at the special furnishings designed specifically for this elementary school without classrooms.

Radcliffe, D., H. Wilson, et al. (2008). Designing Next Generation Places of Learning: Collaboration at the Pedagogy-Space-Technology Nexus, Australian Learning and Teaching Council**:** 20.

Radii (2005). Planning and accountability for school improvement: National and International Literature Review**:** 37.

Rathey, A. (2004). "High-Performance Maintenance." American School & University **77**(2): 50.
Focuses on the relation between the physical condition of a school and its performance. Comparison of the test results of California district students with most daylight with that of lower levels of daylight; Effect of indoor air quality on the performance of students and teachers; Benefits offered by schools which have productive educational facilities.

Read, M. A., A. I. Sugawara, et al. (1999). "Impact of Space and Color in the Physical Environment on Preschool Children's Cooperative Behavior." Environment and behavior **31**(3): 413-428.
Design elements within child care facilities are thought to have important effects on children's behavior. Empirical studies that examine features of the physical environment, such as color, wall surfaces, and vertical space, and how they affect development are sparse. Using Gibson's Ecological Theory of Visual Perception, this study investigated the impact that differentiated space, including changes in ceiling height and wall color, has on children's cooperative behavior. Thirty preschool children experienced four different spatial conditions in small groups. Multivariate repeated-measures analyses of variance indicated that differentiation in ceiling height or wall color were related to higher levels of cooperative behavior among preschool children. As well, developmental level and gender were significant predictors of children's cooperative behavior between spatial conditions. Findings from this study can benefit preschool administrators and designers concerned with developing children's environments that encourage cooperative behavior in preschool children.

Research, F. (2006). Evaluation of Forest School: Phase 2 - England, Forest Research, UK.

Rettig, M. D. and R. L. Canady (1998). "High Failure Rates in Required Mathematics Courses: Can a Modified Block Schedule Be Part of the Cure?" NASSP Bulletin **82**(596): 56-65.
Given the diversity in public schools and the growing trend toward requiring the successful completion of Algebra I for graduation, a schedule that allows students to complete this course in different amounts of time may be one key to success.

Reynolds, P. (2003). "Modular Buildings." School Planning & Management **42**(3): 36-38.
Describes the testing by Berkeley lab scientists of an experimental ventilation system to improve indoor air quality in portable classrooms and use a third of the energy of current systems.

Richards, J. M., Jr. (1990). "Units of Analysis and the Individual Differences Fallacy in Environmental Assessment." Environment and behavior **22**(3): 307-319.
The "Ecological Fallacy" is the error of interpreting results based on ecological entities, such as environmental settings, as though the results apply to individuals. This article argues that it is equally erroneous to interpret results based on individuals as though the results apply to settings, and suggests this error be labelled the "Individual Differences Fallacy." Hypothetical data were used to illustrate two conditions for an instrument intended to assess the characteristics of classroom environments. In the first condition, the instrument actually measured differences among individuals; in the second condition, it achieved its goal of measuring differences among settings. When individuals were the units of analysis, results either were inconclusive or incorrectly suggested that the measure of individual differences was superior. Correct and interpretable results were obtained only when environmental settings were the units of analysis. Therefore, future research on environmental assessment should use settings as the primary units of analysis.

Riehl, C. and J. W. Sipple (1996). "Making the Most of Time and Talent: Secondary School Organizational Climates, Teaching Task Environments, and Teacher Commitment." American Educational Research Journal **33**(4): 873-901.
The relationships among teachers' task environments, more general characteristics of school organizational climates, and teachers' professional and organizational commitments were examined. Data were derived from the 1987-1988 National Center for Education Statistics Schools and Staffing Survey; the study was based on a sample of 14,844 secondary school teachers. Task environment was operationalized in terms of structural features of teachers' class schedules, and school climate was measured in terms of administrative support, teacher influence and autonomy, and collegiality. Results suggest that, while teachers' professional commitment and organizational commitment were unrelated to teachers' class schedules, commitment was associated with school climate.

Riehl, C. J. (2000). "The Principal's Role in Creating Inclusive Schools for Diverse Students: A Review of Normative, Empirical, and Critical Literature on the Practice of Educational Administration." Review of Educational Research **70**(1): 55-81.
Public schools in the United States are serving a more heterogeneous student population now than ever before. Drawing on normative, empirical, and critical literatures, this review explores the role of school administrators in responding to the needs of diverse students. Three administrative tasks are highlighted: fostering new meanings about

diversity, promoting inclusive school cultures and instructional programs, and building relationships between schools and communities. Administrative work that accomplishes these tasks can be thought of as a form of practice, with moral, epistemological, constitutive, and discursive dimensions. Inclusive administrative practice is rooted in values of equity and social justice; it requires administrators to bring their full subjectivities to bear on their practice, and it implicates language as a key mechanism for both oppression and transformation.

Rinaldi, C. (2006). In dialogue with Reggio Emilia: listening, researching and learning. New York, Routledge

Ringli, K. (2008). "Eins und eins ist mehr als zwei. (German)." One and One is More than Two. (English)(12): 14-19.
Schoolhouse in Steinach by Gut Deubelbeiss Architects In their design for the schoolhouse in Steinach the young architect duo Gut Deubelbeiss first of all clarified a number of manageably sized, controllable units: for instance on the upper level, where sliding-folding walls and sliding doors can rapidly transform the four classrooms and two group rooms that make up each cluster in larger or smaller "landscapes for learning". The architects then multiplied this module to create the required size and coupled it with the other functional units. The colour concept by Jorg Niederberger is also based on the same elementary, additive logic: a palette of six colours is used in the classrooms, two for each room. The choice and diversity of the colours produces a "forest of colours" that, together with the usual utensils and objects in the teaching spaces, creates an astonishing balanced spatial impression. This approach reflects the intention to gauge the architecture according to the individual: the needs of the children and teachers are responded to and architectural means are employed to supply answers to important topical educational themes such as heterogeneity and individualisation.

Rivera-Batiz, F. L. and L. Marti (1995). A School System at Risk: A Study of the Consequences of Overcrowding in New York City Public Schools. , IUME: Institute for Urban and Minority Education, Teachers' College, Columbia University, New York.
This research report presents data showing that overcrowding in the New York City public schools is having significantly negative effects on instruction and learning in the system. The impact is particularly strong in schools that have a high proportion of students of low socioeconomic background, where overcrowding is sharply linked to lower achievement. In New York City, enrolment growth has been quick and is occurring at all grade levels. Ninety-one of 111 high schools (82 percent) were operating above their capacity in 1993-94, and 415 of 774 (56 percent) elementary school buildings were above their capacities. Data from the Board of Education document the overcrowding, and a study of four overcrowded schools (130 percent above utilization rate) with surveys of 213 teachers and 599 students, indicates attitudes toward school crowding. Both students and teachers feel deeply affected by overcrowding, with many considering it the most serious issue facing the schools. Both students and teachers feel overwhelmed, discouraged, and often disgusted. Four tables present study findings.

Rivlin, L. G. (1990). "Home and Homelessness in the Lives of Children." Child & Youth Services **14**(1): 5 - 17.
An analysis of the impacts of diverse forms of homelessness in children is presented and the specific roles that homes play in people's lives. The significance of settings to social, emotional and cognitive development of children is outlined. The roles of personal space and personal places are considered including territoriality and place identity. A conception of person/place attachments is offered based on the role of lifestyle, home and neighborhood attributes, affiliations with others and the temporal patterns of these relationships. Implications for homeless children are addressed.

Rivlin, L. G. and C. S. Weinstein (1984). "Educational issues, school settings, and environmental psychology." Journal of Environmental Psychology **4**(4): 347-364.
This paper reviews selected research on classroom and school environments, using a framework that views schools from three perspectives--as places for learning, as places for socialization and as places for psychological development. Studies are included that deal with the impact of noise and classroom design on learning; the relationship between seating position, achievement and status; spatial cognition; the classroom environment and sex role stereotyping; privacy; and density. The need for classrooms to enhance children's feelings of competence, security and self-esteem is also stressed. The goal of the paper is to point out ways in which environmental psychologists can contribute to the improvement of the educational system and to the quality of life in schools.

Roberts, L. (2009). " Measuring school facility conditions: an illustration of the importance of purpose." Journal of Educational Administration **47**(3): 368-380.
Abstract: Purpose – The purpose of this paper is to argue that taking the educational purposes of schools into account is central to understanding the place and importance of facilities to learning outcomes. The paper begins by observing that the research literature connecting facility conditions to student outcomes is mixed. A closer examination of this literature suggests that when school facilities are measured from an engineering perspective, little connection to learning outcomes is evident. By contrast, when school facilities are rated in terms of educational functions, a connection to learning outcomes is apparent. Design/methodology/approach – The paper provides an empirical test of the educational relevance of how school facilities are measured. Using the schools in a Canadian division, the condition of school facilities was measured in two ways, including both conventional, engineering tools and a survey capturing principals' assessments. School facility ratings using these alternate measurement methods were correlated with

schools' quality of teaching and learning environments (QTLE). Findings – Two central findings emerge. First, engineering assessments of facilities are unrelated to the QTLE in schools. Second, educators' assessments of school facilities are systematically related to the QTLE in schools. Originality/value – The findings indicate that more research needs to be directed at developing sound tools for measuring school facilities in terms of their educational relevance. In addition, school administrators need to reconsider policies that devalue the contribution that facilities make to learning outcomes.

Robinson, V., M. Hohepa, et al. (2009). School Leadership and Student Outcomes: Identifying What Works and Why Best Evidence Synthesis, Ministry of Education: Best Evidence Synthesis Iteration (BES)**:** 291.

The new synthesis of 134 New Zealand and overseas research studies or reviews has been developed collaboratively using Ministry of Education guidelines. Professor Viviane Robinson and Dr Margie Hohepa at the University of Auckland were lead writers for this synthesis of effective leadership practices. The big finding of the BES is that when school leaders promote and/or participate in effective teacher professional learning this has twice the impact on student outcomes across a school than any other leadership activity. New Zealand principals spend less time on those activities that make most difference than many of their international peers. In New Zealand the mean effect size for student gain from a year's teaching is .35. Another key finding in this BES is that when school leaders promote or participate in effective teacher professional learning and development they have more than twice this impact across a whole school, not just one class. The BES findings come to life for readers through vignettes and easy-to-read cases (p.214 onwards).These cases provide examples of principals and others in leadership activities that advance achievement and social outcomes for students. The theory included in the synthesis explains how and why is critical to enable leaders to adapt and use the findings in their own contexts. This BES is of relevance to all who have a leadership role in advancing valued outcomes from schooling including principals, middle management, other professional leaders, school trustees, policy makers and those who have a role in supporting the work of schools through research and teaching in the tertiary sector. The quality and relevance of this new best evidence synthesis has been partly due to the help given by New Zealand principals' associations and teacher unions in the process of its development. For example, in their foreword to the document NZPF explain: 'The New Zealand Principals' Federation as one of the instigators of the School Leadership and Student Outcomes BES, gave feedback to the writers during the creation of this work. NZPF representatives robustly challenged and scrutinised this work as it progressed, and we now welcome its completion and its affirmation of the importance of principals' leadership. The strengths of this BES lie in its potential to be used by school leaders as a formative tool….we recommend that principals use this BES as a personal tool.'21 New Zealand leadership groups and organisations have endorsed this new BES.

Rogers, V. (2005). Some Efficient and Effective Classroom Designs That Accommodate Technology for Promoting Learning.**:** 5.

In recent years there has been an increased emphasis on the design of classrooms so that instructional technologies will enhance the learning environment. Good design does not happen accidentally, and when classroom designs are in the planning stages, the first priority should be the needs of the students. This paper discusses classroom design issues that can effectively and efficiently accommodate technology for promoting learning.

Roman, M. (2002). "Realistic Planning with Portable Classrooms." School Planning & Management **41**(7): MB6-MB9.

A brief narrative description of the journal article, document, or resource. Discusses why it is not wise to address the need for short-term space with the least expensive portable classrooms available. Explains that the problem is not that minimum specification trailers deteriorate rapidly with poor maintenance, but that perceived short-term requirements often turn out to be long-term. Asserts that portable classrooms should be considered as part of the permanent facilities plan.

Ronald Henderson Research Foundation (2005). Social capital and education: An economic perspective**:** 16.

Rosas, S., J. Case, et al. (2009). "A retrospective examination of the relationship between implementation quality of the coordinated school health program model and school-level academic indicators over time.(Research Article)(Report)." Journal of School Health **79**(3): 108(8).

BACKGROUND: Although models such as the coordinated school health program (CSHP) are widely available to address student health needs, school professionals have been unconvinced that scarce resources should be allocated to improving student health. Concern that attention may be diverted from meeting academic accountability goals is often seen as a reason not to attend to student health. Despite continuing calls for the study of multicomponent health programs in relation to educational achievement, the understanding of the extent to which adherence to the characteristics of CSHP contributes to or compromises academic outcomes over time remains incomplete. METHODS: A retrospective study was conducted of CSHP implementation across 158 public schools in Delaware, serving grades K-12. Using a doubly multivariate design, this study examined 3 levels of CSHP implementation across 5 school-level academic indicators for 3 years. Indicators included school performance, school progress, and aggregated student performance in 3 content areas--reading, mathematics, and writing. Data for the years prior to, during, and following implementation of CSHP were analyzed. RESULTS: Multivariate main effects of year by implementation level were detected. CSHP schools with high levels of implementation had better school-level performance and progress ratings. CSHP implementation did not have an effect on reading, math, and writing indicators, though all groups showed significant

improvements over time in these areas. CONCLUSIONS: Results of this study suggest that quality implementation of CSHP does not adversely impact school-level academic indicators over time. Moreover, findings suggest a better fit with school-wide accountability indicators than with specific content-based achievement indicators. Keywords: coordinated school health; academic accountability; doubly multivariate design; program implementation.

Ross, J., A. Hogaboam-Gray, et al. (2004). "Prior Student achievement, collaborative school processes and collective teacher efficacy " Leadership and Policy in Schools **3**(3): 163-88.

CTE refers to teacher perceptions that they constitute an effective instructional team, capable of bring about learning in students. Prior research demonstrates that if a staff have strong CTE is likely to generate student achievement. Study of 2170 teachers in 141 elementary schools used structural equation modelling to examine the antecedents of CTE. Found that prior student achievement in Grade 6 maths predicted CTE, as expected in social cognition theory, School processes that promoted teacher ownership of school directions (shared school boards, school wide decision making, fit of plans with school needs, empowering school leadership) exerted a stronger influence on CTE than prior student achievement. School cohesion ad support contributed to CTE but only in domains in which the school has control over its directions.

Ross, M., R. Hancock, et al. (2004). "Pedagogy in a public space: children and adults learning together at Tate Modern." Forum **46**(1): 24-27.

Rowe, F. and D. Stewart (2009). " Promoting connectedness through whole-school approaches: a qualitative study." Health Education **109**(5): 396-413.

Abstract: Purpose – School connectedness, or a sense of belonging to the school environment, is an established protective factor for child and adolescent health, education, and social well-being. While a comprehensive, whole-school approach that addresses the school organisational environment is increasingly endorsed as an effective approach to promote connectedness, how this approach creates a sense of belonging in the school environment requires systematic in-depth exploration. This paper aims to address these issues. Design/methodology/approach – This study examines the influence on school connectedness of a whole-school approach to promote health in school, using a qualitative case study method. Three school communities in Southeast Queensland, Australia, are investigated as case studies in order to formulate a theoretical model of how health promotion approaches can build school connectedness. Findings – This study finds that a health promotion approach builds school connectedness by encouraging a “whole-school” orientation designed to foster interaction among members of the entire school community. Specific activities that promote interaction are school-wide activities involving the entire school community and, at the classroom level, “whole-class” activities in which students and staff work together on activities that create links between the two groups, such as collaborative curriculum planning. The “whole-school” emphasis on partnerships between staff and students and parents is also important, particularly with its focus on initiating and sustaining school-community partnerships. Originality/value – The findings are important, since they validate a whole-school approach to building school connectedness and address an important gap in the literature about how to promote school connectedness and thereby protect the well-being of children and adolescents.

Roy, K. (2005). Great schools by design: a conversation on the classroom of the future. AIA National Summit on School Design. University of Maryland.

Powerpoint slides from representative from Armstrong World Industries. Acoustic specialists.

Rubin, B. C. (2003). "Unpacking Detracking: When Progressive Pedagogy Meets Students' Social Worlds." American Educational Research Journal **40**(2): 539-573.

Despite heated debate over detracking, little research exists on how the reform plays out in the classroom. This article, based on a year-long interpretive study of a detracked ninth-grade program at a diverse urban high school, focuses on the encounter between the "official" practices of the detracked classrooms under study and the "unofficial" social worlds of the students taking part in those practices. The author describes how aspects of the overall school context framed and permeated students' interactions in their detracked classes, at times leading to a reiteration of the very inequalities that detracking was designed to address.

Rudd, P., F. Reed, et al. (2008). The effects of the school environment on young people’s attitudes towards education and learning: Summary Report, National Foundation for Educational Research**:** 33.

This document summarizes research to demonstrate the difference that Building Schools for the Future (BSF) schools are making to young people's attitudes towards education and learning, as measured by their levels of engagement and enthusiasm for school. The key research objective was further broken down into a number of research questions: (1) Has the new school environment contributed to students' levels of motivation and engagement? (2) Do students think that the new buildings/facilities have created better learning opportunities? (3) Has the move from old to new buildings affected students' study skills or their learning behaviours? (4) Have students' attitudes to school changed in any notable ways? (5) Have students' feelings of self-worth, self-esteem and self-efficacy been affected by the new environment? (6) How have the new buildings changed students' ways of learning? How has the use of ICT/new technologies changed? (7) How has the new environment affected teaching and learning? Are there any differences in

the ways that teachers teach? and (8) Do students feel that the new buildings will have any impact on their learning outcomes? The evaluation consisted of "before" and "after" surveys to two year groups of students. The "before" survey was administered to Year 7 and 8 students prior to the opening of the new building at the end of the summer term 2007. The "after" survey was administered to the same year cohorts (now Years 8 and 9), towards the end of the autumn term. The same questionnaire was used in both surveys in order to enable direct comparison of student attitudes over time. Findings from both "before" and "after" surveys are presented Overall findings indicate that student attitudes had become more positive after the move into the new school buildings. The proportions of students who: (1) Said that they felt safe at school most or all of the time increased from 57 to 87 per cent; (2) Said that they felt proud of their school increased from 43 to 77 per cent; (3) Said that they enjoyed going to school increased from 50 to 61 per cent; (4) Perceived that vandalism in their school decreased from 84 per cent of respondents to 33 per cent; (5) Perceived that bullying decreased from 39 per cent of students to 16 per cent; and (6) Expected to stay on in the sixth form or to go to college increased from 64 per cent to 77 per cent. It is not possible to attribute a causal link between improved attitudes of the students and the move to the new BSF building, but the numbers and levels of positive findings suggest an association between the move to the new surroundings and improvements in students' outlooks regarding their experience of school and their expectation for the future.

Rudd, T. (2008). Reimagining outdoor learning spaces: primary capital, co-design and educational transformation. Innovation in Education. London, FutureLab**:** 59.

Capital investment programmes such as BSF and PCP are huge in their scope and scale, and therefore we have chosen to focus specifically on the redesign aspects of outdoor spaces, as there is not room to cover the vast and varied elements of redesign within a single handbook. Other than such practical considerations, given that we are at the beginning of the Primary Capital Programme, it seemed timely to produce a handbook as a tool for rethinking the use of outdoor spaces for a broad range of possible learning and play opportunities and purposes aimed primarily at the primary sector. It is easy to overlook the potential of outdoor spaces for the improved well-being, health and welfare of children when the major emphasis is on the design of buildings. However, outdoor space is a vital element contributing to any child's development and educational experiences, and should therefore not be overlooked or undervalued, given the range of other key initiatives aimed at developing more opportunities for play, exercise and learning beyond the classroom. This publication also attempts to highlight the potential links between capital investment programmes and a range of other initiatives and policies seeking to promote play and outdoor learning for young children. From the 'Learning Outside the Classroom Manifesto'**2** and subsequent play strategy**3**, through to the United Nations Convention of the Rights of the Child (Article 31)**4**, and the plethora of policies, organisations and initiatives that support the right for children to play, there is a clear call and need to provide places other than the classroom for learning and play in order to offer children more direct experience with the outside world. This may include learning away from the school, in parks, forests, in local community spaces, which allow a whole set of different relationships and experiences to flourish. It could mean focusing on providing greater continuity between learning outdoors and what happens indoors and in the curriculum, or it could mean focusing on redeveloping an underutilised and inappropriate space so that it is more stimulating and desirable.

Rudd, T., C. Gifford, et al. (2006). what if....re-imagining learning spaces. London, Futurelab**:** 60.

Our aim is to ensure equal attention is paid to the educational visions underpinning new school designs as it is to questions over the abilities and costs of architects and builders. Without this educational debate, the new schools currently in development are likely to become straightjackets for educators and learners, rather than sites to support, encourage and develop learning in all its guises over the next 100 years. This paper arises from a two-day workshop bringing together individuals from a range of design, teaching, mentoring, policy and research backgrounds. The workshop aimed to 're-imagine' learning spaces, and actively encouraged the development of 'what if' scenarios that push the boundaries of current thinking and encourage debate of the relationship between educational goals and the design and resourcing of spaces for learning. These scenarios are presented in the paper, not as recommendations, but as a stimulus for discussion. The images in this publication are included to prompt debate and discussion rather than to act as simple 'illustrations' of the text. They were generated by young artists as creative responses to the scenarios presented in the document. Translated into image, these 'future visions' of educational spaces are at times challenging and distopian, at others delightful and engaging. They all, however, serve the purpose of questioning our assumptions about what constitutes a 'learning space'.

Russell, J. (2002). Work that's worth doing. No more bored kids: Real alternative for public schools Education Foundation**:** 1.

Russell, J. A. and G. Pratt (1980). "Description of the affective quality attributed to environments." Journal of Personality and Social Psychology **38**(2): 311-322.

Ruth, L. (2000). Design Standards for Children's Environments., McGraw-Hill, New York, NY.

This 3-part book addresses the design or maintenance of spaces where children are the primary users covering both commercial and residential designs and products. Part I chapters provide anthropometric data of children from birth to age 18, offers dimensions for typical objects within the child's built environment; synthesizes the Consumer Product Safety Commission's safety guidelines for play areas; and provides dimensions of typical, and sometimes untypical,

products that are often found in children's environments. Part II features a source list developed for designers that lists products appropriate for use in children's environments. Part III chapters outline the development of children's abilities and perceptions in the first stages of life from birth to age 10, and offers a bibliography of the most effective and highly regarded resources in the area of children's design.

Rutten, A., H. Ziemainz, et al. (2003). " Residential area, physical education, and the health of school aged children." Health Education **103**(5): 264 - 271.

Explores the relationships between the perceived quality of physical education lessons, the perceived quality of opportunities for physical activity in a residential area, and the physical fitness and health of pupils attending Grades 5 and 9 in Germany. The data were collected from 300 pupils in a community in Saxony, using a standardized questionnaire and a standard test of sporting ability. Results indicated that girls evaluated the opportunities for physical activity in the residential area more critically than boys. Multivariate analysis showed that the subjective health status of pupils was associated with good physical fitness and a good perception of opportunities for physical activity in the residential area, but not with the perceived quality of physical education lessons. These results provide evidence that a relationship between the urban environment and physical activity exists, and that the promotion of physical activity for pupils can benefit from intersectoral approaches.

Sandamas, G. and N. Foreman (2007). "Spatial reconstruction following virtual exploration in children aged 5-9 years: Effects of age, gender and activity-passivity." Journal of Environmental Psychology **27**(2): 126-134.

Children of 6-7, 7-8, and 8-9 years explored a virtual environment (VE) consisting of eight buildings distributed in a square arena marked off into four quadrants, as employed in an earlier real-space study. The children twice experienced a virtual space model, actively exploring (operating an input device), passively observing (watching the displacements made by an active participant), or viewing from eight static, pre-set perimeter viewpoints. They then used cardboard models to reconstruct the environment. Consistent with the earlier real-space study, performance (judged from placement distance errors) improved with age and with learning across two successive trials. Also consistent was that no difference was obtained between males and females, despite this having been expected in the VE version of the task. However, dissimilarity from the earlier study was that participants in the active exploration condition showed no advantage over those who viewed the environment from the perimeter. Moreover, those who passively observed the displacements made by an active participant actually demonstrated significantly superior spatial learning. Reasons for the absence of any active advantage, and the presence of a passive advantage, were discussed.

Sandora, T. J., M. C. Shih, et al. (2008). "Reducing absenteeism from gastrointestinal and respiratory illness in elementary school students: a randomized, controlled trial of an infection-control intervention." Child: Care, Health and Development **34**(5): 699(1).

Reducing absenteeism from gastrointestinal and respiratory illness in elementary school students: a randomized, controlled trial of an infection-control intervention Pediatrics Background Students often miss school because of gastrointestinal and respiratory illnesses. We assessed the effectiveness of a multifactorial intervention, including alcohol-based hand sanitizer and surface disinfection, in reducing absenteeism caused by gastrointestinal and respiratory illnesses in elementary school students. Methods We performed a school-based cluster-randomized, controlled trial at a single elementary school. Eligible students in third to fifth grade were enrolled. Intervention classrooms received alcohol-based hand sanitizer to use at school and quaternary ammonium wipes to disinfect classroom surfaces daily for 8 weeks; control classrooms followed usual hand-washing and cleaning practices. Parents completed a pre-intervention demographic survey. Absences were recorded along with the reason for absence. Swabs of environmental surfaces were evaluated by bacterial culture and polymerase chain reaction for norovirus, respiratory syncytial virus, influenza and parainfluenza 3. The primary outcomes were rates of absenteeism caused by gastrointestinal or respiratory illness. Days absent were modelled as correlated Poisson variables and compared between groups by using generalized estimating equations. Analyses were adjusted for family size, race, health status and home sanitizer use. We also compared the presence of viruses and the total bacterial colony counts on several classroom surfaces. Results A total of 285 students were randomly assigned; baseline demographics were similar in the two groups. The adjusted absenteeism rate for gastrointestinal illness was significantly lower in the intervention-group subjects compared with control subjects. The adjusted absenteeism rate for respiratory illness was not significantly different between groups. Norovirus was the only virus detected and was found less frequently on surfaces in intervention classrooms compared with control classrooms (9% vs. 29%). Conclusions A multifactorial intervention including hand sanitizer and surface disinfection reduced absenteeism caused by gastrointestinal illness in elementary school students. Norovirus was found less often on classroom surfaces in the intervention group. Schools should consider adopting these practices to reduce days lost to common illnesses.

Sanford, E. C. (1910). "Experimental pedagogy and experimental psychology." Journal of Educational Psychology **1**(10): 590-595.

Discusses the relation and the differences between experimental pedagogy and experimental psychology. Experimental pedagogy is an experimental branch of educational psychology, and it draws a large part of its arsenal of methods from the older science of experimental psychology. The problems of experimental psychology are different from those of experimental pedagogy. Experimental psychology attempts to describe or analyze the mental phenomena, and it usually deals with artificially simplified cases. Experimental pedagogy determines the most efficient methods for producing given modifications in general or complex behavior. The methods of the two fields would soon become

different due to these differences in aims. The dangers associated with using of methods, without testing them, have been enumerated. It has been suggested that the two departments must work in cooperation.

Sanoff, H. (1995). Creating environments for young children. Raleigh, North Carolina State University.

Sanoff, H. (2007). Community participation in an elementary school classroom addition. School building design and learning performance with a focus on schools in developing countries: proceedings of the 12th Architecture and Behaviour Colloquium, Lausanne, Switzerland.

Education has always been an important subject but today the condition of our educational infrastructure and its ability to meet current learning demands has become an international concern. School classrooms are often unable to support specific course or teaching methods (Lackney, 1994). Schools with inadequate ventilation can make students drowsy and lower their performance. Classrooms with poor acoustics and visual distractions can divert attention from the best prepared lesson plans. Congested hallways can fuel student tensions. Drab interiors, poor lighting, and the lack of pleasant social gathering spots make school less than inviting as a place to work and learn. One hundred and fifty years ago, classrooms represented a common teaching method. Today teaching methods have changed, but, often, the design of the classroom has remained static. An examination of current learning styles and teaching methods suggests a new form of learning environment characterized by different activity settings and small group activities. In order to experience healthy development, students require certain needs to be met. Schoolagers require diversity, which entails different opportunities for learning and different relationships with a variety of people (Levin & Nolan, 2000). In a school that responds to its students' need for diversity, one would not find students sitting in neat rows of desks, all facing teachers who are lecturing or reading from textbooks. Instead, in responsive schools, students and teacher would be engaged in different learning activities in and out of the classroom. A variety f teaching methods including small group work, lectures, learning by doing, individualized assignments, and learning centers, would be used (Jacobs, 1999).

Savin-Baden, M. (2007). Learning Spaces: Creating opportunities for knowledge creation in academic life, Open University Press.

The ability to have or to find space in academic life seems to be increasingly difficult since we seem to be consumed by teaching and bidding, overwhelmed by emails and underwhelmed by long arduous meetings. This book explores the concept of learning spaces, the idea that there are diverse forms of spaces within the life and life world of the academic where opportunities to reflect and critique their own unique learning position occur. Learning Spaces sets out to challenge the notion that academic thinking can take place in cramped, busy working spaces, and argues instead for a need to recognise and promote new opportunities for learning spaces to emerge in academic life. The book examines the ideas that: Learning spaces are increasingly absent in academic life; The creation and re-creation of learning spaces is vital for the survival of the academic community; The absence of learning spaces is resulting in increasing dissolution and fragmentation of academic identities; Learning spaces need to be valued and possibly redefined in order to regain and maintain the intellectual health of academe. In offering possibilities for creative learning spaces, this innovative book provides key reading for those interested in the future of universities including educational developers, researchers, managers and policy makers.

Scannell, L. and R. Gifford (2010). "Defining place attachment: A tripartite organizing framework." Journal of Environmental Psychology **30**(1): 1-10.

Place attachment has been researched quite broadly, and so has been defined in a variety of ways. The various definitions of the concept are reviewed and synthesized into a three-dimensional, person-process-place organizing framework. The person dimension of place attachment refers to its individually or collectively determined meanings. The psychological dimension includes the affective, cognitive, and behavioral components of attachment. The place dimension emphasizes the place characteristics of attachment, including spatial level, specificity, and the prominence of social or physical elements. In addition, potential functions of place attachment are reviewed. The framework organizes related place attachment concepts and thus clarifies the term. The framework may also be used to stimulate new research, investigate multidimensionality, create operational definitions for quantitative studies, guide semi-structured interviews for qualitative studies, and assist in conflict resolution for successful land-use management.

Schneider, M. (2002). Do school facilities affect academic outcomes? Washington DC, National Clearinghouse for Educational Facilities**:** 25.

This review explores which facility attributes affect academic outcomes the most and in what manner and degree. The research is examined in six categories: indoor air quality, ventilation, and thermal comfort; lighting; acoustics; building age and quality; school size; and class size. The review concludes that school facilities affect learning. Spatial configurations, noise, heat, cold, light, and air quality obviously bear on students' and teacher' ability to perform. Needed are clean air, good light, and a quiet, comfortable, and safe learning environment. The review asserts that this can be and generally has been achieved within the limits of existing knowledge, technology, and materials; it simply requires adequate funding and competent design, construction and maintenance.

Schneider, M. (2003). Linking school facility conditions to teacher satisfaction and success**:** 4.

School Planning & Management (2001). "Modular Buildings: A Quick, Quality Solution for Schools." School Planning & Management **40**(7): suppl pMBI1,MBI3-MBI12.

Highlights the history of the modular classroom industry and emergence of the Modular Building Institute. Analyzes the differences between temporary portable classrooms and permanent modular additions. Also examines the possible influence of modular classrooms on future facility design and the ways that educational facilities officials are saving time and money by "going modular." Also describes EnergySmart Schools.

Scottish Funding Council Space collaboration: Learning and teaching-related space use in further and higher education, Scottish Funding Council.

Scott-Webber, L. (2004). In Sync: Environmental Behavior Research and the Design of Learning Spaces.

Analyzes research relating to the environment's impact on behavior and establishes five different archetypal environments that support learning in the current knowledge age, versus the prevalent but outdated agrarian- and industrial-age models: 1) Environments for Delivering Knowledge; 2) Environments for Applying Knowledge; 3) Environments for Creating Knowledge; 4) Environments for Communication Knowledge; and 5) Environments for Decision Making.

Seamon, D. (1982). "The phenomenological contribution to environmental psychology." Journal of Environmental Psychology **2**(2): 119-140.

This essay considers the value of phenomenology for environmental psychology, first, by examining differences between a conventional scientific approach and phenomenology; second, by presenting substantive phenomenological research meaningful for environmental psychology. Three substantive themes are discussed: (1) a phenomenology of human experience; (2) a phenomenology of physical environment; (3) a phenomenology of the person--world relationship. The essay concludes that conventional research in environmental psychology has sometimes uncritically accepted theories and concepts which are out of touch with the actual fabric of environmental behavior and experience. A phenomenological perspective looks at the person--environment relationship afresh and thus helps to revitalize the ontological, epistemological and methodological foundations of environmental psychology.

Seidman, E. and et al. (1979). "Assessment of classroom behavior: A multiattribute, multisource approach to instrument development and validation." Journal of Educational Psychology **71**(4): 451-464.

Describes the simultaneous development and validation of 3 parallel instruments for the multidimensional assessment of a young child's classroom behavior. Scales were constructed to depict teacher-, peer-, and self-rated behavior, including positive as well as negative attributes. The scales were continually refined over the course of 3 successive years, with the total sample size approaching 1,000 1st- and 2nd-grade school children. The multidimensional nature, internal consistency, and test-retest properties of each device are explicated. Finally, higher order principal-components analyses are presented highlighting the convergent and divergent characteristics in this multiattribute, multisource battery. The assets and liabilities of the instruments taken individually and collectively are discussed, as well as directions for future research. (13 ref) (PsycINFO Database Record (c) 2006 APA, all rights reserved)

Sevindik, T. (2010). "Future's learning environments in health education: The effects of smart classrooms on the academic achievements of the students at health college." Telematics and Informatics **27**(3): 314(9).

The aim of this study is to determine the effectiveness of smart classrooms on the academic achievement of the nursing students. The sample of the research included 66 Health College students in ElaziA. The sampling group was randomly chosen from second year students of Nursing and Midwife Education. The research was carried out with experimental approach. The experimental group included nursing students and the control group, midwife students. Pre-test and post-test including questions regarding "internal diseases' course were applied to both groups. t-Test, percentage ands frequency were used as statistical procedures for data analysis. The findings showed that lectures given through smart classroom significantly increases the academic achievements of the students. It is, therefore, reasonable to state that smart classroom applications are effective environments that can be used as an alternative and a supplement to face to face educational environments in the institutions where health education is given.

Shaughnessy, R. J., U. Haverinen-Shaughnessy, et al. (2006). "A preliminary study on the association between ventilation rates in classrooms and student performance.(Author abstract)." Indoor Air **16**(6): 465(4).

Poor conditions leading to substandard indoor air quality (IAQ) in classrooms have been frequently cited in the literature over the past two decades. However, there is limited data linking poor IAQ in the classrooms to student performance. Whereas, it is assumed that poor IAQ results in reduced attendance and learning potential, and subsequent poor student performance, validating this hypothesis presents a challenge in today's school environment. This study explores the association between student performance on standardized aptitude tests that are administered to students on a yearly basis, to classroom carbon dioxide (CO.sub.2) concentrations, which provide a surrogate of ventilation being provided to each room. Data on classroom CO.sub.2 concentrations (over a 4-5 h time span within a typical school day) were recorded in fifth grade classrooms in 54 elementary schools within a school district in the USA. Results from this preliminary study yield a significant (P < 0.10) association between classroom-level ventilation rate and test results in math. They also indicate that non-linear effects may need to be considered for better representation

of the association. A larger sample size is required in order to draw more definitive conclusions. Abstract: Practical Implications Future studies could focus on (1) gathering more evidence on the possible association between classroom ventilation rates and students' academic performance; (2) the linear/non-linear nature of the association; and (3) whether it is possible to detect 'no observed adverse effect level' for adequate ventilation with respect to academic performance in schools. All of this information could be used to improve guidance and take regulatory actions to ensure adequate ventilation in schools. The high prevalence of low ventilation rates, combined with the growing evidence of the positive impact that sufficient ventilation has on human performance, suggests an opportunity for improving design and management of school facilities.

Sheets, M. (2009). The relationship between the condition of school facilities and certain educational outcomes, particularly in rural public high schools in texas. Educational Leadership and Policy Studies. Lubbock, Texas, Texas Tech University. **Doctor of Philosophy**.

If the condition of facilities in some schools is such that the schools cannot provide a quality education for its students equal to that of other schools, then equal educational opportunity may not be available for all children. The purpose of this study was to examine the relationship between the condition of rural public high school facilities in Texas and student achievement, student attendance, and teacher turnover, while controlling for the effects of student wealth level, school district wealth level, and percent minority students.

The measures for the condition of facilities variables used in this study were obtained from the 2006 Texas Comptroller's Facility Survey of the 1,037 public school districts in Texas. The participants for this study were the 72 rural public high schools out of the 309 total responses to the survey from all district types. Multiple regression analyses were utilized to examine which selected condition of facilities variables and demographic variables best predicted certain educational outcomes.

This study found that the student wealth level contributed most to the variance in student achievement. However, the condition of school facilities has a measurable effect over and above socioeconomic conditions on student achievement and teacher turnover, particularly when found in rural schools made up of primarily low-income students. Significant findings with regard to condition of school facilities included:

1. Rural public high schools with a large percentage of portable classrooms have lower student achievement and higher teacher turnover.
2. Rural public high schools with a large percentage of deferred maintenance in their facilities have lower student achievement.

School leaders are not able to control the socioeconomic conditions of the students they serve. The do, however, have some control over the quality of their school facilities. Excellent facilities for children who need them the least and inadequate facilities for the ones who need them the most violates the principal of equal educational opportunity for all children.

Shelton, D. R. (2003). Perceptions of key informants toward the use of portable facilities for educational purposes. Department of Education, Oklahoma State University, United States.

Scope and method of study . The purpose of this study was to provide an overview of the use of portable facilities in one school district and to study the perceptions about portable classrooms by those who use them. The participants in this study were 14 teachers who taught in the portable buildings across the largest district in a northern Oklahoma county, the four principals at the sites which had portable classrooms, and the central administrator in charge of these facilities. Each participant in the study filled out a perception questionnaire and completed a personal one-on-one interview. The data were analyzed for patterns that would provide a complete picture of the perceptions regarding the use of portable facilities. Findings and conclusions . Informant perceptions, relevant literature, and personal observations of facilities showed that monetary shortages were given as the main reason portable facilities exist. The participant responses brought out that the lack of money throughout the district was a large factor in the presence of portable facilities. The participants stated their understanding that as a result of the ever-changing student population and the shortage of funds throughout education, portable facilities would probably always exist at certain sites throughout the district. Information collected, from the district administrator in charge of facilities, stated the quickness and ease of erecting portable facilities as well as the difference in cost between portable and permanent facilities as the reason for the existence of portable facilities. Health and safety issues were shown as a major concern in portable facilities being used as learning spaces. Teacher and principal responses were overwhelmingly negative to the fact that health issues stemming from poor air quality, mold and mildew, and other toxic substances used in the construction of portable facilities were detrimental to the learning process. The administrative participant suggested that these were problems in the past, but they had been resolved. The district administrator showed that there were at times problems that arose with certain individual students, but in general health and safety was not a big concern. The data suggests numerous problems that must be dealt with when using portable facilities for educational purposes.

Shelton, J. T., E. M. Elliott, et al. (2009). "The distracting effects of a ringing cell phone: An investigation of the laboratory and the classroom setting." Journal of Environmental Psychology **29**(4): 513-521.

The detrimental effects of a ringing phone on cognitive performance were investigated in four experiments. In Experiments 1 and 2, the effects of different types of sounds (a standard cell phone ring, irrelevant tones and an instrumental song commonly encountered by participants) on performance were examined. In Experiment 1, slower

responses were observed in all auditory groups relative to a silence condition, but participants in the ring and song conditions recovered more slowly. In Experiment 2, participants who were warned about the potential for distraction recovered more quickly, suggesting a benefit of this prior knowledge. This investigation continued in a college classroom setting (Experiments 3a and 3b); students were exposed to a ringing cell phone during the lecture. Performance on a surprise quiz revealed low accuracy rates on material presented while the phone was ringing. These findings offer insight into top-down cognitive processes that moderate involuntary orienting responses associated with a common stimulus encountered in the environment.

Sheremetov, L. and G. Nunez (1999). "Multi-agent framework for virtual learning spaces." Journal of interactive research **10**(3-4): 301-319.

This article reports on the first results of the research work within the paradigm of Configurable Collaborative Learning, which we have named EVA (states for Virtual Learning Spaces in Spanish). The main purpose of this project is to develop models, architectures and multi-agent environment for collaborative learning and experimentation. Each space in EVA consists of a number of components, composed of a set of deliberative and auxiliary agents. The article focuses on theoretical and practical issues of personalized collaborative learning with artificial learning companions, personal learning assistants with activities planning, and experimentation activities with agents. A unified framework for the distributed heterogeneous learning environment is defined on the basis of distributed component and agent models.

Shibata, S. and N. Suzuki (2002). "Effects of the foliage plant on task performance and mood." Journal of Environmental Psychology **22**(3): 265-272.

In this study we investigate the effect of leafy plants on subjects' task performance and mood. As independent variables, two types of tasks and several room arrangements were used. There was an association or a sorting task and the room was arranged either with the plant placed in front of the subjects, to the side of the subjects, or with no plant placed in the room. Gender was also considered a's a variable for analysis. Undergraduate students (F = 63, M = 83) performed either the association task or the sorting task under one of the three room arrangements. The association task was to create no more than 30 words for 20 different items. The sorting task was to sort 180 index cards into Japanese syllabary order. As for the task performance, Room x Gender interaction was significant in the scores of the association task ($p < 0.05$). Male subjects working without plants performed worse than female subjects under the same conditions ($p < 0.01$). Moreover, the task performances of the male subjects using the front arrangement were higher than that of the male subjects working without plants ($p < 0.10$). It was concluded that, the presence of the plants affected the association task more than the sorting task, and male subjects more than female subjects.

Shilling, C. (1991). "Social Space, Gender Inequalities and Educational Differentiation." British Journal of Sociology of Education **12**(1): 23-44.

The spatial dimensions of social interaction and reproduction have received increasing attention from sociologists in recent years. However, these issues remain largely implicit in most studies of classrooms, schools and the education system. In this paper, I argue that the study of social space should be integral to analyses of the relationship between educational differentiation and social reproduction. After examining the position of space in Giddens' theory of structuration, I focus on how space is used in schools as a resource in the production of unequal gender relations. Space is viewed not simply as a context in which interaction occurs, but as a phenomenon which both produces, and is produced by, gendered power relations.

Sigfusdottir, I. D., G. H. Gudjonsson, et al. (2010). "Bullying and delinquency. The mediating role of anger." Personality and Individual Differences **48**(4): 391-396.

The principal aim of the study was to examine the relationship between bullying, both studying those who bully and those who are victims of bullying, and non-violent delinquency (i.e., theft and burglary). We used structural equation modelling, while controlling for sex of participants, family structure and parental education, to examine the relationship between bullying and bully victimisation and delinquent behaviour, and whether this association is mediated through anger. The data for the analysis were drawn from a cross-sectional, population-based sample of 7149 15- and 16-year-old adolescents in Iceland. Results revealed that: (1) bullying behaviour and bully victimisation both increased the likelihood of delinquent behaviour, but the effects were significantly stronger for bullying behaviour than bully victimisation, explaining 40% and 30% of the variance in delinquency, respectively; and (2) the association between bullying behaviour and bully victimisation and delinquent behaviour was in both groups partly mediated through anger. The findings support Agnew's revised general strain theory that emotions such as anger are important in delinquency.

Sime, J. D. (1986). "Creating places or designing spaces?" Journal of Environmental Psychology **6**(1): 49-63.

Recent years have seen renewed interest in the ancient idea of a 'sense of place' amongst architects, planners and researchers in a number of countries. In contrast to technological fix solutions which appear to by-pass people, concern with the creation and preservation of 'places' reflects an attempt to provide an optimum psychological fit between people and their physical surroundings. This paper considers 'placemaking': the degree to which a 'place' can be created in architectural design independently of the people who eventually use it. Different approaches to the study of 'place' in architecture, geography and psychology are reviewed. It is argued that modern architecture has concentrated on the properties of geometric space, while psychology has neglected the physical context of behaviour and experiences. The

concept of place should help to integrate design and research issues. A politics of place and the design and research of place patterns are discussed. It is concluded that it is not possible to create a place for building users solely by manipulating the physical environment on 'their' behalf.

Simon, N. and L. Maxwell (2007). Building quality, academic achievement and self-comptency in New York City public schools. 12th architecture and behaviour colloquium. E. Knapp, K. Noschis and C. Pasalar. Ascona, Switerland, Comportements**:** 41-50.

Simon, S., G. Evans, et al. (2007). Building quality, academic achievement and self-competency in New York City public schools. School building design and learning performance with a focus on schools in developing countries: proceedings of the 12th Architecture and Behaviour Colloquium, Lausanne, Switzerland.

American buildings are falling apart. Nearly a third of US public schools are in disrepair (CAO, 1995) with close to 15% rated as "non-operational" (NCES, 1999; Oritz, 2004). Large urban schools, where the marjority of students are low-income (NCES, 1999) are most likely to be inadequate (evans, 2004; Oritz, 2004). For example, four-fifths of New York City's schools are in need of repair (buresh & hayden, 1996). The situation for the vast majority of schools attended by children throughout the world is much worse. Unfortunately much of the research on school building quality (SBQ) and child development suffers from conceptual and methodological problems. Most studies rely on school personnel to rate building quality and thus are subject to potential bias. Another common approach is to compare child data in old versus new school buildings without measurement of SBQ. SBQ data are typically assessed at the school level. This ignores within school variability in quality and precludes investigation of individual children's reactions to SBQ. Children perceptions of SBQ, however, are different to adults. Moreover their SBQ perceptions may be a critical factor mediating the link between objective SBQ and child outcomes (Maxwell, 1999) Herein we present a preliminary exploration of SBQ using a standardized rating instrument by trained evaluators. We also assess children's reactions to SBQ and, in turn, how these perceptions mediate academic outcomes of objective SBQ.

Skanfors, L., A. Lofdahl, et al. (2009). "hidden spaces and places in the preschool: withdrawal strategies in preschool children's peer cultures." Journal of Early Childhood Research **7**(1): 94-109.

The article discusses how children make use of their preschool context in order to withdraw. Ethnographic observations were made of two-to five-year-old children's interactions during free play and teacher-led activities in the preschool, and documentation was carried out through field notes and video recordings. The empirical material was analysed using Corsaro's theory on children's peer cultures. Results show that children, in their peer cultures, construct withdrawal strategies -- `making oneself inaccessible' and `creating and protecting shared hidden spaces' -- by making use of the preschool's organization of time and space.

Smith, A. (2006). Schools designed for learning: the Denver School of Science and Technology. Great Schools by Design. Denver, American Architectural Foundation**:** 27.

Like many of us, you probably attended a traditional school that had an institutional feel and standard classroom layout. Perhaps it didn't even have windows or adequate ventilation. But the nature of education today has become more interactive and experiential. Students now have the opportunity to learn in multiple ways, and the spaces where they learn should be equally varied. Our school facilities should reflect the latest thinking in education. For students at the Denver School of Science and Technology, learning takes place in an environment that is engaging, instructive, and comfortable. The building is an example of design supporting learning, and it provides spaces that are both flexible and inspiring. In addition, the school is outfitted with cutting edge technology—the building is a wireless environment, and each student works with a laptop computer. These students learn in new and exciting ways every day. It is truly a school that has been designed to promote student achievement, and you will see many examples of this powerful idea in the video. Within this resource guide, you will find an overview and history of the Denver School of Science and Technology, a checklist of ways that school design can support learning gathered from the Design for Learning Forum held by the American Architectural Foundation and Target, and reference materials on how to create an effective discussion about the video. We hope that the video and resource guide help generate discussions and enthusiasm in your community about the importance of design excellence in your schools. These educational resources are one part of the American Architectural Foundation's *Great Schools by Design,* an initiative that promotes collaboration, design excellence, and innovation in the design of educational facilities. School design institutes, publications, videos, and forums provide community leaders, educators, and design professionals with a wealth of information to help improve school design across the country. AAF is proud to have partnered with Target as a presenting sponsor of *Great Schools by Design* and with KnowledgeWorks Foundation as a partner on the *Great Schools by Design* video series and the National Summit on School Design. Our schools are great investments in the future, and we cannot afford to neglect the design of these facilities and their impact on students. Thank you for your commitment to improving the quality of America's schools.

Solomon, D. and A. J. Kendall (1976). "Individual characteristics and children's performance in open and traditional classroom settings." Journal of Educational Psychology **68**(5): 613-625.

Assessed the performance of 56 boys and 36 girls with different motivational and cognitive characteristics in 3 "open" and 3 "traditional" 4th-grade classrooms. Cluster analysis of factor scores representing child orientations, motives, and prior achievement produced 6 "types." Three-way analyses of variance investigated the effects of child type, classroom type (open vs traditional), sex of child, and various interactions on several outcome measures, including academic

achievement, creativity, inquiry skill, social-educational attitudes, and teacher ratings of children's classroom behavior. Main effects appeared for each of the 3 independent variables, along with several Child * Class interactions. An approach using child types or clusters rather than abstracted dimensions may facilitate further Attribute * Treatment interaction research and applications. (38 ref) (PsycINFO Database Record (c) 2006 APA, all rights reserved)

Sommer, R. (1959). "Studies in Personal Space." Sociometry **22**(3): 247-260.

Sommer, R. and H. Olsen (1980). "The Soft Classroom." Environment and behavior **12**(1): 3-16.
Most college students and faculty regard their classrooms as drab, sterile, and institutional. A traditional classroom was converted into a softer more aesthetically pleasing room. Student attitudes toward the new room were favorable, and there was an increase in classroom participation, including student-student discussion.

Spieles, D. J. (2009). "David W. Orr, Earth in Mind: On Education, Environment, and the Human Prospect, 10th Anniversary ed. , Island Press, Washington, DC (2004) ISBN 1-55963-495-2 221pp., $19.95." Journal of Environmental Psychology **29**(1): 169-170.

Staiger, A. (2005). "School Walls as Battle Grounds: Technologies of Power, Space and Identity." Paedagogica Historica: International Journal of the History of Education **41**(4): 555-569.
A daily war is waged in schools all over the United States over wall space. Adolescents are using school walls to convey messages, create name recognition, slander each other, or for claiming territorial space. On the other side is the school administration, which paints over and erases these unsanctioned claims to space, power and identity, as it regards these expressions as challenging the authority of the school. In this paper, which is based on 18 months of ethnographic fieldwork in an urban school in California, it is argued that both practices constitute technologies to generate and sustain group loyalties and both channel aggression against other groups: taggers in the form of threats to or attacks on other groups, the school through athletic competitions. Tracing the history of school colors and their link to competitive athletics underscores the symbolic link between school and nation. However, while official symbols of school colors represent the legitimate and sanctioned identity of the school that is regarded as instrumental to developing *esprit de corps*, graffiti and tagging represent the illegitimate and criminal/ized identity of gangs and tagging crews. Examining the ongoing battle over wall space and claims to power/identity between school authority and taggers, it is argued that both constitute technologies of power that, while competing with each other, also mutually reinforce each other's claims to power over allegiances through the very process of contestation.

Stanley, J. C. (1964). "A paradigm for classroom experimentation." American Psychologist **19**(1): 64-65.
"The substantial, continual assistance to researching teachers can be augmented somewhat by in-service training concerning principles of design and analysis." In the Laboratory of Experimental Design of the Department of Educational Psychology at the university, the assisting process is conceptualized in 10 sequential steps, each of which is described briefly.

Stansfeld, S. A., C. Clark, et al. (2009). "Aircraft and road traffic noise exposure and children's mental health." Journal of Environmental Psychology **29**(2): 203-207.
There have been few studies examining noise and psychological disorders in children and the results are equivocal. The objective of this study was to examine exposure-effect relationships between aircraft and road traffic noise exposure and children's mental health. We conducted a cross-national, cross-sectional study assessing 2844 pupils, aged 9-10, from 89 schools around three major airports in the Netherlands, Spain and United Kingdom matched within country for socio-economic position. We selected children on the basis of exposure to external aircraft and road traffic noise exposure. The Strengths and Difficulties Questionnaire (SDQ) assessed child mental health, including emotional problems, conduct disorder, hyperactivity, peer problems and prosocial behaviour. Aircraft noise exposure was significantly associated with an increased score on the hyperactivity subscale (pooled B estimate 0.013 CI 0.007-0.019) after full adjustment. Road traffic noise was significantly associated with lower scores on the conduct problems subscale maintained after full adjustment (pooled B estimate 0.010 95%CI -0.020 to -0.001). There was no association between either aircraft or road traffic noise exposure and the SDQ total score. The hyperactivity results have been found in a previous UK study and may indicate that high aircraft noise exposure exacerbates hyperactivity symptoms in children although this finding requires further replication.

Stansfeld, S. A., D. S. Sharp, et al. (1993). "Road traffic noise, noise sensitivity and psychological disorder." Psychological Medicine **23**(4): 977-985.
The relationship between traffic noise exposure and psychological morbidity was assessed using the population-based Caerphilly Collaborative Survey of 2398 men from Caerphilly, South Wales. The findings showed that traffic noise exposure levels were strongly associated with annoyance to noise. Noise-sensitive men were more likely to be highly annoyed by noise exposure than less noise-sensitive men. There was no direct association between noise exposure level and psychological morbidity but there were provocative interactions with noise sensitivity. The role of noise sensitivity is discussed as an indicator of vulnerability to environmental stressors and a measure of negative affectivity and over-reporting.

Stebbins, R. (1973). "Physical Context Influences On Behavior: The Case of Classroom Disorderliness." Environment and behavior **5**(3): 291-314.

Stetsenko, A. and I. Arievitch (1997). "Constructing and Deconstructing the Self: Comparing Post-Vygotskian and Discourse-Based Versions of Social Constructivism." Mind, Culture & Activity **4**(3): 159-172.

Constructing and deconstructing the self are the two alternative ways to conceive of a human agentic individual that coexist in the present-day socioconstructivist framework. We analyze two respective theoretical approaches employing the grounding assumptions of social constructivism: (a) the discourse-based perspective, which creates important epistemological prerequisites for studying the self but at the same time dissolves the self in the linguistic or social reality of discourse; and (b) the post-Vygotskian perspective, which turns to the methods of guided formation and views these processes as a modus vivendi of a developing self. We argue that the second perspective can provide a nonreductionist account of the agentic self by taking an active stance in co-constructing, changing, and directing its development. We compare actual post-Vygotskian lines of research (with focus on either interpsychological or intrapsychological aspects of evolving selves) and discuss the ways to synthesize their accomplishments.

Stevenson, K. (2001). The Relationship of School Facilities Conditions To Selected Student Academic Outcomes: A Study Of South Carolina Public Schools, Department of Educational Leadership and Policies**,** College of Education, University of South Carolina.

This research project sought to determine if a relationship exists between school academic outcomes and school facilities characteristics. To address this issue, data were gathered from a variety of sources including research literature, state data files, principal questionnaires, and focus groups. The major findings of the study include:
• The better a principal rates the physical condition and adequacy of his or her school, the greater the likelihood that students score well on standardized achievement tests, though the socio-economic make up of the student body as measured by the portion of pupils on free or reduced lunch is heavily intertwined with this finding.
• The newer a school, the greater the likelihood that students score well on standardized achievement tests, though the socio-economic make up of the student body as measured by the portion of pupils on free or reduced lunch is heavily intertwined with this finding.
• The larger a school, the greater the likelihood that students score well on standardized achievement tests, though the socio-economic make up of the student body as measured by the portion of pupils on free or reduced lunch is heavily intertwined with this finding.
• The higher the teacher and student attendance rate, and especially student attendance, the greater the likelihood that students score well on standardized achievement tests, though the socio-economic make up of the student body as measured by the portion of pupils on free or reduced lunch is heavily intertwined with this finding.
• Most principals believe that the condition and adequacy of a school facility has a significant impact on school academic outcomes. They view the relationship as very complex, indicating that facilities affect teacher attitudes, which in turn affect classroom productivity.
• One out of every five schools in this state is rated by the principal as having a direct negative impact on school productivity.
• Among facilities factors adversely affecting the educational process are overcrowding, poor physical condition of the structure, portables, lack of storage, inadequate laboratory space.
• Because a) this study affirms previous research indicating that school facilities affect student outcomes, b) one of every five schools in this state is rated as making a negative impact on the educational process, and c) the average school facility is 70% through its expected life cycle, it is recommended that a comprehensive and adequate system of funding school construction in South Carolina be developed and implemented.

Stevenson, K. (2007). Educational trends shaping school planning and design: 2007. Washington DC, National Clearinghouse for Educational Facilities.

Stokols, D. (1976). "The Experience of Crowding in Primary and Secondary Environments." Environment and behavior **8**(1): 49-86.

Stone, N. J. (2001). "Designing effective study environments." Journal of Environmental Psychology **21**(2): 179-190.

The study setting (private or open-plan), environmental color (blue, red, or white), and study material (reading or math comprehension) were manipulated in a simulated study environment to determine their effects on adult students' mood, satisfaction, motivation, and performance. Students rated the reading task as more demanding and less enjoyable than the math task. Negative mood was slightly greater for students given the reading task. Positive mood was slightly higher when students studied in a blue carrel compared to a red carrel in the open-plan setting. Satisfaction with performance and motivation were not affected. Performance was significantly lower on the reading task in the red environment. Implications of these findings and suggestions for research are discussed.

Strange, C. and H. Banning (2002). Educating by design: Creating campus learning environments that work. San Fransisco, Jossey-Bass.

Physical environments : the role of design and space -- Aggregate environments : the impact of human characteristics -- Organizational environments : how institutional goals are achieved -- Constructed environments : different views through different eyes -- Promoting safety and inclusion -- Encouraging participation and involvement -- Building a

community of learners -- Designing environments by computer mediation -- Designing for education : campus assessment and action

Strauss, H. (2002). "New learning spaces: Smart learners, not smart classrooms." Syllabus **16**(2): 12-14.

Strickland, R. and J. Riesman (2005). "Place-making as an expression of teaching and learning: the Hilltop, Washington, D.C." Places **17**: 50-55.

"Architects, urban designers, and urban planners have a critical role to play in the reconstruction of urban public education. ... An evolving proposal for school design, educational reform, and community development in a low-income African-American neighborhood in Washington, D.C., may serve as a promising model. Asked in 2003 by the District of Columbia Public Schools (DCPS) to revisit both the design and program for an historic, but closed, vocational high school in a section of Northeast Washington, the University of Michigan's New American School Design Project developed an expansive concept for a comprehensive pre-K through postsecondary educational campus fully integrated with its community and firmly anchored to the District's rich institutional resources."

Strike, K. A. (1999). "Can Schools be Communities? The Tension between Shared Values and Inclusion." Educational Administration Quarterly **35**(1): 46-70.

This article considers a central dilemma associated with school communities, the tension between the need for shared values that are constitutive enough to serve as the basis for community and the premises of liberal inclusiveness. The author evaluates 3 candidates for school-community values--comprehensive doctrines, caring, and democracy--and concludes that, if a value is a constitutive one, then it cannot be consistent with liberal inclusiveness. He suggests a middle ground based in variants of these values that are thick, but vague, and more freedom of association within the public school system around these values.

Strolin-Goltzman, J. (2010). "The Relationship Between School-Based Health Centers and the Learning Environment." Journal of School Health **80**(3): 153-159.

BACKGROUND: School-based health centers (SBHCs) have improved access to primary and preventive health care for underserved children and youth by bringing comprehensive health services into the schools while addressing critical health problems that make it difficult for students to learn. Despite the findings on the positive effects of SBHCs on health outcomes, the literature investigating the relationship between SBHCs and the learning environment is scant. This purpose of this study is to add to the literature by investigating the correlation between SBHCs and perceptions of the overall school learning environment. METHODS: This study investigates the relationship between SBHCs and the learning environment utilizing a retrospective quasi-experimental design. Researchers used secondary data from the 2007 Board of Education Learning Environment Survey (LES) of a large northeastern city to compare schools with SBHCs and schools without SBHCs. RESULTS: The findings demonstrate that the presence of a SBHC is associated with greater satisfaction in 3 out of 4 learning environment domains. CONCLUSIONS: Perhaps by helping to eliminate the barriers that affect lower-performing students' readiness to learn, while improving student and parent engagement, SBHCs can partner with schools to reach their performance and accountability goals.

Sultzky, G. R. (2005). "Design that supports learning, human development and appropriate behavior." Education Facility Planner **40**(3&4): 37-40.

There appears to be mounting widespread agreement that the process of formal education - especially of formal public education in this country - is in serious need of improvement. At the same time, there appears to be an increase in the growth of what we know about how learning occurs, and an appreciation for the importance of the role that the physical environment can play. So, it is somewhat puzzling that the substance of what we typically construct doesn't seem to have changed much since the days before we knew so much.

Summers, J. J. and M. D. Svinicki (2007). "Investigating classroom community in higher education." Learning and Individual Differences **17**(1): 55-67.

The purpose of this research was to demonstrate an empirical relationship between classroom community and students' achievement goals in higher education, and to offer a possible explanation for differences in this relationship for cooperative and non-cooperative classrooms. Structural equation modeling techniques revealed that students' perceptions of interactive learning significantly mediated the relationship between students' goals and their sense of classroom community, but only for classrooms that used cooperative learning techniques. In the traditional lecture-style course surveyed, students' feelings of classroom community and interactive learning were significantly lower than in cooperative learning classrooms. Finally, while mastery goals were significantly higher for cooperative learning students, performance-approach goals were significantly higher for traditional lecture students.

Sundstrom (1987). 'Work Environments: Offices and Factories. Handbook of Environmental Psychology. S. D and A. I, Wiley**:** 751.

Swaim, C. (2005). "Six implications for instructional technology." Education Facility Planner **40**(3&4): 41-44.

Information technologies continue to evolve through convergence, even as planners and educators have raced to keep pace. Predicting future instructional technologies can be more accurate once trends have been established and futuring

processes applied to them. The six implications presented here provide a foundation for more confident decision making relative to classrooms of the next 20 years. Continuing to apply the processes will help planners, designers, and educational leaders move confidently in providing future generations the learning spaces and resources they deserve.

Symes, C. (1996). "Building the Queenslander: the contribution of school architecture to the formation of the child." Queensland Review (St Lucia, Qld) **3**(2): 86-99, 152-154.

Sztejnberg, A. and E. Finch (2006). "Adaptive use patterns of secondary school classroom environments." Facilities **24**(13/14): 490 - 509.

Abstract: Purpose – The purpose of this research is to investigate how secondary school teachers adaptively make use of the classroom learning environment. The approach illustrates the intimate relationship between teaching style, learning style and the adaptive use of space as well as the preferences for different learning environments. Design/methodology/approach – A multi method study approach was used to carry out the research. Two main methods were used in the study. In the first method, trainee teachers recorded spatial observations (mapping). Maps of the chemistry classrooms were produced. The observers marked all fixed, semi-fixed and flexible elements in the classroom space. The second method involved two questionnaires. The first questionnaire (Principles of Adult Learning Scale (PALS)) was used to identify and describe teachers' teaching styles. The second questionnaire (Questionnaire of the Classrooms' Physical Properties) was used by trainee teachers acting as observers. It consists of a set of items that enable the evaluation of classroom quality related to specific physical properties. Research data were collected from ten secondary schools (upper level of the Polish secondary schools) in five cities located in South-West part of Poland. Findings – The results suggest that the traditional row and column classroom seating arrangement was dominant. It was found that teaching styles could be identified determined using factors identified using the PALS scale. Teachers generally perceived their own learning environment as more teacher-centered or more student-centered. Their teaching styles were combinations of student-centered and teacher-centered activity. Practical implications – The research has practical significance in that it had developed a questionnaire that can be used by students and teachers to monitor the quality of physical classrooms environments and provide guidelines for the improvement of learning spaces. Originality/value – The application of the multi-method described in this study creates possibilities for a deeper understanding of secondary school classroom environments. A structured data collection system was valuable for the trainee teachers. They acquired a useful knowledge of classroom management and how to create effective learning environments, during the professional practice period. Trainee teachers gain awareness that would enable them to make changes to the classroom environment as an adaptive resource.

Tanner, C. (2000). "Essential Aspects of Designing a School ". Retrieved 6 May 2010, from http://www.coe.uga.edu/sdpl/research/principlesofdesign.html.

Over the past several months the School Design and Planning Laboratory (SDPL) has been conducting research to find school design variables that influence student achievement. Our samples have been in the State of Georgia and may not necessarily generalize to other areas. We were successful in finding 29 design patterns that significantly relate to student achievement. In all cases statistical controls were placed on social and economic variables to eliminate bias. The following list represents findings from two studies. All of the school design categories were assessed by a valid and reliable scale and correlated significantly with student achievement (Alpha = .05). The research represents findings concerning the cognitive aspect of learning. We have not examined the behavioral or affective dimensions, but these areas are on our research agenda.

Tanner, C. (2000). "The influence of school architecture on academic achievement." Journal of Educational Administration **38**(4): 309-330.

Limited, dated information is available to school administrators concerning the influence that the built learning environment has on academic achievement. Given the population increases, volatile standardized test scores, demand for new schools, and deplorable conditions of school facilities in the United States, it is timely to investigate this neglected aspect of educational research. In the face of radical technological changes and curriculum innovations, much of the new public school architectural design is tied firmly to past and outdated practices. Currently reform advocates push for program change to occur, while voicing minimal concern for the often obsolete and shabby physical environments of the schools where the program improvement is to evolve. With these problems representing the educational need, the specific purpose of this study was to determine how school architectural design factors might influence student achievement scores in elementary schools. A total of seven design factors were found to correlate with student learning outcomes.

Tanner, C., K. (2000). School Design Factors for Improving Student Learning, University of Georgia**:** 26.

Basic design factors are reviewed from three perspectives: Environmental, educational, and architectural. Selected developmentally appropriate characteristics of students are reviewed and linked to affective, behavioral, and cognitive learning categories. These characteristics are then matched with learning goals, and activities. Given these foundations, appropriate architectural/natural support systems are defined and designs that match the learning goals are recommended.

Tanner, C. (2008). "Explaining relationships among student outcomes and the school's physical environment." Journal of Advanced Academics **19**(3): 444-471.

Tanner, C. (2009). "Effects of school design on student outcomes " Journal of Educational Administration **47**(3): 381-99.
This paper compares student achievement with three school design classifications: movement and circulation, daylighting and views. From a sample of 71 schools, measures of these designs were taken on 10 Likert scale and compared to student outcomes defined by 6 parts of the Iowa test of Basic Skills (ITBS): reading comprehension, vocabulary, language arts, mathematics, social studies and science. Data was tested on a reduced regression analysis and the effect of a full regression R2 was seen to be the effect of physical environment on student's outcomes. Significant effects were found on reading vocabulary , comprehension, language arts, maths and science. These findings have implications for school design. Study arises from University of Georgia's program of research and School Design and Planning Laboratory that has been measuring the impact of schools physical environment on aspects of affective, behavioural and cognitive learning.

Tanner, C. and J. Lackney, Eds. (2006). Educational facilities planning. Boston, Pearson.
This book includes a thorough conceptual framework, with descriptions of facilities' planning, design and research. Each chapter provides a special 'reality-based' contribution to the educational facilities planning and design process. Ideas are conveyed through comprehensive descriptions, illustrations, summaries, and extended activities developed to increase understanding and emphasize the relevance of school planning and design in a regulated, political climate. The reader is guided to visualize a broader context for educational planning and design, where design principles are categorized according to building organization, educational level, shared school and community resources, and site design and outdoor spaces.

Tanner, C. K. (2008). "Explaining Relationships Among Student Outcomes and the School's Physical Environment." Journal of Advanced Academics **19**(3): 444-471.
This descriptive study investigated the possible effects of selected school design patterns on third-grade students' academic achievement. A reduced regression analysis revealed the effects of school design components (patterns) on ITBS achievement data, after including control variables, for a sample of third-grade students drawn from 24 elementary schools. The sample means on the ITBS per school represented approximately 1,916 third-grade students. The independent variable set for developing a possible explanation of student achievement was the school's physical environment, defined as four sets of design patterns: movement and circulation (e.g., adequate personal space and efficient movement patterns throughout the school), large group meeting places (e.g., social gathering places), day lighting and views (e.g., windows with natural light), and instructional neighborhoods (e.g., large and small group areas that accommodate wet and dry activities). Each of the four full regression models, which included subsets of the design elements, explained between 2% and 7% of additional variance in achievement when compared to the reduced model, which included a measure of school SES. Therefore, each of the four design variables was positively related to student achievement, even after controlling for school SES.

Tanner, C. K. and A. Langford (2003). The Importance of Interior Design Elements as They Relate to Student Outcomes.**:** 49.
This study investigated the following questions: (1) "What are the perceptions that elementary school principals have concerning the influence of interior design elements such as floor and wall coverings, lighting, flexibility, acoustics, color, texture, patterns, cleanliness, and maintenance on student achievement, teacher retention, and student attendance?" (2) "Do the acoustics of the environment relate significantly to student achievement?" (3) What floor coverings in the classroom relate significantly to the acoustics of the classroom?" and (4) "Are there any possible links between floor coverings in the classroom and student achievement?" The study found that in all subject areas studied, students attending schools having carpeted classrooms had higher achievement scores than those attending schools having hard surfaced classrooms. The study also found that the importance of a school's interior design is slightly higher for school principals than for teachers.

Taylor, A. (2005). Silent curriculum: learning through creative design. AIA National Summit on School Design. University of Maryland**:** 12.
Professor from School of Architecture and Planning, University of New Mexico. Presentation on flexible furniture, technologies and sustainable design.

Taylor, A., R. A. Aldrich, et al. (1988). "Architecture Can Teach." Transforming Education **Winter**: 31.

Taylor, A. and K. Enggass (2009). Linking Architecture and Education: Sustainable Design for Learning Environments., University of New Mexico Press, Albuquerque.
Presents a holistic, sustainable philosophy of learning environment design based on the study of how schools, classrooms, playgrounds, homes, museums, and parks affect children and how they learn. The author argues that architects must integrate their design knowledge with an understanding of the developmental needs of learners, while at the same time educators, parents, and students must broaden their awareness of the built, natural, and cultural environment to maximize the learning experience. The book presents numerous examples of dynamic designs that are

the result of interdisciplinary understanding of place. Also included are designer perspectives, forums derived from commentary by outside contributors involved in school planning, and numerous photographs of thoughtful and effective solutions to create learning environments from comprehensive design criteria.

Taylor, A. F., F. E. Kuo, et al. (2001). "Coping with add: The Surprising Connection to Green Play Settings." Environment and behavior **33**(1): 54-77.

Attention Restoration Theory suggests that contact with nature supports attentional functioning, and a number of studies have found contact with everyday nature to be related to attention in adults. Is contact with everyday nature also related to the attentional functioning of children? This question was addressed through a study focusing on children with Attention Deficit Disorder (ADD). This study examined the relationship between children's nature exposure through leisure activities and their attentional functioning using both within and between-subjects comparisons. Parents were surveyed regarding their child's attentional functioning after activities in several settings. Results indicate that children function better than usual after activities in green settings and that the "greener" a child's play area, the less severe his or her attention deficit symptoms. Thus, contact with nature may support attentional functioning in a population of children who desperately need attentional support.

Taylor, A. F., A. Wiley, et al. (1998). "Growing Up in the Inner City: Green Spaces as Places to Grow." Environment and behavior **30**(1): 3-27.

Children growing up in the inner city are at risk for a range of negative developmental outcomes. Do barren, inner-city neighborhood spaces compromise the everyday activities and experiences necessary for healthy development? Sixty-four urban public housing outdoor spaces (27 low vegetation, 37 high vegetation) were observed on four separate occasions. Overall, inner-city children's everyday activities and access to adults appeared remarkably healthy; of the 262 children observed, most (73%) were involved in some type of play, and most groups of children (87%) were supervised to some degree. In relatively barren spaces, however, the picture was considerably less optimistic: Levels of play and access to adults were approximately half as much as those found in spaces with more trees and grass, and the incidence of creative play was significantly lower in barren spaces than in relatively green spaces.

Taylor, R. G., M. L. Vasu, et al. (1999). "Permanent vs Temporary School Facilities: Decision Making in an Information-Rich Environment." Education **119**(4): 706.

Argues the issue of permanent versus temporary school facilities. Compilation of data; Influence of public policy on land use in student growth patterns; Calls for mixed or permanent construction; Accuracy of student growth predictions.

Temple, P. (2007). Learning spaces for the 21st century: A review of the literature, Centre for Higher Education Studies, Institute of Education, University of London.

Temple, P. (2009). "From Space to Place: University Performance and its Built Environment." Higher Education Policy **22**: 209-223.

Temple, P. and R. Barnett (2007). "Higher Education Space: Future Directions." Planning for Higher Education. **36**(1): 5-15.

This article draws upon work undertaken by the authors as part of the Higher Education Funding Council for England's (HEFCE) United Kingdom Space Management Project, and HEFCE's permission is gratefully acknowledged. Responsibility for the present article rests, of course, entirely with the authors.

Tenenbaum, G., S. Naidu, et al. (2001). "Constructivist pedagogy in conventional on-campus and distance learning practice: an exploratory investigation." Learning and Instruction **11**(2): 87-111.

This study attempts to identify characteristics of constructivism and their presence in face-to-face and open and distance learning (ODL) environments. In phase 1 of this study, a 6-week discussion through an electronic mailing list was carried out to explore the concept of constructivism, the process underlying constructivist learning and its facilitation. In the second phase, a questionnaire was developed and later analysed to ascertain the presence of constructivist principles in formal higher education instructional activities. The results of these studies were very similar and foregrounded the following seven components of constructivist teaching and learning: (1) arguments, discussions, debates, (2) conceptual conflicts and dilemmas, (3) sharing ideas with others, (4) materials and measures targeted toward solutions, (5) reflections and concept investigation, (6) meeting student needs, and (7) making meaning, real-life examples. Based on tutorials analysis (phase 1) and surveys (phase 2) in one university, the findings indicate that these components are not sufficiently present in any of the settings which were investigated, despite the positive intentions that instructional designers had in their planning phase.

The XII Architecture & Behaviour Colloquium (2007). School building design and learning performance: with a focus on schools in developing countries. 12th architecture & behaviour colloquium, Ascona, Switzerland, Comportements.

The XII Architecture & Behaviour Colloquium took place in Monte Verita (Ascona, Switzerland) from March 29 to April 1, 2006 and was a very productive meeting. Its theme was Architectural Quality in School Buildings: School Building Design and its Relevance to Students' Learning Performance – With a Specific Focus on the Planning and Design of Schools in Developing Countries. The specific theme of the Colloquium can be rephrased in questions. Should we be concerned about how buildings look, how they work and are used by pupils and teachers in contexts where usually the priority is

simply to be able to offer basic school training for youngsters ? Is building quality a luxury in situations where the first challenge is just to find spaces where youngsters can be taught ? The issue of the interrelationship between school buildings and the level of students' scholarly performances has been the topic of studies in the social sciences for a number of years. Research is being done at universities and institutes across Europe and North America and the debate is of considerable interest to both scientists and practitioners. Yet the impact of such research is uncertain. Some pedagogical approaches, such as those followed by Rudolf Steiner schools, do explicitly acknowledge and integrate the influence of the characteristics of buildings (e.g. colours
and shapes) in their teaching programmes. But "ordinary" schools ?

Theoharis, G. (2007). "Social Justice Educational Leaders and Resistance: Toward a Theory of Social Justice Leadership." Educational Administration Quarterly **43**(2): 221-258.

Purpose : A subgroup of principals--leaders for social justice--guide their schools to transform the culture, curriculum, pedagogical practices, atmosphere, and schoolwide priorities to benefit marginalized students. The purpose of the article is to develop a theory of this social justice educational leadership. Research Design: This empirical study examined the following questions: (a) In what ways are principals enacting social justice in public schools? (b) What resistance do social justice--driven principals face in their justice work? (c) What strategies do principals develop to sustain their ability to enact social justice in light of the resistance they face in public schools? Data Collection and Analysis: A critical, qualitative, positioned-subject approach combined with principles of autoethnography guided the research methods. Seven public school leaders who came to the principalship with a social justice orientation, who make issues of race, class, gender, disability, sexual orientation, and other historically marginalizing factors central to their advocacy, leadership practice, and vision, and who have demonstrated success in making their schools more just, were studied through interviews. Findings: A description of (a) how the principals enacted social justice, (b) the resistance they faced as well as the toll the resistance had on them, and (c) the strategies they developed to sustain their social justice work is provided in detail. Implications for administrator preparation are made at the close of this article.

Thomas, J. (2009). Overview of Post Occupancy Evaluation methods, British Council for School Environments**:** 3.

Thomson, P. and J. Blackmore (2006). "Beyond the power of one: redesigning the work of school principals." Journal of Educational Change **7**(3): 161-177.

There is mounting international research evidence that the work of school principals is increasingly difficult, time consuming and more unattractive to prospective applicants. We suggest that the solution to this situation lies in redesigning the work that principals do. Using the New London Group's (1996) definition of design as both process and product and as a hybrid of existing resources, we offer five cases of redesign: distributed pedagogical leadership, co-principalship, shared principalship, multi-campus principalship, and community-based principalship. We argue that these examples show that redesigns that focus on the school, rather than on the work of the principal, have more far-reaching effects, but are also much more vulnerable to context. We propose three emerging principles for redesign viz. developing a strong warrant for redesign, attending to infrastructure and building organic relations between school and community.

Thomson, P., K. Jones, et al. (2009). Creative School Change Research Project, Creativity, Culture and Education**:** 105.

This report gives an account of a research project that explored the ways in which schools have taken up the „offer" made by Creative Partnerships, so as to bring about school change. Its findings are expressed partly in the form of descriptions and analyses of change, and partly in the form of heuristics - a way of identifying and labelling activities to facilitate discussion about features of school practice, and thus to assist the work of professional development. The report sets school change in the context of international policies of school reform, arguing that such policies are always inflected at regional and at school level, so that an understanding of the process of *vernacularisation* – the local language and practice of change – is essential.

Thorne, G. (2002). Collaborative Planning: Structures implemented by Western Australian Department of Education Rural Primary Schools, Western Australian Department of Education Rural Primary Schools**:** 47.

This study investigates a variety of way that Department of Education Primary Schools have undertaken restructuring to implement collaborative planning time for staff. The schools provide education to students from ages 4 to 12, are located in rural Western Australia and vary in size from small (level 3) medium (level 5). Staff working in teams to implement new curriculums and teaching methods is a world-wide trend. The issues of benefits of collaborative planning, the type of structures in place, implementation methods and recognizable facilitators and blockers to implementation are explored. A qualitative approach using cases is adopted. Initially nominated principals provided 'stories' to a Department of Education project team. Overall these 'stories' provided physical details of the restructures but did not allow readers to relate the structure to the individual school context nor did they outline the change process. Initial analysis of the written documents allowed the development of a matrix of issues. These issues became the focus for a series of interviews with the original 'story' writers. Findings of this research are presented at two levels. Firstly presentation of four individual cases allow the reader to connect structures and implementation strategies with particular contexts. At the next level summaries allow a wider audience of principals in other schools across the state to

peruse a range of restructuring possibilities, suggestions for implementation and indicators that will allow smoother and speedier implementation of site-developed restructures. Overall the study highlights the wide variety of structures that are regarded as 'good practice' by Departmental District Curriculum Managers. Also of note is the key role principals take in leading their schools and the necessity for multiple leaders to be fostered in schools undertaking significant curriculum and pedagogy change.

Tiburcio, T. and E. Finch (2005). "The impact of an intelligent classroom on pupils' interactive behaviour." Facilities **23**(5/6): 262-278.

The purpose of this research is to determine whether new intelligent classrooms will affect the behaviour of children in their new learning environments. A multi-method study approach was used to carry out the research. Behavioural mapping was used to observe and monitor the classroom environment and analyse usage. Two new classrooms designed by INTEGER (Intelligent and Green) in two different UK schools provided the case studies to determine whether intelligent buildings (learning environments) can enhance learning experiences. Several factors were observed in the learning environments: mobility, flexibility, use of technology, interactions. Relationships among them were found indicating that the new environments have positive impact on pupils' behaviour.

Tolmie, A. K., K. J. Topping, et al. (2010). "Social effects of collaborative learning in primary schools." Learning and Instruction **20**(3): 177-191.

There is conflicting evidence on whether collaborative group work leads to improved classroom relations, and if so how. A before and after design was used to measure the impact on work and play relations of a collaborative learning programme involving 575 students 9-12 years old in single- and mixed-age classes across urban and rural schools. Data were also collected on student interactions and teacher ratings of their group-work skills. Analysis of variance revealed significant gains for both types of relation. Multilevel modelling indicated that better work relations were the product of improving group skills, which offset tensions produced by transactive dialogue, and this effect fed through in turn to play relations. Although before intervention rural children were familiar with each other neither this nor age mix affected outcomes. The results suggest the social benefits of collaborative learning are a separate outcome of group work, rather than being either a pre-condition for, or a direct consequence of successful activity, but that initial training in group skills may serve to enhance these benefits.

Trickett, E. J. and R. H. Moos (1973). "Social environment of junior high and high school classrooms." Journal of Educational Psychology **65**(1): 93-102.

Reports on the development of a Classroom Environment Scale (CES), a 90-item perceived environment scale that assesses 9 dimensions (e.g., student involvement, competition) of the classroom. Intercorrelations among the subscales indicate that the CES measures distinct, though moderately correlated, aspects of the classroom environment. Each of the subscales significantly discriminated among 38 classrooms in a standardization sample, and internal consistency of the subscales and overall profile stability were high. Sample profiles of contrasting classrooms are described and compared. The theoretical implications and the pragmatic utility of the CES are discussed.

Tschannen-Moran, M. and M. Barr (2004). "Fostering Student Learning: the relationship of collective teacher efficacy and student achievement " Leadership and Policy in Schools **3**(3): 189-209.

Collective teacher efficacy (CTE) refers to the collective perceptions that teachers in a given school make an educational difference to their students over and above the educational impact of their homes and communities. Significant positive relationships were found between CTE and student achievement in the grade 8 Maths, writing and English tests. In addition, significant relationships were found between both the instruction and discipline subscale of CTE with al three tests. When controlling for ses CTE made a significant independent contribution to the Grade 8 writing scores.

Udin, A., R. Udin, et al. (2008). Physical environment in school setting: conceptual reviews. Seminar Penyelidikan Pendidikan Pasca Ijazah. Universiti Teknologi Malaysia, Universiti Teknologi Malaysia Insitutional Repository.

Increasing numbers of educators have begun to believe that the physical environment might have an impact on students' outcomes. There are several research findings indicate that students academic outcomes are affected positively or adversely by the visual, acoustical, and thermal characteristics of the classroom environment (Bowers et al. 1987) such as student behavior (Cash, 1993); attitudes (Weinstein, 1979); and achievement (Cash, 1993; O'Sullivan, 2006); personality development (Roberts and Robins, 2004); student preferences and comfort (Corgnati et al., 2007). Concrete foundation is needed to discuss the circumstances of the physical environment in school setting. The valuable theorists mostly cited as a guidance is person-environment fit theory (Caplan and Van Harrison, 1993). The match between attributes of the person and attributes of the environment reflects the concept of person-environment (PE) fit (Roberts and Robins, 2004). This paper will reviews the related concept of physical environment from ergonomics perspectives which is mostly applied in workplaces setting in order to relate it with the condition or situation in classroom setting.

UK Design Industry Skills (2007). High-level skills for higher value, UK Design Industry Skills Development Plan: Design Skills Advisory Panel**:** 72.

A new design industry for a competitive economy This is an important moment for the UK design sector and its profile

has never been higher. Our design education system is respected worldwide and the industry has grown rapidly over the past decade to become the largest in Europe, with an annual turnover in excess of £11 .6bn. In parallel, there is an increasing understanding by business of the role that design can play in enhancing competitiveness and innovation performance, and there is growing recognition by government of the value that design can add to the economy. The potential for future development of the design industry is significant and there are important opportunities on the horizon. But to take advantage of them we must make sure we have the right skills. This report encapsulates the design industry's analysis of its current skills, giving an honest appraisal of where the skills gaps are and how we could work with government to address them. Industry-led skills development is a major part of government strategy for improving the UK economy and this plan is the design industry's response to that strategy. It has been produced by the Design Skills Advisory Panel, and contains recommendations developed in consultation with more than 4000 designers over the last two years.

Uline, C. and M. Tschannen-Moran (2008). "The walls speak: the interplay of quality facilities, school climate, and student achievement." Journal of Educational Administration. **48**(1): 55.

A growing body of research connecting the quality of school facilities to student performance accompanies recent efforts to improve the state of the educational infrastructure in the USA. Less is known about the mechanisms of these relationships. This paper examines the proposition that part of the explanation may be the mediating influence of school climate. Teachers from 80 Virginia middle schools were surveyed employing measures including the School Climate Index, a seven-item quality of school facilities scale, as well as three resource support items. Data on student SES and achievement were also gathered. Bivariate correlational analysis was used to explore the relationships between the quality of facilities, resource support, school climate, student SES, and student achievement. In addition, multiple regression was used to test school climate as a mediating variable between the quality of facilities and student achievement. Results confirmed a link between the quality of school facilities and student achievement in English and mathematics. As well, quality facilities were significantly positively related to three school climate variables. Finally, results confirmed the hypothesis that school climate plays a mediating role in the relationship between facility quality and student achievement. Deeper understandings of the complicated interplay between the physical and social environments of school, and how these dynamics influence student outcomes, may help educators build a compelling case.

Uline, C., M. Tschannen-Moran, et al. (2009). "The walls still speak: the stories occupants tell." Journal of Educational Administration **47**(3): 400-426.

Purpose – Accompanying the recent concern for the quality of our nation's educational infrastructure, a growing body of research connects the quality of school facilities to both student outcomes including achievement, behavior, and attitude as well as to teacher attitude and behavior. Less is known about the mechanisms of these relationships. This paper aims to examine the link between school building quality and student outcomes through the mediating influence of school climate. Results build upon those of a recent study that confirmed a link between the quality of school facilities and student achievement in both English and Mathematics, as well as the mediating role of school climate. This qualitative follow-up study explores the complicated intricacies of how a school building's physical properties influence teaching and learning. Design/methodology/approach – The study is structured according to a collective, instrumental case study design. Individual, focus group, walk-through and photo-interviews, as well as observations inform the inquiry. Two high-poverty schools are identified from the earlier quantitative study because the ratings of the quality school facilities by their faculties fall within the upper quartile. These two schools, one urban and one rural, are selected purposefully for this study, maximizing learning from cases rich in information. Findings – Results of the research indicate that ongoing interactions between the original design, the day-to-day reality of the built environment, and the occupants of that environment help to define the learning climate of these schools. Reciprocally, the climate helps to shape the interactions that take place, fostering environmental understanding, competence and control and supporting academic learning. From the data, several broad themes related to building quality emerge as central to this interaction between the built environment and building occupants, including movement, aesthetics, play of light, flexible and responsive classrooms, elbow room, and security. Originality/value – Through the stories told by occupants of these two schools, we gain further understanding of the interactions between certain building conditions and design features and how these reinforce and enhance the social environment of school, helping to foster a sense of belonging within a place, a sense of control and competence, and a sense of collective commitment to the place and its purposes. As school designers balance considerations of durability with flexibility, the voices of these occupants may serve to argue for the inclusion of design features that allow occupants some measure of control over comfort and use factors. The broad themes related to building quality that emerge from the data include movement, aesthetics, the play of light, flexible and responsive classrooms, elbow room, as well as safety and security.

University of Melbourne School of Architecture Smart Green Schools.

This project involves the investigation of educational and environmental sustainability opportunities resulting from innovative school building design. It will explore the use and perception of the built environment for learning and as a 3D textbook. Investigate the influence of innovative and sustainable school building designs on the education of middle years students (Years 5-8) in four different school settings in Victoria, Australia. It will focus on understanding how learning spaces may support new and future teaching and learning pedagogical approaches, including the integration of

ICT and multimedia technologies. The concept of utilising the buildings themselves as learning objects, or 3D textbooks, will also be investigated within the context of environmental sustainability education. The school environment is just one aspect of an interrelated system of cultural, economic, pedagogical, oganisational and motivational factors. Research suggests that teachers do not perceive the physical environment as a major component of education and are therefore unlikely to fully explore the potential of the environment as a 3D textbook to facilitate learning (Nair and Fielding 2005). This research will make recommendations on how environmental considerations might be better embedded into teacher education and school management training. It will investigate the extent to which teachers recognise the importance of the environment as a key part of their thinking and practice. The engagement of middle years' students will be a key focus of this research. They will help collect environmental data and learn more about climate and energy. In this proactive research methodology, students, teachers and architects will collaborate to manipulate the curriculum and learning spaces to suit different learning modalities. Students will participate within teams to further their problem solving, communication and organizational skills. Teachers will learn to effectively manage space both environmentally and pedagogically. Partner architects will have the unusual opportunity of experiencing and critiquing their designs through the eyes of users.

US Department of Education Washington DC (2000). Schools as centers of community: a citizens' guide for planning and design. Washington DC**:** 59.

In the summer of 1998, the U.S. Department of Education organized a small symposium of educators, architects, planners and other professionals involved in the planning and design of the physical environments that support learning. The outcome of the symposium was a forum on the design of Schools as Centers of Community held in Washington D.C. in October, 1998. The Citizen's Guide for planning Schools as Centers of Community was developed to communicate some ideas generated by the forum. These ideas have been established in a set of national Design Principles. In addition to the U.S. Department of Education, these design principles have been subsequently endorsed by the Council for Educational Facilities Planners International; the American Institute of Architects; the American Association of School Administrators; and the Construction Managers Association of America. The Citizen's Guide outlines a practical introduction to a process for engaging all educational stakeholders in the process of planning schools that more adequately address the needs of the whole learning community.

Valenti, M. (2005) Learning Space Design Precepts and Assumptions. Educause Review **40**, 40

Valeski, V. (2003). Creating Flexible Middle School Classrooms., University of Delaware, Newark 381.

Investigates one school district's efforts to develop, design and construct optimum middle school classroom learning environments. Of particular interest to this author were the mandates, guidelines and processes that impeded optimization of middle school classroom facilities. A variety of stakeholder groups were surveyed and interviewed. Each group's unique perspective collectively led to two findings. The first was that the features of an optimal middle school classroom had not been identified and documented. Additionally, a protocol did not exist that appropriately communicated methodologies for middle school classroom optimization to educational decision-makers, planners and architects. Secondly, current design methodologies did not acknowledge or anticipate the dynamic instructional programming that is transforming both teaching and learning in current middle school classrooms. Consequently, the flexibility of middle school level instructional environments has been limited by the design mandates, guidelines and processes that were followed by educational decision-makers, planners and architects. A planning protocol was developed to help educational planners and decision makers allocate and prioritize limited classroom construction resources. The protocol is intended to identify the essential components of an optimal middle school classroom and permit the user to select from a range of negotiated outcomes.

Van Note Chism, N. (2005). Challenging Traditional Assumptions and Rethinking Learning Spaces. Learning Spaces. D. Oblinger. Boulder, Educause.

Van Wagenberg, D., M. Krasner, et al. (1981). "Children Planning an Ideal Classroom: Environmental Design in an Elementary School." Environment and behavior **13**(3): 349-359.

In recent years there has been a conceptual merging of influence from open education, behavioral psychology, environmental psychology, and architecture into an approach that can be labeled "environmental design." In this study an elementary school teacher and an architect trained a group of third grade students in the principles of designing an ideal classroom. An evaluation of the training demonstrated that the subject's ability to observe and design environments was significantly greater than comparable students not receiving the training. The study demonstrated that children as young as eight or nine can be systematically taught to participate in the designing of their own environments.

Vasudeva, A., L. Darling-Hammond, et al. (2009). Oakland Unified School District New Small Schools Initiative Evaluation, The School Redesign Network, Stanford University**:** 92.

his final report by the School Redesign Network at Stanford University (SRN) completes a Phase II evaluation study of Oakland Unified School District's (OUSD) New Small Schools Initiative1 from 2000 to present. The Phase II evaluation

study follows a Phase I study completed in September 2007 by Strategic Measurement and Evaluation, Inc. The Phase II study takes a deeper, longitudinal look at the 45 new small schools in operation during the 2007-08 school year and addresses questions raised by the Board of Education; district administrative leadership; community partners; and school principals, teachers, and parents based on the findings of the Phase I evaluation. These questions were incorporated into and informed three overarching research goals for this study: Research Goal #1 To understand how well new small schools and existing schools in OUSD are performing over time, taking into account the students they serve and their process of startup and development.; Research Goal #2 To understand what factors influence schools' achievement and their improvement trajectories over time.; Research Goal #3 To recommend policy strategies that can build on current successes and address identified needs and issues.

Veletsianos, G., C. Scharber, et al. (2008). "When sex, drugs, and violence enter the classroom: Conversations between adolescents and a female pedagogical agent." Interacting with Computers **20**(3): 292-301.

In this article, we investigate the discourse between a female conversational pedagogical agent and 59 adolescents in the context of a social studies lesson. We note that previous pedagogical agent research has focused on the positive effects of agents, while failing to take into account the intricacies of learner-agent discourse, and subsequently missing the abuse suffered by pedagogical agents at users' fingertips. Our analysis indicates that learners readily misuse and abuse pedagogical agents while placing them in a subordinate and inferior role. We conclude by making recommendations on agent design and future research.

Vincent, S., Ed. (1999). The Multigrade Classroom: A Resource Handbook for Small, Rural Schools. Book 2: Classroom Organization., Northwest Regional Educational Lab., Rural Education Program, Portland, OR

Offers guidelines for classroom organization that will accommodate the multiple activities occurring in the multigrade classroom. Outlines an activity-centers approach to classroom design that designates classroom areas for specific purposes. Defines general considerations for planning, including activity level and noise likely to occur during different learning activities, use of visual barriers to define activity centers, placement of teacher and student resources, traffic patterns, age and physical size differences among students, and storage of student belongings. A list of questions clarifies classroom design principles and aspects of a particular classroom plan. Presented in workbook fashion, a three-step design process involves describing the present classroom, identifying specific learning activities that will take place, and drawing the final plan.

Von Ahlefeld, H. (2007). What the OECD PISA study reveals about the learning environment. School building design and learning performance with a focus on schools in developing countries: proceedings of the 12th Architecture and Behaviour Colloquium, Lausanne, Switzerland.

The Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) has been described as the "finest example of effective international governance by the simple dissemination of information". The strength of PISA is its capacity to relate internationally comparable data on *student outcomes* to *contextual factors* using sophisticated statistical analyses. In PISA, student outcomes are measured using student assessment scores. In PISA 2003, students completed a two-hour paper-and-pencil assessment containing both multiple-choice items and questions requiring students to construct their own responses, which covered reading, mathematical and scientific literacy, and problem solving, with a primary focus on mathematical literacy. Items were organised in units based on a stimulus presenting a real-life situation. Data on contextual factors derive from short questionnaires complete by school principals and student on, for example, student's family background, students' learning of mathematics, school characteristics and pedagogical practices. Examining relationships between contextual variables and student performance using PISA data permit the identification of differences between countries in the relationship of achievement and student-and school-level factors; the examination of the proportion of variation in achievement between and within schools; the analysis of the impact of schools in moderating or increasing the effects of individual-level variables on achievement; and addressing and monitoring these relationships over time. This paper describes the PISA instrument and the results from PISA 2003 relating to educational facilities. Although this paper will demonstrate that existing data shed little light on the relationship between the built environment and student performance, the PISA tool has great potential for investigating this relationship in greater depth.

Von Ahlefeld, H. (2009). "Evaluating quality in educational facilities." CELE Exchange 2009 **9**.

Ensuring the quality of educational facilities is a policy priority in many OECD countries. The above statement summarises the conclusions of experts participating in three OECD meetings in 2005-06 on "Evaluating Quality in Educational Facilities". In 2005, the OECD Programme on Educational Building (PEB) brought together experts from over 20 countries in two experts' group meetings to discuss how they define and measure quality in educational facilities. In 2006, the OECD/PEB Governing Board agreed to form a Working Group on Evaluating Quality on Educational Facilities to advance this work. In 2009, this work encompasses numerous strands.

Walbe Ornstein, S., N. Saraiva Moreira, et al. (2009). "Improving the quality of school facilities through building performance assessment: educational reform and school building quality in Sao Paulo, Brazil." Journal of Educational Administration **47**(3): 360-367.

The paper describes the purpose of and strategies for conducting post-occupancy evaluations (POEs) as a method for

assessing school building performance. Set within the larger context of global efforts to develop and apply common indicators of school building quality, the authors describe research conducted within the newest generation of Sao Paulo's schools. Design/methodology/approach – The various methods of POE, including expert walkthroughs, physical measurements, observations, behavioral mapping, user interviews, focus groups, and survey questionnaires were applied within a purposefully selected case study school. Findings – The POE carried out at Fernando Gasparian High School revealed limitations in the building's design, particularly in light of the neighborhood context, thus raising significant concerns about safety and security. Users gave the construction quality of the building, a generally positive evaluation, however, there were some important aspects of the building design judged as deficient. In particular, researchers observed a significant mismatch between the building design and the realities of the surrounding community. This sort of incongruity introduced important challenges to principals, teachers, and staff, as they worked to ensure the safety of students who attend the school. Originality/value – The research explores the effectiveness of POE methods in capturing user and expert assessments of overall building quality, as well as the degree to which building designs assist educators and community members in realizing Brazil's larger educational reform goals.

Wallace, J. G. (2003). "Innovation and sustainability and quality of life: a university perspective." Industry and Higher Education **17**: 15-20.

Wallen, N. E., R. M. W. Travers, et al. (1963). "Relationships between teacher needs and teacher behavior in the classroom." Journal of Educational Psychology **54**(1): 23-32.

2 samples of elementary school teachers (N = 77 and 41) were studied with respect to consistencies between classroom behavior and "needs" as measured by a paper-and-pencil questionnaire. The paper-and-pencil device provided scores on Achievement, Affiliation, Recognition, and Control needs. Behavioral data consisted of observations recorded as ratings and also as Q sorts and an analysis of verbal statements made by the teachers. The principal findings were: (a) significant positive relationships among the various measures of teacher behavior on the Control and Affiliation dimensions, (b) a significant negative relationship between Control and Affiliation behavior as viewed by the observers, and (c) significant positive correlations (.30-.50) between Control need as measured by the questionnaire and controlling behavior of the teachers.

Wang, N. and M. Boubekri (2010). "Investigation of declared seating preference and measured cognitive performance in a sunlit room." Journal of Environmental Psychology **30**(2): 226-238.

Current daylighting standards are not sufficient to guarantee a high-quality daylighting experience as they fail to take the behavior of building occupants into consideration. The way that a daylit room is appreciated and used has not been fully explored, especially under sunlighting conditions. This research is the first of its kind to assess how the distance between a subject and a sun patch on the floor is related to a broad range of behavioral responses, including conclusive preference and measured cognitive performance. One hundred subjects participated in a controlled experiment in a work setting. Investigations of the declared preferences of seating area and subjects' cognitive performances indicated that people are not always aware of the environmental factors that influence their behavior. Subjects were generally attracted to sunlight and outdoor views, but they did not necessarily perform best in these preferred areas. Privacy and a sense of control were two hidden factors that greatly affected subjects' decisions and performances. Current daylighting literature and design practice do not pay adequate attention to such factors as sense of visual control or privacy in the design of rooms. On the other hand, the perceived problem of visual glare caused by sunlight penetration did not affect performance as much as subjects believed it would. An additional result suggested that individual behaviors were more affected by environmental elements than were group activities.

Washor, E. (2003). Innovative pedagogy and school facilities: the story of the MET School in Rhode Island. Doctoral Program in Educational Leadership. Providence, Rhode Island, Johnson and Wales University. **Doctor of Education:** 99.

Several forces are converging to place school facilities design—particularly high school facilities design—at the center of national attention: 1) a resurgence of interest in high school reform, particularly focused on personalizing learning; 2) the growing number of alternatives to traditional high schools; 3) a crumbling physical infrastructure; and 4) a recognition that the prevailing physical characteristics of high schools serve as substantial impediments to fundamental reform. When "form follows function" prevails as a design principle and the function is shifting fundamentally to address such concepts as meeting student interests, school facilities will need to accommodate different learning styles and contexts. Each set of stakeholders, however, will see the concept differently and imagine a different physical space. What are the forces at work and the tensions impacting these innovative school designs? How can we document and make sense of the process of translating innovative pedagogical designs into facilities designs? This research examines the translation of innovative and complex school reform models, based upon nontraditional pedagogical models, into school facilities designs. This research identifies key factors facilitating and impeding the translation process. In addition, the research examines the dynamics of relationships between the numerous constituencies involved in the design process to understand how these relationships affect the translation process. A qualitative approach using in-depth case studies of a high school's facilities design process was employed. Interviews, analysis of the minutes of design and construction meetings, observation of the design process, and an analysis of the design drawings were used. The research found three major forces at work. Several recommendations are made for addressing these issues. The results will improve educators' understanding of school facilities design processes and recommend approaches

educators need to take in order to assure that their pedagogical designs get translated appropriately into physical designs. The research will also affirm the importance of the development of hypotheses for investigating specific forces and variables more precisely and intensively. Such research will support improved facilities planning for new schools and future plans to enhance student learning.

Waterman, A. S. (2007). "Doing Well: The Relationship of Identity Status to Three Conceptions of Well-Being." Identity: An International Journal of Theory and Research **7**(4): 289 - 307.

A study involving 217 college undergraduates was conducted to evaluate the relationship between measures of ego identity status and three conceptions of well-being: subjective, psychological, and eudaimonic. The various measures of well-being were found to be positively correlated, mostly in the low to moderate range. As predicted, scores on the Extended Objective Measure of Ego Identity Status for the identity achievement status were positively correlated with measures of all three conceptions of well-being, while corresponding negative correlations were obtained for identity diffusion scores. The correlations for the moratorium and foreclosure scales were negative for the various measures of psychological well-being but nonsignificant with measures of subjective and eudaimonic well-being. Multiple regression analyses for the moratorium and foreclosure scales yielded a more complex understanding of the associations of various well-being measures for these statuses.

Wedge, C. and T. Kearns (2005). "Creation of the learning space." Educause Review **40**(4): 32-38.

Wei, H.-S., J. H. Williams, et al. (2010). "The effects of individual characteristics, teacher practice, and school organizational factors on students' bullying: A multilevel analysis of public middle schools in Taiwan." Children and Youth Services Review **32**(1): 137-143.

This study investigated the effects of individual characteristics (gender, depression, and delinquency), teacher practice (support and maltreatment), and school organizational factors (school size and pupil-teacher ratio) on adolescents' verbal and physical bullying behaviors. A random sample of 1172 7th-9th grade students from 12 public middle schools in Taichung City, Taiwan was selected for this study. A self-report questionnaire survey was administered. The results showed that during the previous semester, 38.7% of the students had ever bullied other students physically while 53.0% had verbally bullied others. Hierarchical linear modeling was employed to conduct a two-level analysis. Individual characteristics including gender, depression, and involvement in delinquent behaviors were found to significantly contribute to both verbal and physical bullying. Teacher's support and maltreatment of students were also associated with the two types of bullying. School size and pupil-teacher ratio, on the other hand, did not significantly contribute to bullying behaviors. Implications were discussed.

Weinstein, C. S. (1979). "The Physical Environment of the School: A Review of the Research." Review of Educational Research **49**(4): 577-610.

This paper reviews research on the impact of classroom environments on student behavior, attitudes, and achievement. The first section examines studies of six environmental variables: seating position, classroom design, density, privacy, noise, and the presence or absence of windows. In the second part of the paper, research conducted from an "ecological" perspective is considered. A third section focuses on the effects of open space school designs. Finally, some future directions for research are discussed, and the advantages and limitations of various research designs are summarized.

Weinstein, C. S. (1982). "Privacy-seeking behavior in an elementary classroom." Journal of Environmental Psychology **2**(1): 23-35.

This study observed privacy-seeking behavior in an elementary classroom, investigated individual differences in privacy seeking, and compared preferences for private spaces varying in degree of enclosure. Four privacy booths were placed in a fourth-grade classroom. A ticket system was used to assess booth use. Information on personality and background variables was obtained with self-report, peer, teacher, and parent questionnaires. After an initial period of enthusiasm, overall booth use declined sharply. However, analysis revealed substantial individual variation in booth use that remained consistent throughout the study. For boys, booth use was significantly correlated with teachers' ratings of sociability, aggressiveness, and distractibility. For girls, a significant positive relationship was found between privacy seeking at home and in school. Self-reported desire for privacy was uncorrelated with actual privacy-seeking behavior in the classroom. No significant differences in the use of the various booths were found, although self-reported preferences clearly favored the booth that allowed visual access to the rest of the classroom when desired.

Weinstein, C. S. and T. G. David (1987). Spaces for children : the built environment and child development. New York, Plenum Press.

Weinstein, C. S. and A. E. Woolfolk (1981). "Classroom design and impression formation: A new area for research." Contemporary Educational Psychology **6**(4): 383-386.

Recently, educators and psychologists have begun to discuss the messages conveyed by different classroom designs. Although the arguments presented are persuasive, the basic contention--that classroom design influences impression formation--has not been empirically tested. The purpose of this article is to bring to the attention of educational psychologists the possibilities for research in this area. The paper summarizes the findings of some initial investigations

and suggests directions for future study.

Weinstein, C. S. and A. E. Woolfolk (1981). "The classroom setting as a source of expectations about teachers and pupils." Journal of Environmental Psychology **1**(2): 117-129.

The major purpose of this research is to examine the impact of classroom spatial arrangement (open versus traditional) and orderliness (messy versus neat) on observers' impressions of teachers and pupils. In experiments 1 and 2, samples of college students were shown color slides of vacant elementary classrooms which varied on these two physical dimensions. Subjects were asked to indicate their impressions of the teacher and the pupils who used each room by completing a set of bipolar adjective scales. Data analysis indicated that teachers in neat classrooms were rated more positively than their counterparts in disorderly classrooms on measures of kindliness, inventiveness, and organization. Pupils associated with neat classrooms were judged to be happier and better behaved. Open classroom teachers received higher ratings than traditional classroom teachers on kindliness and inventiveness. In experiment 3, the same procedure was used to obtain ratings from fifth-grade students. Their judgements of teacher and pupil characteristics were also positively affected by neatness, but classroom arrangement had no impact.

Weinstein, R. S., H. H. Marshall, et al. (1982). "Student perceptions of differential teacher treatment in open and traditional classrooms." Journal of Educational Psychology **74**(5): 678-692.

234 4th-6th graders from 8 open and 8 traditional classrooms completed the Teacher Treatment Inventory, rating the frequency with which 44 teacher behaviors were accorded 1 of 4 hypothetical target students. Nominations by principals and teacher self-ratings on the Walberg-Thomas Open Education Teacher Questionnaire were used to operationally define classroom structure. Ss described low achievers (LAs) as the recipients of more negative feedback, teacher direction, schoolwork, and rule orientation than high achievers (HAs). HAs were perceived as receiving higher expectations and more opportunity and choice than LAs. These treatment differences were perceived regardless of sex of student rated. The hypothesis that Ss in open classrooms would perceive less differential treatment of HAs and LAs than Ss in traditional classrooms was not supported. Although unrelated to the open or traditional orientation of teachers, classrooms did differ in the extent of differential treatment perceived by Ss.

Weinstein, R. S. and S. E. Middlestadt (1979). "Student perceptions of teacher interactions with male high and low achievers." Journal of Educational Psychology **71**(4): 421-431.

To investigate whether students perceive differential treatment by teachers of high and low achievers, 102 children from Grades 1-3 and 4-6 rated 60 teacher behaviors as descriptive of a hypothetical male high or low achiever. Information about the sex and the self-concept of attainment (J. G. Nicholls' 1976 scale) of the raters was also collected. Students perceived differential treatment across 25% of the teacher behaviors studied. In some cases, the perceptions were shared; in others, grade level as well as other perceiver characteristics affected perceptions. Student-perceived teacher treatment of male high achievers reflected high expectations, academic demand, and special privileges. Male low achievers were viewed as receiving fewer chances but greater teacher concern and vigilance. Implications for the self-fulfilling prophecy are discussed.

Weis, L. and C. Centrie (2002). "On the Power of Separate Spaces: Teachers and Students Writing (Righting) Selves and Future." American Educational Research Journal **39**(1): 7-36.

The debate on segregated and desegregated schools generally has been framed as an either-or matter, and in fact, legally, this has been the case. What we have not investigated to any great extent are programs within already desegregated schools that serve an identifiable population of students for the express purpose of cultural affirmation and advancement of the targeted group. In this article we provide data that attest to the potential power of such spaces, investigating a girls' group in an urban magnet school and a homeroom set aside for Vietnamese students in a neighborhood-based urban comprehensive school. Using ethnographic data, we articulate both the power of such spaces and the contradictory impulses within such arrangements.

Wells, M. and L. Thelen (2002). "What Does Your Workspace Say about You?: The Influence of Personality, Status, and Workspace on Personalization." Environment and behavior **34**(3): 300-321.

Approximately 70% of American workers personalize their workspaces. However, some employees personalize more than others, such as managers and employees with enclosed offices. Studies examining personality traits suggest that employees who personalize the most tend to be creative and have a high need for affiliation and a low need for privacy. However, major personality factors have not been examined. This study examines the relationships between workspace personalization and the Big Five personality factors by surveying 234 employees from 33 companies. Results indicate that personality is only indirectly related to personalization through employee characteristics such as status and type of workspace. Personalization is primarily predicted by the company's personalization policy and an employee's status and workspace.

Wells, M., L. Thelen, et al. (2007). "Workspace personalisaton and organisational culture." Environment and Behaviour **39**(5): 616-34.

Wells, M. M. (2000). "Office clutter or meaningful personal displays: The role of office personalization in employee and

organizational well-being." Journal of Environmental Psychology **20**(3): 239-255.

It has been suggested that personalization of one's space may enhance well-being, though this relationship has not been empirically studied. Other research points to gender differences in personalization. To determine whether office personalization is associated with employee well-being and to determine the effect of gender on this relationship, a survey of 338 office workers at 20 companies was conducted in Orange County, California. In addition, 23 of the participants were interviewed and their workspaces observed. Results revealed an indirect relationship between personalization and employee well-being with satisfaction with the physical work environment and job satisfaction as intervening variables. Further, an association was also found between the company's personalization policy and organizational well-being. There were also gender differences in personalization: women personalized more than men, and men and women personalized with different items and for different reasons. Moreover, the interview data suggested that personalization is more integral to the well-being of women than to that of men, although the survey data did not confirm this finding.

Wells, M. M., L. Thelen, et al. (2007). "Workspace Personalization and Organizational Culture: Does Your Workspace Reflect You or Your Company?" Environment and behavior **39**(5): 616-634.

Approximately 70% to 90% of American workers personalize their workspaces. Personalization has many benefits for employees (e.g., enhanced job satisfaction and well-being) and organizations (e.g., improved morale and reduced turnover). Personalization is also related to organizational issues such as employee status, workspace quality, and policies. This study extended the research by examining organizational commitment and culture. It was predicted that highly committed employees personalize more than do less-committed employees and that culture has an indirect effect on personalization. Thus, 172 office employees from 19 businesses were surveyed. Path analyses revealed that employee commitment was only indirectly related to personalization through status. As expected, organizational culture had an indirect effect on personalization, via personalization policies or norms and employee status. Thus, this research suggests for the first time that the primary predictors of workspace personalization are organizational rather than personal. Your workspace most likely reflects your company rather than you.

Wentzel, K. R., A. Battle, et al. "Social supports from teachers and peers as predictors of academic and social motivation." Contemporary Educational Psychology **In Press, Corrected Proof**.

Young adolescents' perceptions of teachers' and peers' multiple classroom supports were examined in relation to motivational outcomes (interest and social goal pursuit). Responses from sixth (n = 120), seventh (n = 115), and eighth (n = 123) grade students concerning four dimensions of support (expectations for specific behavioral and academic outcomes, provisions of help, safety, and emotional nurturing) indicated that social supports differ as a function of students' sex, grade level, teacher, and classroom, and in their relations to interest and social goal pursuit. Relations of students' perceptions to motivational outcomes differed as a function of source of support. In addition, students' perceptions of teacher and peer supports differed as a function of teacher and classroom. In general, findings confirm the utility of a multi-dimensional approach to social support that acknowledges the independent as well as interactive contributions of teachers and peers to student motivation.

Wheeler, A. (2008). Approaching the Radically Other of Animal and Natural Worlds: Exploring Participatory and Co-design methods in Building Sustainable Schools. 2008 Annual Meeting, Boston, Massachusetts.

This paper examines how participation and sustainability are being addressed by architects in new schools building programmes in the UK. It explores Government policy and a variety of participation practices which suggest co-design of school buildings. Through research with young people from some of the most disadvantaged communities in the UK, those communities that the Building Schools for the Future (BSF) programme is targeting, the paper demonstrates that young people attitudes to sustainable lifestyles and to education can illuminate many of the problems of current policy, and suggests that we need some very different ways of teaching in the C21st if we are to address the social and environmental problems that climate change will bring. Art based participation practices with young people suggest empowerment, citizenship, place making and community, but so many questions are refused by educationalists, architects and within policy literature. New educational philosophies may provide useful insight, as will new architectural approaches but the question of well-being is key and is also poorly researched. Participation within the Building Schools for the Future (BSF) programme risks becoming tokenistic, understanding the relationship between art practices in participation and sustainability could however, not only counter these accusations but enable the UK Government to achieve the dual objectives of providing better learning environments and sustainable schools.

Wheeler, A. (2008). Can We Design Schools to Encourage Lifestyle Change? Participation and Sustainable Behaviour.

This paper explores how participation and sustainability are being addressed by architects within the new schools building programmes in the UK. It examines Government policy, the Sustainable Schools initiative and a variety of participation practices, to investigate how the participation of children in the design of their school environments can encourage sustainable citizenship. The Children's Plan: Building Brighter Futures (published in December 2007) by the Department for Children, Schools and Families states an ambition for all new school buildings to be zero carbon by 2016. Tony Blair states of the Building Schools for the Future programme: "Sustainable development will not just be a subject in the classroom: it will be in its bricks and mortar and the way the school uses and even generates its own power. Our students won't just be told about sustainable development, they will see and work within it: a living,

learning place in which to explore what a sustainable lifestyles means' (Blair, 2004). The involvement of young people in design processes is often used to suggest empowerment, place making and community building and yet sustainability implies an agenda often in conflict with commonly held community belief. Theoretical investigations of sustainable citizenship can provide a useful insight into such problems, but educating young people about sustainability citizenship in the design process implies their own exploration of how they are in the world together with how they relate to political theory. We need some very different ways of teaching in the C21st if we are to address the social and environmental problems that climate change will bring, and many ethical questions are being refused by educationalists, policy makers and architects. Blair, T. (2004) "PM Speech on Climate Change 14th September 2004" Archive No. 10 Downing Street, London. http://www.pm.gov.uk/output/page6333.asp.

Wheeler, A. (2008). "Glass Submarines, Beach Houses, Holographic Teachers and Elvis: Exploring Sustainable Behaviour in School Design Workshops with Young People."

How can we build with children the quality of relationship we need to begin to address the global challenges of environmental change? How can we begin to foster with young people sustainable and just communities? The UK government has a created a unique educational opportunity with its new school building programme. Its aims are to transform learning and embed sustainability into the life experience of every child? Participation with children is presented as the means to achieve some of these aims, but the link between participation and sustainable behaviour is complex. If sustainable behaviour is to be encouraged, honestly and effectively young people will have to enter into a discussion of community, relation, social cohesion and all the political and philosophical complexities this entails. Furthermore, young people will have to reconcile the need for reduced consumption with the consumerist norms of their peers. This paper explores the philosophical and political dimensions of Education for Sustainable Development in the context of design workshops with young people and argues that to really engage with encouraging sustainable behaviour we need to examine radically new ways of being in the world together and develop new pedagogies that cross the disciplinary boundaries of architecture and education.

Wheeler, A. (2008). Sustainable Schools and Sustainable Behaviour School of the Built Environment, University of Nottingham.

What are young people's attitudes towards sustainable development? Do young people think that sustainable behaviour and lifestyle change should be part of the school agenda? How do young people understand environmental issues? In the context of "one planet living" can they understand the need for reduced consumption and do they think these ideas are appropriate to them? Preliminary work with young people in the UK showed that whilst they thought responding to the problem of global warming in the context of school building was important for the future, it was not as important as schools providing good education. Immediate issues concerning improving the local environment were of more concern. But what happens if young people themselves are involved in exploring what a sustainable community could mean and in designing sustainable schools? What happens if they believe they will be listened to? Does involving children in co-design processes suggest different ideas, different responses to environmental issues? This presentation looks at the design work of small groups of mixed ability young people aged 11-15 asked to plan their new school buildings. It describes answers provided in interview to questions concerning sustainable development, and conversations within the group whilst engaged in design decision making. It illustrates by means of drawings, audio and video recordings, children's criticisms of their school day and potential design solutions. Whilst it is often only "gifted and talented" children that are involved with such consultation events, it is noteworthy that children with some special needs had both very different concerns and different design approaches. The UK Government is involved in a massive programme of school renovation and rebuilding. According to government literature new schools will transform learning and embed sustainable behaviour into the life experience of young people, but perhaps young people have some ideas that could improve the effectiveness of such policy. Perhaps they already have some understanding in the change in ethics, behaviour and lifestyle change that will be needed to adapt to the environment and social changes global warming will bring.

Wheeler, A. (2008). Sustainable schools: Can participation make better learning environments? Can participation encourage sustainable behaviour?, School of the Built Environment, University of Nottingham.

Wheeler, A. (2009). "The ethical Dilemma of lifestyle change: designing for sustainable schools and sustainable citizenship." Les ateliers de l'éthique **4**(1): 140-155.

This paper explores how participation and sustainability are being addressed by architects within the Building Schools for the Future (BSF) programme in the UK. The intentions promoted by the programme are certainly ambitious, but the ways to fulfil these aims are ill-explored. Simply focusing on providing innovative learning technologies, or indeed teaching young people about physical sustainability features in buildings, will not necessarily teach them the skills they will need to respond to the environmental and social challenges of a rapidly changing world. However, anticipating those skills is one of the most problematic issues of the programme. The involvement of young people in the design of schools is used to suggest empowerment, place-making and to promote social cohesion but this is set against government design literature which advocates for exemplars, standard layouts and best practice, all leading to forms of standardisation. The potentials for tokenistic student involvement and conflict with policy aims are evident. This paper explores two issues: how to foster in young people an ethic towards future generations, and the role of co-design practices in this process. Michael Oakeshott calls teaching the conversation of mankind. In this paper, I look at the

philosophy of Hannah Arendt, Emmanuel Levinas, Maurice Merleau-Ponty and Luce Irigaray to argue that investigating the ethical dilemmas of the programme through critical dialogue with students offers an approach to meeting government objectives, building sustainable schools, and fostering sustainable citizenship.

Wigginton, M. (2005). "The cost of sustainability: Witheridge Primary School "classroom of the future"." ARQ: Architectural Research Quarterly **9**: [120]-131.

Design model from the British government's nationwide Classrooms of the Future program. Includes working details of a prototype for a pre-fabricated classroom.

Wiley, C. (2000). "Synthesis of research on the causes, effects, and reduction strategies of teacher stress." Journal of Instructional Psychology **27**(2): 80A.

Wilk, R. E. (1964). "An experimental study of the effects of classroom placement variables on student teacher performance." Journal of Educational Psychology **55**(6): 375-380.

This paper describes an experimental study designed to test the effect of certain variables associated with the placement of student teachers on their classroom behaviors and to control certain other factors to prevent their influence upon these behaviors. Data from the classroom observation of 36 women student teachers in elementary education were used to test the effect of placement variables. The results showed that all but 2 of the 11 scales used to describe classroom performance were significantly affected by 1 or more placement factors. It was concluded that classroom placement factors such as those studied do affect observed classroom behaviors.

Williamson, B. Briefing framework for secondary school projects. D. o. E. a. Skills. UK. **Building Bulletin 98:** 66.

The key purpose of this document is to set out simple, realistic, non-statutory area guidelines for secondary school buildings (Part C) and grounds (Part D) which supersede those in Building Bulletin 82: Area Guidelines for Schools, published in 1996, and any revisions. Following draft revisions and the publication of the Exemplar Designs for Schools, the recommended gross area of secondary school buildings has been further increased to an average of 18% above the maximum in 1996. Funding from the Department for Education and Skills (DfES) in 2005-06 and beyond, for instance in the Building Schools for the Future programme, will allow all new buildings to be built to these standards. Simple graphs and formulae can be used to check that the number, size and type of rooms in both new designs and existing buildings are at least that recommended for six categories of usable space. These have been calculated to address the requirements, common to every school, of pupils with special educational needs (SEN) and disabilities, the school workforce and community use out of school hours. Similar standards are set for various categories of site area. Crucially, a further 'float' is also recommended to accommodate the individual priorities of each school: whether facilities for the specialism or limited 'extended school' provision. Every mainstream school is expected to need at least the total net area recommended, which includes the 'float'. Some schools may then have further supplementary area over and above this, for instance for specially resourced SEN provision. However, getting the area right is only part of creating facilities which support the educational aims and vision of each school. Design quality and appropriate specifications are also crucial. Part A of this bulletin offers a framework for every secondary school to develop a strategic masterplan, incorporating any future building project, whether major new buildings or minor refurbishments. Part B identifies the key issues that should be addressed in the brief to ensure that the design is in line with the organisation and preferences of the school. The Government's continuing commitment to education is reflected in the recent sharp increases in capital funding for schools. In the light of this investment, it is now all the more crucial to ensure that any building project is in line with a long-term masterplan for the whole site. The guidance in this bulletin will assist school staff and governors, with the help of Local Education Authorities (LEAs), dioceses, and building professionals, to develop a masterplan and a brief to the necessary detail and ensure that the priorities of the school are clearly expressed and can be carried through the design.

Wilson, C. (2008). The impact of the educational facility on student achievement, University of Georgia**:** 8.

The following paper is a reflection by the author regarding the impact of the educational facility on student achievement. The reflections regarding this topic are based on the book entitled *Educational facility planning: Leadership, Architecture and Management,* by C. Kenneth Tanner and Jeffery A Lackney. The author of this paper reviews relevant portions of the body of research which were cited in the book regarding this topic. After a review of the body of literature, the author reflects on the meaning that such information had to her as a student, as a teacher and will have to her as a future school leader in the elementary school setting. The main purpose of this paper is for the author to reflect on the ways that this information could be applicable to her in the future as a school leader.

Wilson, G. (2002). The pod room - A group learning space. Next Generation Learning Spaces**:** 4.

Winsler, A., S. L. Caverly, et al. "The social and behavioral ecology of mixed-age and same-age preschool classrooms: A natural experiment." Journal of Applied Developmental Psychology **23**(3): 305-330.

Social interaction and task behavior of preschool children in mixed-age (MA) and same-age (SA) groups were studied longitudinally in this natural experiment, which capitalized on one preschool's transition from two SA (separate 3, 4) classrooms to two MA (combined 3/4) classrooms. In contrast to previous research examining MA and SA grouping,

which has typically lacked appropriate comparison groups, the present study was essentially able to hold teachers, curriculum, location, teaching philosophy, and participant population constant. A total of 7887 naturalistic, time-sampled, classroom observations on 47 children attending the two classes were conducted over the course of 18 months. Children's goal-directed activity, sustained attention, social affiliation, inappropriate behavior, and affect were reliably recorded using a checklist instrument. Significant age differences in behavior between the 3- and 4-year-olds in SA classrooms were typically eliminated in the context of MA classrooms such that the 3-year-olds in MA classes in several ways were more like 4-year-olds in SA classrooms, and 4-year-olds in MA classes behaved more like 3-year-olds in SA classrooms. The social and behavioral ecology of the MA preschool classrooms changed significantly over time as children became more familiar with one another. Several of the social affiliation advantages of MA grouping that were found (i.e., age and gender desegregation) wore off over time as the school year progressed. The effects of MA grouping on children's social and behavioral development appear complicated. Developmental benefits that MA grouping may provide appear to come with some costs, especially for the older children in the classroom.

Winterbottom, M. and A. Wilkins (2009). "Lighting and discomfort in the classroom." Journal of Environmental Psychology **29**(1): 63-75.

Aspects of classroom lighting and décor that can promote discomfort and impair task performance through glare, and imperceptible 100 Hz flicker from fluorescent lighting, were examined in a sample of UK schools. In 90 classrooms, across eleven secondary schools and six local education authorities variables measured included flicker, illuminance at desks, and luminance of whiteboards. Results showed that 80% of classrooms are lit with 100 Hz fluorescent lighting that can cause headaches and impair visual performance. Mean illuminance (from excessive day- and artificial lighting) was in excess of recommended design illuminance in 88% of classrooms, and in 84% exceeded levels beyond which visual comfort decreases. Lighting could not be adequately controlled due to classroom design and infrastructure. Ceiling-mounted data-projectors directed at whiteboards mounted vertically on the wall resulted in specular reflection from the whiteboard, visible as a glare spot with luminance high enough to cause discomfort and disability glare. The intensity of the glare spot varied between different brands of whiteboard. Ambient lighting, needed for close work at pupils' desks, reduced image contrast. Venetian blinds in 23% of classrooms had spatial characteristics appropriate for inducing pattern glare. There was significant variation between schools and local authorities. These findings may provide insights into small-scale reports linking pupils' attainment, behaviour and learning to classroom lighting, and may also help explain some of the benefits of coloured overlays for pupils' reading.

Wolff, S. (2002). Design features for project-based learning. Education. Corvallis, Oregon, Oregon State University. **Doctor of Education:** 72.

The purpose of this study was to: (a) determine the design features of the physical learning environment that support and enhance collaborative, project-based learning at the community college level; and (b) to gain an understanding of the rationale for the selection of the features. The characteristics of the physical environment investigated in the study were scale, location, functionality, relationships, and patterns. Aspects of the rationale or purpose for the selected features included: (a) important factors for consideration, (b) sequence of consideration among the factors, (c) relationship among the factors, (d) derivation of the factors, (e) design process considerations, and (f) theories used to make the recommendation. The literature review indicated a need for changing learning expectations to prepare learners for rapidly changing roles and responsibilities in work, family, and community for the 21st century. Collaborative, project-based learning was identified as a pedagogy that prepares learners for these new learning expectations by conceiving, developing, and implementing projects relevant to the learners' and the communities' needs. This active learning process teaches critical thinking, problem solving, teamwork, negotiation skills, reaching consensus, using technology, and taking responsibility for one's own learning. Data were collected in three phases using a phenomenological approach to gain an understanding of the two foci areas of the study. Methods for collecting data included site visits, observations, text, interviews, and designs. Participants included architects, educators, and learners. The findings from the study included the initial identification of 44 design features of the physical learning environment that support and enhance collaborative, project-based learning at the community college level and the determination of the rationale for the selection of the features. Analysis and synthesis of the features resulted in 32 design features that were placed in the following six categories: (a) learning group size, (b) functional spaces for learning activities, (c) adjacencies, (d) furnishings, (e) psychological and physiological support of the learners, and (f) structural aspects. The essence of designing physical environments that support and encourage collaborative, project-based learning is the interrelationship among the categories and features within the categories.

Wolff, S. (2003). Design Features Of the Physical Learning Environment: For Collaborative, Project-Based Learning at The Community College Level, National Research Center for Career and Technical Education University of Minnesota**:** 65.

The purpose of the study was to (a) determine the design features of the physical learning environment that support collaborative, project-based learning, and (b) to gain an understanding of the rationale for the selection of the features. The literature review indicated a need for changing learning expectations to prepare learners for rapidly changing roles and responsibilities for the 21st century. Collaborative, project-based learning was identified as a pedagogy that prepares learners for these new learning expectations. Data were collected in three phases using a phenomenological approach. Collection methods included site visits, observations, reflection, text, interviews, and designs. Architects and educators participated in the study. Thirty-two design features were identified and placed into six categories. Upon

further reflection and analysis, it appears the essence of the findings is the interrelationship among spaces and people.

Woolner, P., E. Hall, et al. (2007). "A sound foundation? What we know about the impact of environments on learning and the implications for Building Schools for the Future." Oxford Review of Education **33**(1): 47 - 70.

This paper reports on a literature review conducted in the UK for the Design Council and CfBT (Higgins et al., 2005) which looked at the evidence of the impact of environments on learning in schools. We have reviewed the available evidence regarding different facets of the physical environment and provided an analysis based on different areas of effect, including the extent to which different facets interact (positively and negatively) with one another. Our conclusions suggest that, although the research often indicates the parameters of an effective environment, there is an overall lack of empirical evidence about the impact of individual elements of the physical environment which might inform school design at a practical level to support student achievement. However, at a secondary level of analysis, there are indications that environmental change can be part of a catalytic process of school development and improvement. The implications of these findings for Building Schools for the Future will be discussed.

Woolner, P., E. Hall, et al. (2007). "Getting together to improve the school environment: user consultation, participatory design and student voice." Improving Schools **10**(3): 233-248.

This article first investigates historical trends in both the practice and the understanding of consultation, considering the often contrasting perspectives of architects and designers, compared to teachers and educationalists. Differing assumptions held by these two broad groups of professionals can lead to conflicting aims and objectives for school buildings, even where there is determination to communicate effectively and find common ground. Our exploration of this issue will centre on the potential contribution of users of the educational environment and, in particular, what happens to the student perspective. Consultation over school buildings has tended in the past to centre on educators, and so miss out direct involvement of students (Woolner et al., 2005). However, there is increasing conviction that children should participate in decision-making (Burke and Grosvenor, 2003; Clark et al., 2003), including about school-design (DfES, 2002), and methods are being developed to do this (Wall and Higgins, 2006). The historical analysis will bring us to a point where, using the example of one school, the consultation procedure in practice can be reflected on. This will form the second element of the article, exploring consultation within the modern context of participatory school design and student voice. The experiences of a school undergoing redesign of a classroom space will be discussed in light of the dichotomy previously established, the perspective of architecture in contrast to that of education. The role of the child's view in influencing design solutions will be considered, together with the consequences for teaching and learning, consultation procedures and the re-design of school buildings.

Wright, S. (2003). "Designing schools for the whole community." ExtraTime Specials **107**(Autumn): 4.

School buildings should be beautiful and inspirational, raising the spirits of those who use them. This issue, written by Sharon Wright, Managing Director of School Works, explains how important it is that schools with funding for building work or improvements involve pupils, staff, parents and the local community in articulating their vision for how the buildings should be designed and used.

Wyon, D., I. Andersen, et al. (1979). "The effects of moderate heat stress on mental performance." Scand J Work Environ Health **5**(4): 352-361.

Moderate heat stress is believed to affect mental performance by lowering levels of arousal. Conscious effort can counteract this effect. In most experiments, raised temperatures are perceived at the start by subjects and can act as a stimulus to exert conscious effort. In practice, temperatures usually rise slowly and may therefore have a more marked effect. Thirty-six male and 36 female 17-year-old subjects in standard cotton uniforms (0.7 clo) were exposed in groups of four in a climate chamber to rising air-temperature conditions typical of occupied classrooms, in the range 20--29 degrees C. The maximum rate of rise was 4 degrees C/h. Each group performed mental work during three successive periods of 50 min with 10-min breaks between. During each break the air temperature was reduced by 3 degrees C. Sentence comprehension was significantly reduced by intermediate levels of heat stress in the third hour. A multiplication task was performed significantly more slowly in the heat by male subjects, showing a minimum at 28 degrees C. Recognition memory showed a maximum at 26 degrees C, decreasing significantly at temperatures below and above, and an independent measure of degree of certainty in recall showed a maximum at 27 degrees C. These findings are in accordance with the hypothesis of reduced arousal in moderate heat stress in the absence of conscious effort.

Wyss, V. L., R. H. Tai, et al. (2007). "High school Class-size and College Performance in Science " The High School Journal **90**(3): 45-53.

This paper focuses on the influence of high school science class size on students' achievement in introductory college science courses and on the variation of teacher practice across class size. Surveys collected information about high school science class experiences from 2754 biology, 3521 chemistry, and 1903 physics students across 36 public and 19 private institutions from 31 different states. The first analysis includes a cross-tabulation of 6 different class sizes and the frequencies of teacher practices reported by students. The second analysis includes a multiple linear regression of class size and student achievement. Results show no differences for pedagogy and student achievement until class sizes fall to 10 or fewer students. These findings suggest that incremental reductions in class size are likely not to have a

significant impact on later student achievement.

Yendol-Silva, D. and N. F. Dana (2004). "Encountering New Spaces: Teachers Developing Voice within a Professional Development School." Journal of Teacher Education **55**(2): 128-140.

This 18-month ethnographic study provides a snapshot of teachers' use of space and voice as they work in a newly formed Professional Development School (PDS) committed to shared responsibility for teacher education and developing a culture of simultaneous renewal through inquiry. The study identified the tensions produced when a PDS functions within a hierarchically organized district where teachers do not feel empowered to participate in decisions beyond their classroom and where mandates and standardization drive teachers' work. This work informs those new to PDS work of ways teachers may first occupy the new spaces PDS work creates for teachers to be decision makers and teacher educators. Implications for the future of teachers' work within partnerships focused on reform are discussed.

York-Barr, J., G. Ghere, et al. (2007). "Collaborative teaching to increase ELL student learning." Journal of Education for Students Placed at Risk **12**(3): 1-34.

Zahn, G. L., S. Kagan, et al. (1986). "Cooperative learning and classroom climate." Journal of School Psychology **24**(4): 351-362.

The impact of two cooperative learning techniques, Student Teams-Achievement Divisions and Teams-Games-Tournaments, on classroom climate among students was compared to a traditional whole-class format. Thirty-five student teachers were randomly assigned to one of the three classroom structures. Their pupils were 864 second- through sixth-grade students, including 288 non-Anglo (black and Mexican American) students. A new measure of classroom climate, the Classroom Attitudes Scale, was developed that produced two attitude factors: Social Relations and School-work Cooperative techniques generally produced a slightly more favorable climate on both dimensions, and especially for females on Social Relations. Of the cooperative methods, Teams-Games-Tournament produced a significantly more favorable climate for Anglo-American students. The results support the conclusion that choice of classroom structure can bias classroom climate in favor of or against different ethnic groups.

Zbar, V. (2002). An 8-step process for improving classroom practice. No more bored kids: Real alternative for public schools Education Foundation**:** 1.

Zbar, V. (2006). New Arrangements to Close the Gap Invitation Symposium: REPORT OF DISCUSSION. The New Arrangements to Close the Gap Symposium The Boston Consulting Group in Melbourne, Education Foundation.

This New Arrangements to Close the Gap symposium builds on an earlier successful Case for Change in Schooling Arrangements: A Way Forward invitational symposium conducted by Education Foundation Australia in June 2004 as part of a broader project entitled The Case for Change. Research undertaken as part of this project clearly indicates there is a widening gap in the educational outcomes for students in different geographical regions and different schools. This widening gap is as much a phenomenon of schools within each of the sectors as it is a phenomenon between schools in different sectors. From Education Foundation Australia's perspective, this widening gap represents more than just a gap in education achievement. In today's global economy, it also represents a gap between those families and communities who enjoy the benefits of prosperity, and those who are shut out. The 2004 Case for Change symposium provided an opportunity to share analyses of the problem and canvass solutions to it. The 2006 New Arrangements to Close the Gap symposium was designed to take the next step by discussing specific proposals and exploring the development of new alignments with like-minded organisations in the public and non-government sectors, including business and philanthropic organisations, with a view to developing these proposals into practical and scaleable model arrangements that enable the problem to be clearly addressed. The particular focus of the day's program in this context was: Enabling structures for new provision and partnerships for equity and excellence; Scaleable partnerships for equity and excellence between education, welfare, philanthropy and business; and Scaleable partnerships for equity and excellence between school sectors. Participation in the symposium was limited to around 30 participants invited because of their capacity to make a significant contribution to the issues under discussion and to advance the Case for Change.

Zentall, S. S. and J. H. Shaw (1980). "Effects of classroom noise on performance and activity of second-grade hyperactive and control children." Journal of Educational Psychology **72**(6): 830-840.

Two experiments assessed the effects of task-overlapping linguistic noise (ambient noise including conversations) on activity and performance of 24 hyperactive and 24 control children. High and low levels of linguistic classroom noise were each presented while Ss were performing tasks requiring auditory processing of information in a repeated-measures crossover design. Hyperactive Ss were most active and performed math and alphabet tasks worse in high than in low linguistic noise. Control Ss showed the opposite performance and activity pattern. The differential effects of linguistic noise were less pronounced in Exp II when the task was new and more challenging for the control Ss, suggesting that task difficulty may play a role in the effects of overlapping stimulation on both groups. (25 ref) (PsycINFO Database Record (c) 2006 APA, all rights reserved)

Zyngier, D. (2002). R.U.MAD? program: social justice through community connectedness. No more bored kids: Real alternative for public schools Education Foundation**:** 1.