Condition matters: pupil voices on the design and condition of secondary schools

PRICE, I., CLARK, E., HOLLAND, M. R., EMERTON, C. and WOLSTENHOLME, C.

RESEARCH PAPER

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Ilfryn Price, Elizabeth Clark, Michael Holland, Charles Emerton, Claire Wolstenholme

Sheffield Hallam University

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About the authors

Dr Ilfryn Price is Professor of Facilities Management in Sheffield Business School where he leads research in the Centre for Facilities Management Development, having been involved in its foundation in 1993. He was recently recognised by the British Institute of Facilities Management as one of the 20 most influential pioneers in the subject. His research interests aim at bridging the gap between facilities and management by evidencing the specific organisational contributions of buildings. He previously spent 18 years with BP as a geologist, research manager and change facilitator. His publications can be found at **www.shu.ac.uk/cfmd**.

Elizabeth Clark is a Senior Research Fellow at the Centre for Facilities Management Development at Sheffield Hallam University. She has worked at CFMD for 14 years where she has initiated and developed most of the public sector Facilities Management (FM) Networks that the Centre currently runs. She currently manages the Government FM Network which delivers research and CPD events for facilities managers/directors from local authorities and central government departments and agencies. Elizabeth has an MBA in FM from Sheffield Hallam University.

Dr Mike Holland is Head of Employment Based Initial Teacher Training at SHU. He has taught in five 11–18 comprehensive schools, and has been a senior manager in schools and higher education and a school inspector. His research interests are mainly about the professional development of teachers. He has led several large longitudinal studies on the impact of government policy in schools funded by the TDA, Research Machines, Coca Cola, the European Social Fund and local authorities. A selection of recent reports and publications can be found at **www.shu.ac.uk/ceir**.

Charles Emerton is a BA Hons undergraduate student from Sheffield Hallam University who was undertaking his placement year with CFMD when the research described here was completed. As a Network Assistant he was involved in a number of wide-ranging research topics including renewable energy technologies, environmental psychology and the built environment.

Claire Wolstenholme has worked as a researcher at the Centre for Education and Inclusion Research for three years after having completed a degree in Psychology. Claire's work in the Centre has involved qualitative interviewing and analysis, extensive literature reviews and desk research as well as some quantitative techniques. Her research within the Centre has recently focused on international student mobility. Claire is currently undertaking a Master's degree in social science research methods.

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- **Mike Chapman**, Headteacher, High Storrs School, Sheffield
- **Mike Coldwell**, Director, Centre for Education and Inclusion Research, Sheffield Hallam University
- **Richard Harrison**, Bedfordshire County Council and Partnerships for Schools
- **Veronica Hill**, PFI Contract Administrator, Children and Young People's Services, Sheffield City Council
- **Paul Hudson**, Haden
- **Joe Nethercoate**, Asset Management Team Leader, Buckinghamshire County Council
- **Phil Roberts**, Independent Consultant

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Executive Summary

"… to establish a reliable instrument for assessing pupils' opinions of the condition of school buildings."

The report describes the first phase of a research project designed to establish a reliable instrument that can be used for assessing pupils' opinions of the condition of school buildings. It describes the experience of conducting two interactive focus groups with pupils from two schools in south Sheffield. School 1 was in an obvious state of extreme disrepair. School 2 was a four-year facility constructed as a PFI project.

In each case, we invited the group to take us on a tour of their school pointing out features that they either liked or disliked. We were shown the schools through the eyes of the pupils. The experience proved both compelling and surprising. We used the results to construct an internet questionnaire that asked in various ways for pupils' perceived satisfaction with aspects of their school's facilities and their perceptions of the importance of these. We also invited responses to five open-ended questions.

The researchers' primary goal was to construct a shorter research instrument intended for wider use and the report explains how we have used factor analysis to achieve that end. A study of only two schools cannot be conclusive about links between facilities (design and condition of physical space) and educational achievement but the common observations and the differences do contain pointers towards such an end. There is a hint in GCSE results of an improvement in the new school. Pupils there described it as like an adult facility whereas those in School 1 spoke of it being harder to feel like trying in such poor space. Going all day without using the terrible toilets can hardly be conducive to learning.

The importance of social learning space is confirmed. Both groups emphasised the importance of, and the lack of, 'networking' space. In the surveys, spaces are rated as at least as important as classrooms. We were shown the impromptu use of stairwells and corridors, and in one case space under an entrance bridge, as all there was. Pupils at both schools were critical of the fact that the dining facilities were only available at meal times. From an FM perspective closing the dining room is probably seen as saving cleaning and even maintenance space. From a wider perspective it represents under-use of part of the building.

Our biggest surprise, again confirmed in the survey, was that the group in School 1 were critical of the provision and use of interactive whiteboards whereas those at School 2 were enthusiastic. On the advice of a steering group we had not extended the study to staff. However we also received an impression that staff in School 2 were more likely to engage with the process as they saw us visiting. One teacher there volunteered the opinion that the new space made it easier to teach a new curriculum.

About half the responses to the survey in School 1 expressed the opinion that the poor environment adversely affected the teaching staff. In School 2 where comments were made they were to the effect that the influence was positive.

The pupils in School 2 talked about respect for the condition of the new building, diminishing the incidence of litter and chewing gum under tables. The survey results contain hints of these problems starting to surface and point to the need, prevalent elsewhere in FM, to keep new buildings in good condition. A pupil survey might set a standard against which to assess cleaning and maintenance service levels.

Pupils in School 1 actually thought that some of the areas we saw might have been cleaned up a bit because we were visiting though we know this is not the case. They did point out that parents and visitors would not normally see the parts we were taken to. In School 2 the design encouraged such a difference. The main entrance across a bridge led to offices and a hall for performances. Pupils entered and left through fire doors on the ground floor level.

In short, even this small study throws up evidence that could inform the design and

facilities management of new schools. Our steering group has described other new schools where some of these lessons have already been learnt.

A review of the literature established the absence of any instrument for assessing pupils' views of the quality of school facilities and led us to a series of propositions. We find in the literature:

1. Numerous arguments supporting the proposition that tangible features of a school's physical environment impact on pupils and their educational attainment
2. A tendency on the part of educational researchers to view such studies as unduly deterministic
3. A relative paucity of work asking for pupils' opinions but suggestions (especially Maxwell, 2000) that they do not see aspects of design as convenient and that visitors may not see the real school
4. Views reported by head teachers that design and condition influence teacher motivation and – directly or indirectly – pupil motivation
5. A similar view that the effectiveness of teaching might be correlated to, or at least influenced by, a school's condition
6. A claim that leadership in schools is correlated to condition
7. Support in the policy literature for the increasing role of school facilities for other purposes
8. Inconsistent approaches to a complicated, multi facetted problem with many variables
9. Support, but little direct evidence, for the hypothesis that the influence of intangible or psychosocial factors on pupils might be more important than the tangible.

The work reported here firmly supports several of these propositions including the last one. The geography of a school should encourage social learning. Buildings in poor condition do exert an influence on pupils – both directly and via the influence on their teachers. Maxwell's suggestions are supported and direct evidence from pupils confirms, as is to be expected, the reports from interviews with headteachers. We cannot, however, support proposition 6 from this study except to observe that leadership must be more difficult in failing buildings.

At a time when cuts in expenditure are threatened, even if education budgets are to be protected at least for the present, we suggest that the study does show the need for a reliable means of assessing pupils' perceptions of school facilities. This report is intended to inform the creation of a wider network to do just that. It also highlights the potential benefits of extending the approach to teachers and other categories of school staff.

1 Introduction

"… it remains to be seen how these perceptions develop as more use is made of the buildings and these become less 'new'."

1.1 Aims

It is important, at the outset, to understand the aims of the work described here. As a recent before-and-after survey of pupils' and teachers' perceptions of a new school (Rudd *et al*, 2008) suggested:

> *Moving into a new building has clearly improved perceptions regarding the impact of (various) problems, but of course it remains to be seen how these perceptions develop as more use is made of the buildings and these become less 'new'.*

Our longer-term aim is to develop an instrument that will allow schools or local authorities (LAs) to evaluate views of the condition of schools as they age. This study was a first step, contrasting two schools to develop a pilot survey instrument. That instrument is now being offered to an ongoing network of LAs and Building Schools for the Future (BSF) providers.

The researchers were most emphatically not trying to undertake a complete review of the influence of physical environments on the educational achievement of a given group of pupils, a task recently completed in a CfBT sponsored study (Higgins *et al*, 2005; Woolner *et al*, 2007a; 2007b). As those authors note, the current UK Government has committed a sizeable resource to the creation of new or upgraded school facilities under the BSF initiative. The existing stock, dating largely from the late nineteenth century or the period 1945 to 1975, had generally fallen into a poor state of repair (Audit Commission, 2003).

In times of stretched resource, maintenance of the fabric of a school and deferral of any work that is not absolutely essential represents one of the few items of optional expenditure available to the headteacher and school governors (Loeb *et al*, 2008; Harrison, 2006). According to the *teachernet* resource provided by the Audit Commission and the Department for Children, Schools and Families (DCSF) the expenditure on maintenance, improvement and cleaning is only 5.4% of the total income of a typical secondary school. Catering and facilities services provided by the same typical school actually contribute nearly 3% of the total revenue.[1]

The BSF programme, as currently underway, largely relies on Private Finance Initiative (PFI) funding. In theory because local authorities are paying under contracts for the availability of buildings in a suitable condition, the funding will guarantee and incentivise necessary levels of both upfront investment in more durable materials and a sufficient level of preventative maintenance. Whether this materialises in practice remains largely untested (Audit Commission 2003, CABE 2006).

The side effects of reduced cleaning and maintenance may not be appreciated. Ultimately reduced maintenance hastens the decay of a building to the point where it becomes functionally obsolete (Pinder *et al*, 2003). There may actually be direct cost implications. Do poorer buildings reduce achievement by pupils? Do poorer buildings encourage faster decay because they are less well treated by their users? Do poorer buildings contribute to increased levels of staff stress, hence higher turnover and absence with consequent impacts on necessary expenditure on recruitment and/or agency teachers? These are all difficult and complex problems. Some are currently being researched from a psychological perspective – particularly about what is an optimal learning environment (Tschannen-Moran *et al*, 2006; Marjoribanks, 2006). Although these studies and the models they generate have been based upon data from USA and Australian schools they are potentially useful in providing a platform to interpret our own data.

[1] **https://sfb.teachernet.gov.uk/MetricStage.aspx** typical community secondary school with sixth form accessed 31 March 2009

The study reported here is one step in seeking answers. It was a pilot designed with advice from a steering group comprising a headteacher, school governors, local authority property managers and providers of schools under the BSF programme. It aimed to examine the views of pupils concerning the design but more importantly the condition of their school facilities. It does not pretend to offer a comprehensive answer to the questions posed in the previous paragraph. It is seen as a step to inform a future research network of those responsible for Facilities Management in schools and towards, ultimately, a suite of 'Pupil Quality Indicators' (PQIs).

1.2 Context

We use the term Facilities Management (FM) here to embrace all the professions and businesses concerned with the supply and day-to-day management of buildings. We are well aware of the plethora of frequently competing claims of different terms to describe aspects of that supply and to restrict FM to day-to-day maintenance: outsourced and then forgotten. To reopen those debates here would serve no purpose. FM as we have defined it combines supply by contractors and 'in-house' management.

Since its inception in 1993 what is now Sheffield Hallam University's Centre for Facilities Management Development (CFMD) has been concerned with research which emphasises an understanding of buildings' contributions to particular businesses, and with the education and professional development of individuals who understand that impact. Much of the research is undertaken via ongoing networks in health, higher education and government. Generically it has to provide results that are useful to subscribing member organisations; hence it has to recognise real life compromises between the demands of day-to-day FM with efforts to develop indicators of business impacts. Where possible these are judged at least in part in financial terms (Pinder and Price, 2005). In some cases that is simply not possible. The income of local authorities bears little relationship to the various departments housed in civic accommodation. The amount of accommodation used, measured by occupation density does indicate the efficient use of resources by an authority and the satisfaction of staff in that accommodation can be shown to be a surrogate for perceived productivity (and in some specific cases improved business outcomes). We now offer members of the government network, which includes national departments, an annual opportunity for their staff to participate in a building-specific satisfaction survey. Contra to some arguments against 'open plans' there are departments and authorities whose accommodation portfolio achieves upper quartile performance on both indicators (Price and Clark, 2009).

Developing that survey instrument was a long-term activity beginning with surveys of the perceived importance of aspects of FM to building users, then their perceived satisfaction. Those studies, complemented by specific case based work by doctoral students, informed the design of the final satisfaction index, which has proven to be both repeatable (annual scores for particular buildings are normally consistent) and sensitive to particular alterations as year-on-year changes have proven to be explicable. Online technology makes surveys logistically achievable.

In some business sectors such as retail or hospitality where a facility is clearly and obviously part of a business's 'servicescape' (Bitner, 1992) it is usually managed as such on appropriate timescales for particular business cycles (Price, 2004). Outside such sectors it remains vastly more common for FM and the supposed 'core' business to occupy different worlds with, frequently, little contact. FM does not earn its cherished seat at the top table and managers do not get information on the facility in terms that are relevant to their business concern – as is confirmed, yet again, by a recent study for the RICS (Thompson, 2008). Schools are no exception. When they face budget pressures FM – cleaning and especially maintenance – is often an inevitable area to look for savings. Government guidance on asset management continues to emphasise cost per unit area as both a headline performance indicator and *de facto* performance measure. Large poorly maintained buildings can appear

Recent reports from the Office for Standards in Education (Ofsted) have stated that as many as 1 in 5 schools in England has accommodation that is in such an unsatisfactory state that the delivery of the curriculum is affected.

cost effective. The result, in a perverse example of Goodhart's Law is run-down, worn-out buildings (Price and Clark, 2009; May and Price, 2009). As the introduction to research commissioned in 1999 (PricewaterhouseCoopers, 2000) states:

> *'Recent reports from the Office for Standards in Education (Ofsted) have stated that as many as 1 in 5 schools in England has accommodation that is in such an unsatisfactory state that the delivery of the curriculum is affected.'*

It is not clear where that point is reached, and it seems intuitively unlikely that there is a threshold of disrepair below which delivery is suddenly affected any more and that there is a continuous linear relationship between investment in school condition and attainment: the objective sought by the research. The BSF programme follows from political recognition of the problem with, it can be argued (Woolner *et al*, 2007a; 2007b), an overly optimistic faith in new buildings as a panacea and some evidence of a continuing supply of too much of the wrong sort of space.

It is important to note that the DCSF Every Child Matters agenda is being implemented at the time of our pilot study. Organisations that provide services to children from schools, hospitals, police and voluntary groups are teaming up to share information and work together. This policy includes the provision of extended services and community services, for example childcare, business and enterprise activities, family learning and greater community access to facilities. This policy has implications for the design of learning environments in schools and will also place additional demand on FM as utilisation changes.

2 Literature

> *… some studies overlap with environmental considerations but do not have changes to the learning environment as the primary focus and therefore do not report in sufficient detail for comparisons to be made with other studies.*

2.1 Schools specific

2.1.1 Recent literature

The current enthusiasm in government circles for new schools has been a catalyst for a number of studies and reports, particularly ones with a design emphasis, into the impacts of learning environments. Summarising an in-depth review of more than 200 such items Woolner *et al.* (2007a) comment:

> *We found that despite general interest in and ideas about some areas relating to learning environments, there is frequently a paucity of clear, replicable empirical studies, particularly research which addresses specific elements of the environment. Certain case study evidence exists, but there are issues of how replicable or generalisable these findings are. Moreover, some studies overlap with environmental considerations but do not have changes to the learning environment as the primary focus and therefore do not report in sufficient detail for comparisons to be made with other studies.*

Their review sought to divide the impacts into five, recognisably inter-related, fields:

> ***Attainment**: improvements in curriculum attainment measured by standardised tests or exams, or as monitored by teacher observation.*
>
> ***Engagement**: improvements in levels of attention, more on-task behaviours observed, decrease in distracting or disruptive behaviour.*
>
> ***Effect**: improvements in self-esteem for teachers and learners, increased academic self-concept, improvements in mood and motivation.*
>
> ***Attendance**: fewer instances of lateness or absenteeism.*
>
> ***Well-being**: impacts on the physical self, relating to discomfort as well as minor and major ailments.*

As they say:

> *It seems likely that some of these elements, such as well-being, will tend to be affected directly, whereas others, such as attendance and achievement, are more likely to occur at the ends of chains of effect, even if these chains are not always described.*

To this construct we might add *economics*, the cost to schools of poor condition, and *attitude*, the possibility that poor quality facilities influence a more casual treatment by users. By way of example, in a small longitudinal study Harrison (2006) found a reduction in the need to spend on agency teachers following a refurbishment of a school occasioned by the final demise of an under-maintained boiler. In an unpublished case study of a PFI primary school in Bolton (Price and Clark, 2006) the authors were told by the headteacher and the building manager that a zero tolerance approach to graffiti had become effectively self-policing once pride in users of the new facility[2] reached a sufficient level. In other case studies of new mental health and addiction service facilities, we have been informed of dramatic drops in the level of reportable incidents; e.g. abusive behaviour towards staff. We would endorse Higgins *et al.*'s (2005) conclusion:

> *However, beyond the necessity of meeting basic standards, there is not enough evidence to give clear guidance to policy makers on how to set priorities for funding, or to evaluate the relative value for money of different design initiatives. There are a small number of environmental improvements which are associated with improvements in attainment but it is important to remember that once provision reaches a reasonable standard, the complexity of environmental interaction comes into play. It is difficult to come to firm conclusions about the impact of learning environments because of the multi-factorial nature of environments and the subsequent diverse and disconnected nature of the research literature. The empirical research that exists on the impacts of*

[2] The overall project included a youth club with an active boxing group.

> *Capital investment was found to be one of the two most important levers on teacher motivation…*

environment on teaching and learning tends to focus much more upon some elements (such as noise) and to fail to synthesise understandings (such as the implications of noise and temperature research tend to conflict). To give one example, an attempt at improving acoustics in a classroom by deadening echo noise through the use of hangings might achieve the primary aim but may also decrease the air quality in the classroom, through increased dust and allergen particles being held in the fabrics. More broadly, it is not possible on the basis of the available evidence to weigh the potential benefits of environmental improvements against alternative uses for these monies, such as professional development or the provision of teaching assistants. It would be useful if future research directly and explicitly addressed this issue of comparison and cost-benefit analysis.

That study also made important observations on user involvement in the design process (see 2.1.4 below). It did however, and this is a function of the available literature, focus on design. Literature on building management is even more prone to consider the building as a building rather than as the site of a particular set of activities. The architectural literature emphasises design and the architectural profession has been criticised for attention to design rather than to issues such as ease of maintenance. Not surprisingly perhaps, recent research into school design from the Commission for Architecture and the Built Environment (CABE) shares the same emphasis. Their (CABE, 2006) 10 points for a well-designed school were derived from 14 case studies interviewing headteachers and LAs and include the use of robust materials and the need for flexibility in use:

- *Good clear organisation, an easily legible plan, and full accessibility*
- *Spaces that are well-proportioned, efficient, fit for purpose and meet the needs of the curriculum*
- *Circulation that is well organised, and sufficiently generous*
- *Good environmental conditions throughout, including appropriate levels of natural light and ventilation*
- *Attractiveness in design, comparable to that found in other quality public buildings, to inspire pupils, staff and parents*
- *Good use of the site and public presence as a civic building wherever possible to engender local pride*
- *Attractive external spaces with a good relationship to internal spaces and offering appropriate security and a variety of different settings*
- *A layout that encourages broad community access and use out of hours*
- *Robust materials that are attractive, that will weather and wear well and that are environmentally friendly*
- *Flexible design that will facilitate changes in the curriculum and technology and which allows expansion or contraction in the future.*

2.1.2 Policy studies

In 1999 the then Department for Education and Employment (DfEE) commissioned a study of the perceived benefits of capital investment in schools, a question of some importance given an economic argument in the American literature (e.g. Hanushek, 2005) to the effect that no link could be shown between investment and attainment. The DfEE study (PricewaterhouseCoopers, 2000) comprised a thorough review of the – ambiguous – economic literature, a qualitative phase of interviewing headteachers and a quantitative examination of capital investment and attainment scores as measured both in SATs tests and school ratings achieved in Ofsted inspections. The qualitative phase found that headteachers judged capital investment to have had a *'strong influence on three main factors, each of which had a major impact on pupil performance'*:

***Teacher motivation**: capital investment was found to be one of the two most important levers on teacher motivation through, for example, the boost to morale which teachers get from working in an appropriate and quality physical environment;*

***Pupil motivation**: e.g. through the visible sign that their education is valued by the teaching staff, and society in general;*

> ***Amount of learning**: e.g. by reducing the amount of time lost moving between different school buildings and classrooms.*

The quantitative modelling could not find a statistically robust correlation between SATs results and investment, a conclusion offered with one caveat:

> *It is important to note that the absolute size of the effect of capital spend on pupil performance is relatively weak, i.e. capital-related changes in performance are small relative to changes which can be related to other factors such as the socio-economic composition of the school.*

The review did not raise the alternative hypothesis that SATs scores did not constitute a meaningful measure of assessment (Schagen and Hutchison, 2003). A strong relationship was estimated between capital investment and some of the Ofsted variables which reflect more qualitative features of the school environment. In particular, the analysis found that:

> *Good teaching takes place in schools with a good physical environment, i.e. schools in which the quality of the capital stock is judged to be favourable;*
>
> *Good leadership can also be found in schools with a high quality capital stock;*
>
> *The general attitudes, behaviour and relationships amongst pupils and staff are more conducive to learning in those schools which have had significant capital investments.*

A further study (PricewaterhouseCoopers, 2003) repeated the quantitative modelling after breaking capital investment down by type and found that:

> *In terms of the different types of capital investment, the strongest positive findings are in relation to 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). 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).*

A sceptic might say that these are areas where evaluation of attainment by direct SATs tests is simplest. The second study also extended the qualitative study to consider reported community impacts which were judged to be greatest in less affluent communities where alternative facilities were less likely.

The Audit Commission (2003a) engaged MORI to administer a questionnaire based on a Construction Industry Council design evaluation tool in 18 new-build schools, ten traditionally procured and eight provided by PFI. Simultaneously they retained the Building Research Establishment (BRE) to study ten traditional and eight PFI schools (the samples did not all overlap). The Commission reported:

> *Not only that few schools came out well in terms of the buildings, cost of ownership, but that the PFI sample scored, statistically speaking, significantly worse than the traditionally funded sample (with) little evidence so far that more investment has been made to reduce longer-term maintenance costs in the majority of the PFI schools reviewed than is usually the case in traditionally funded schools. BRE commented on the maintenance consequences for PFI schemes arising from the workmanship and materials used in initial construction.*

2.1.3 Educational attainment and research approaches

The influences on educational attainment are notoriously debated (Table 1), a problem acknowledged by researchers who have tried to investigate questions of the impact of the built environment of schools. To cite PricewaterhouseCoopers (2000) as a result of their own literature review:

> *There is some evidence from the school effectiveness/improvement literature on the link between resources and performance, and more specifically on capital investment and school environment and performance. In the 1960s and 1970s the broad consensus in this literature was that 'schools don't matter' and that individual and family*

> *"… what is needed is more firm policy advice about the types of capital investments that would be most conducive to learning and to good teaching."*

> *background factors were key (e.g. Burstall, 1979). However, this consensus has been seriously challenged in the last twenty years, and a wide range of other factors have been identified which have a significant impact on pupil performance.*

Table 1, kindly provided by J Nethercoate, summarises those purported variables. The table includes a category labelled intangibles which, by comparison with research in other sectors, we hypothesise might be more important and which we find to be under-researched in the literature.

Different attempts to control for such variables have been made. One study sought such control by seeking to create pairs within a total of 28 schools in Essex and Hampshire (Edwards, 2006). One member of each pair belonged to a cluster of environmentally sustainable (green) schools constructed in these two counties between 1975 and 1995. The green examples generally, but not exclusively, showed improved performance of 3 to 5% in SATs scores and, especially in Hampshire, lower absenteeism rates.

Many American studies support the theory that the condition of school buildings affects student academic achievement. They have tended to use external data as a source of objective condition assessments, hence Berner (1993) found a correlation between the condition of schools in the district of Columbia reported by the DC Committee on Public Education (COPE) and found the largest variance in condition to be correlated with increased size and budgets from the Parent Teacher Association. The Virginia Polytechnic group, under the leadership of Glen Earthman, has conducted several detailed assessments of school condition using a 31 factor survey instrument (e.g. Cash, 1993; Earthman *et al*, 1996; Hines, 1996; Lanham, 1999). These studies and others, notably Tanner's (1999) *School Design Assessment Scale* were reviewed by Schneider (2002) who concluded:

> *While existing studies on school building quality basically point to improved student behavior and better teaching in higher-quality facilities, what is needed is more firm policy advice about the types of capital investments that would be most conducive to learning and to good teaching. This would help those who manage construction dollars better target and maximize the return on such investments.*

There has been a growing interest in the interplay between school climate, quality facilities and student achievement (Tschannen-Moran *et al*, 2006). Their research is based on the use of a school climate index for USA schools which collects survey data largely from teachers, and then matches the results with student achievement data. School climate is considered to be a mediating variable that could explain, at least in part, the impact that poor facilities have on learning through factors such as low morale of staff, reduced effort from pupils, reduced community engagement and less positive forms of school leadership. If pupils do make less effort to learn in a poor quality environment we need to know why this is the case.

One such model, the hierarchical model of motivational needs provided by Maslow (Maslow and Lowery, 1998) has been suggested as a way of viewing optimal learning environments and could contribute to the design process which starts from the learner's needs (Malcolm, 2008). A different approach has been taken by Marjoribanks (2006) who sought to construct a moderation-mediation model underpinned by the notion of cognitive habitus (Bourdieu, 1998) to examine relationships between cognitive dispositions of young people towards learning, their learning environments, the affective outcomes of schooling and educational attainment. In this model, learning environments include that of the family and the school, and recognition that previous academic attainment and self concept are factors that may influence attainment. Data collection using this model was undertaken in 300 randomly selected schools in Australia, with a randomised selection of over 7,000 Year 9 and Year 10 pupils. Regression analysis of the data revealed that adolescent educational aspirations were related positively to educational attainment but the causation was complex. To investigate this further the researchers recognised the desirability of measuring attitudes towards learning as students move through a school (as a longitudinal study) and that more

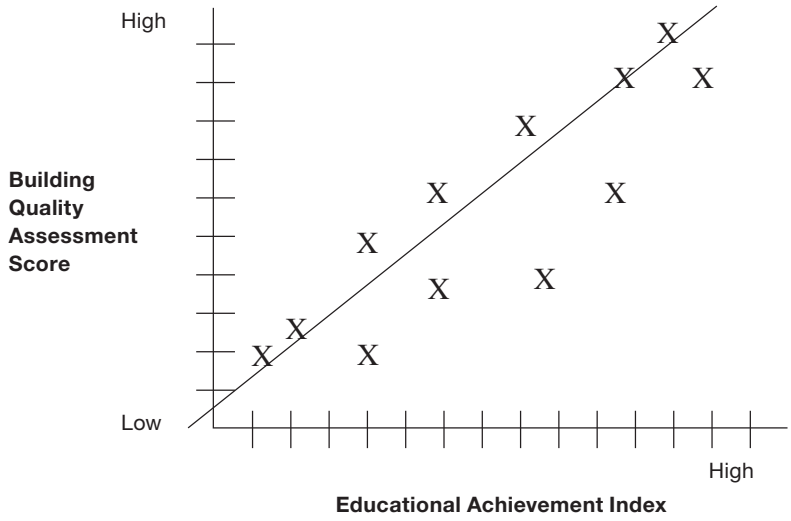
TABLE 1: Variables claimed as influences on educational attainment
Social Characteristics
• Social background/economic profile – rates of student poverty • Parent profession • Characteristics of neighbourhood • Ethnicity • Religion (the fight for places in 'faith' schools) • School 'reputation' as a mechanism for determining pupil ability profiles in an atmosphere of parental choice
Economic Characteristics
• Schools' financial resources – per pupil allocations of capital and revenue • Rates of investment in maintenance and construction • Family income • Teacher salaries
School Organisational Characteristics
• School leadership • Teacher ability • Class size • Parental role in school • School size
Pupil Physical Factors
• Nutrition • Dehydration • Rest • Comfort breaks!
Environment Physical Factors
• Heat • Light • Noise • Facilities • Physical condition of constructional elements • Function of space determined by condition
Environment – 'Intangibles'
• Condition – as an indicator of worth • Symbolism of environment as 'device of inspiration' • Social behaviours controlled by space • Learning preferences and environment constraints • Environment limits pedagogies

refined measures need to be developed for investigations between learning environments and attainment.

We are also aware of one similar unpublished study in the UK where one of the country's leading authorities on building quality assessment, Bernard Williams, was asked to assess the quality of a range of secondary schools in an English county and contrast his findings with the results of standard attainment tests (Figure 1). The results do indeed suggest a correlation, though do not, of course, prove causation. They are vulnerable, as are the other studies cited, to the charge that better condition simply reflects more affluent or more engaged parental populations: a criticism which Edwards' (2006) study sought to negate

> *Overall, the evidence is consistent with regard to the importance of user engagement in defining and solving design problems in schools…*

FIGURE 1: An apparent correlation between building quality and educational revealed in a pilot study for a County Council. Reproduced with permission of Professor Bernard Williams



by pair-wise comparison of schools with comparable catchment demographics.

Engagement

There is a more general critique made of some of these studies in that scholars have suggested the possibility of architectural determinism: a view expressed strongly by the Newcastle Review (Higgins *et al*, 2005; Woolner *et al*, 2007a; 20007b). They cite Cooper (1981, p. 125), to the effect that *'Those who offer guidance on the planning of buildings tend to assume that there is some necessary relationship between the design of a building and the behaviour of those who occupy it'* – a position which he went on to reject comprehensively. They continue (2007a):

> *Overall, the evidence is consistent with regard to the importance of user engagement in defining and solving design problems in schools and a necessary consequence of this is the realisation that design solutions will be individualised, organic and local. Indeed, the most successful are likely to be those which are seen as interim solutions and which have within them elements of flexibility and adaptability for new cohorts of learners and teachers, new curriculum demands and new challenges.*

Similar positions are being argued elsewhere in respect of buildings in general, hence *Process Architecture* (Hörgen *et al*, 1999) and the mounting evidence from successful 'open plan' office environments that while deterministic solutions often fail (Becker and Steele, 1995; Kurpitz, 1998; Brennan *et al*, 2002) those that involve users in the design specification often succeed in delivering greater vibrancy and innovation (Price and Fortune, 2008). What is conspicuously absent from most of the research reviewed above, or reviewed in the works cited above, is any systematic engagement with the opinions of pupils and only limited (e.g. PricewaterhouseCoopers 2000, 2003) and arguably non impartial (Schneider, 2002) engagement with headteachers and governors via interviews. The innovative work of the Sorrell Foundation[3] on joined-up design has

[3] **http://www.thesorrellfoundation.com/judfs.html**

> *Teachers told us that physical conditions have direct positive and negative effects on teacher morale, feelings of effectiveness in the classroom and on the general learning environment.*

demonstrated the potential of pupil engagement as did Burke and Grosvenor (2003).

Such engagement is still not common in the general literature. One exception (Maxwell, 2000) asked primary school pupils aged 9 and upwards, parents, teachers and occasional users of a single primary school to choose up to five items from provided lists that made the school seem welcoming and appear safe. Significant differences were discussed in focus groups after a survey. Her observations on the differences between what pupils reported and what designers had provided, or indeed what visitors saw, bear repeating:

> *To the visitor, the school may appear to be clean and well-maintained. Teachers and parents considered the apparent cleanliness of the school to be a welcoming factor. Many students, however, disagreed. In the focus group discussions, students indicated that the toilets are dirty (paper on the floor, graffiti on the walls). Students also indicated that the restrooms should have hot water and mirrors.*
>
> *In addition, the classrooms are cluttered and have unpleasant odors. Classrooms do not have cubbies, so students must hang coats on hooks located in the back of the room. There is no place, except the floor, to put book bags, boots, and other personal belongings. Students said the classrooms had too much 'stuff' and that there was. 'no room to walk'. Since students eat in the classrooms, there is garbage left over from lunch, making the classrooms, at least to some students, smelly. The student toilets and classrooms are important areas to the children and seen to play a role in how the students view the school. These areas may not be high priority areas to adults. Adults appear to be judging the cleanliness of the school by the condition of the public areas.*

Comments made by students in the focus groups are consistent with the survey results where students were less likely than adults to choose cleanliness of the school as a welcoming feature (see Table 1). Ahrentzen and Evans (1984) note that teachers (adults) and children may respond differently to physical environmental features because: (1) their perception of the environment is different, and (2) they perform different activities in the setting. In this case study, clearly the condition of the student toilets is not a high priority to the adults because they do not use them.

Elsewhere, if determinism is in retreat, researchers emphasise the voices of teachers, administrators and governors. Hence, in explaining a programme for those involved in facility provision, Uline and Tschannen-Moran (2008) suggest that:

> *Teachers, administrators, and community members must join together in answering some important questions: What makes a school significant? How do we know when a school's physical structure reinforces the established goals of teaching and learning? Do we understand why certain spaces work and others do not? As participants debate what is most important and necessary, parents and other community members come to appreciate educators' knowledge of learning and teaching. Further, the experience taps the interests and skills of citizens. Research and scholarship to date underscores the important role active community involvement plays in designing and building quality schools and in strengthening communities.*

The much-cited student voice studies (Poplin and Weeres, 1992) argued that a depressed physical environment is believed by pupils to reflect society's lack of priority for their education and is therefore detrimental to morale and effort. In similar vein Corcoran *et al* (1988) report what seem blindingly obvious statements from teachers about the depressing effect of poor physical condition:

> *Teachers told us that physical conditions have direct positive and negative effects on teacher morale, feelings of effectiveness in the classroom and on the general learning environment. Building renovations in one district 'led to a renewed sense of hope' … In dilapidated buildings in another district the atmosphere was punctuated more by despair and frustration with teachers reporting that leaking rooves, burned out lights and broken toilets were the typical backdrop for teaching and learning.*

Yet such questions, the intangible signals transmitted by buildings, the artefacts within

them, and especially their state of repair still seem insufficiently explored in the later literature though, to cite a review from the publisher's website, Grosvenor and Burke (2008) suggest that 'continually, though silently, a school building can tell students who they are and what they should think about the world. It can help to manufacture rote obedience or independent activity; it can create high self-confidence or low self-esteem.'

To a researcher more acquainted with FM literature in other sectors, the literature on schools repeats common messages. The question of user engagement in design is repeated in the general management of buildings. Facilities management, as an activity, still suffers a tendency to concern itself with the physical building rather than with that building's intended influence on those who use it and the purpose for which it was constructed (Price, 2004; Thompson, 2008). Regular comparisons of building performance in terms of occupier opinions or business outcomes remain the exception.

Where it does address such impacts, research in other sectors tends to come from a structural functional perspective (Vischer, 2008) and concentrate on measurable and tangible aspects of buildings, such as colour, ventilation, air quality, lighting, temperature and observable physical condition, with much less consideration of the indirect impacts of the subliminal messages sent by buildings or the indirect influence of matters such as workplace geography. Despite Winston Churchill's anticipating Grosvenor and Burke (op cit) with[4] *'First we shape our buildings and afterwards they shape us'*, the shaping is less frequently researched. The indirect impacts of buildings, via expression to users and via the impact of workplace geography (Allen *et al*, 2004; Price, 2007, 2009) may have greater impacts on the organisation than do the direct tangible variables; indirect influence rather than simple, linear determinism. A simple model (Figure 2, after Price, 2007) captures the difference. In the case of schools it is, of course, likely that there may be not only direct and psychosocial influences on pupils but also equivalent influences on staff.[5]

2.1.4 Summary

In summary we find in the literature:

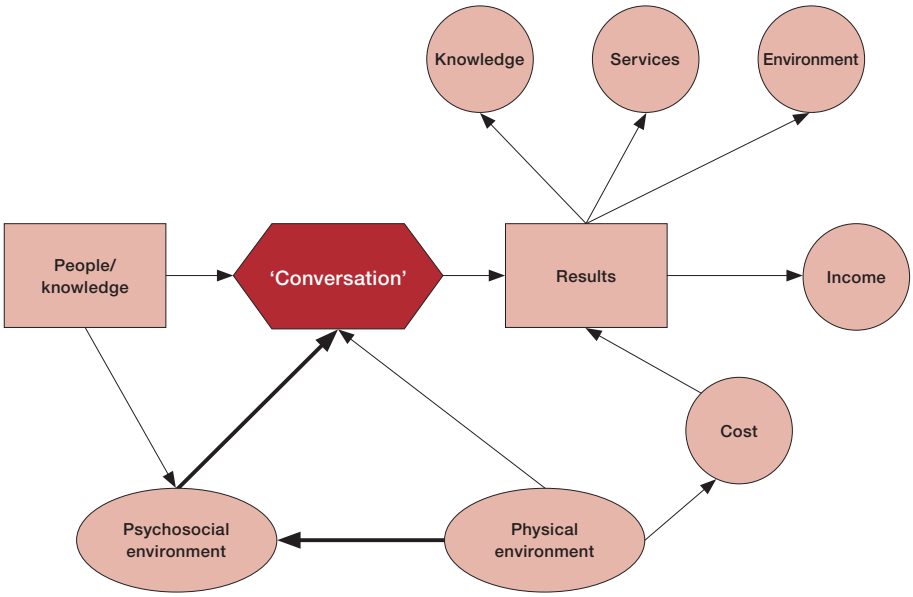
- numerous arguments supporting the proposition that tangible aspects of school facilities impact on pupils and their educational attainment
- a tendency on the part of educational researchers to view such studies as unduly deterministic
- a relative paucity of work asking for pupils' opinions but suggestions (especially Maxwell, 2000) that they do not see aspects of design as convenient and that visitors may not see the real school
- views reported by headteachers that design and condition influence teacher motivation and directly or indirectly pupil motivation
- a similar view that the effectiveness of teaching might be correlated to, or at least influenced by, a school's condition
- a claim that leadership in schools is correlated to condition
- support in the policy literature for the increasing role of school facilities for other purposes
- inconsistent approaches to a complicated, multi-faceted problem with many variables
- support, but little direct evidence, for the hypothesis that the influence of intangible or psychosocial factors might be more important than the tangible.

The research reported below is the first stage in what will hopefully develop into a more

[4] **http://www.winstonchurchill.org/i4a/pages/index.cfm?pageid=388#Shape_our_Buildings**

[5] A reviewer of an earlier draft of this report questioned whether it is enough to just ask the students or whether this 'voice' alone is actually redundant when not considered alongside other influential perspectives within the school community, for example admin staff, caretakers and dinner supervisors as well as of course the teachers. We acknowledge the point, and especially the inclusion of what would be seen in other sectors as FM staff. Our starting with pupils was a result firstly of resource constraints, and secondly of the direct advice of the headteachers and governors on our steering group.

FIGURE 2: A model to suggest that the influence of Physical Environments on occupiers which is mediated via the overall psychosocial environment exerts more influence on organisational results. This model was constructed for offices (Price, 2007). We expect the same to be true for schools



consistent programme of evidence gathering in this area and extend to various staff groups. We set out to develop and validate a means of gathering pupils' views. Ultimately, as with research into the influence of facilities on student choice of university (Matzdorf *et al,* 2003) or the effectiveness of office occupancy from user and business perspectives (cf. 1.2 above) sheer logistical convenience dictates survey based research, which can now be conducted online. We can, however, inform the design of such surveys by means of focus groups.

3 Research

"We planned a series of focus groups with secondary school pupils using a common series of open-ended questions."

3.1 Methodology

The authors put the points developed above to a steering group containing, initially, one headteacher, three local authority property or service managers (one of whom was also a school governor and one of whom was also a DBA researcher in the subject) and an independent BSF Consultant who was a former Director of Administration for a county council. We subsequently sought views from another headteacher and a further local authority, all of whom endorsed the propositions and offered assistance with access for the research. It was their unanimous opinion that, despite the multi-faceted nature of potential influences, the research should start with the views of pupils. Pragmatic considerations suggested starting with secondary schools.

In the absence of previous research on the subject, the research team determined on a grounded approach. We planned a series of focus groups with secondary school pupils using a common series of open-ended questions (Table 2). During the first of these the group became somewhat stilted when the session was held in the Headteacher's study (he was not present and had emphasised to the pupils that they could give their views openly). In something of a 'eureka moment'[6] we invited the group of six pupils to take us on a tour of their school, highlighting aspects of the buildings that they did, or did not appreciate. The tour turned into a rich source of opinions. It was not possible to tape record the full proceedings because of the animation in the group. Instead one researcher summarised into a tape recorder what the pupils were telling us while a second photographed aspects of the school that were pointed out to us. The process yielded a wealth of data and comments. It was adopted for a second school. Both tours were entirely pupil led.

The original plan was to seek access for four further focus groups. In the event that proved difficult to arrange within reasonable timescales. Moreover the researchers were swamped with the observations which emerged in the first two exercises. Nothing in the literature had prepared us for the animation and amount of opinion that would be expressed by six pupils when offered an

TABLE 2: Focus Group Questions

Q.	**What is your favourite subject and why?**
Q.	**What do you notice about the buildings when you walk into the school?**
Q.	**What are your favourite places in the school?**
Q.	**Do you have a favourite classroom? – why?**
Q.	**What parts of the school are your least favourite?**
Q.	**Are there parts of the school that are fun?**
Q.	**What parts of the school are best for talking to friends?**
Q.	**If you could change something about the school buildings what would it be?**
Q.	**If you could make a change to your classrooms what would it be?**
Q.	**Is there anything else about the school buildings that we have not talked about?**

[6] With hindsight it should not have been. The senior author has many years experience of walking through physical spaces and indeed incorporates such 'fieldwork' into Masters level teaching.

opportunity to show us round their school. The first phase of the study was therefore confined to two schools. Both were located in the southwest of Sheffield. School 1 was at the stage of planning a rebuilding programme. School 2 had been constructed four years previously as a PFI project. Both drew on broadly similar catchments on the more prosperous side of Sheffield; however the consensus in the city regarded School 1 as traditionally more desirable. In point of fact the 2008 School Achievement Tables[7] give both schools comparable results for both GCSEs (Table 3) and A Levels (Table 4). The historic data from 2005 are only presented for GCSEs and suggest an improvement after the new building opened. School 1 is in dreadful condition and is scheduled for replacement.

Participants in the groups were assured that their identities would not be revealed nor would individual comments be attributed. They were aware that their headteachers had approved the research and were interested in the results. To guard against leading the participants, the researchers started the focus groups by explaining that they would try not to prompt the participants and emphasised that it was up to the group where they took us in the walk-around phase. The formal focus groups were tape recorded. Those records and a researcher's comments of what was being shown, and why, during the walkabouts, were transcribed and coded. Initially we had expected that the focus groups would simply inform the design of the questionnaire. However the results proved a rich source of qualitative comment in their own right. They are accordingly reported here in more detail. The transcripts can be made available for scrutiny.

TABLE 3: GCSE grade A*–C passes for the sample schools

% of 15-year-old pupils achieving 5+ A*–C (and equivalent) including English and maths GCSEs				
	2005	**2006**	**2007**	**2008**
School 1	71%	63%	62%	63%
School 2	58%	66%	60%	63%
% of 15-year-old pupils achieving 5+ A*–C (and equivalent)				
School 1	75%	65%	65%	67%
School 2	62%	71%	68%	80%

TABLE 4: A Level results for the sample schools

Average A Level point score per student			
	2006	**2007**	**2008**
School 1	767.4	776.1	675.8
School 2	833.6	731.2	794.5
Average A Level point score per examination entry			
School 1	210.5	212.8	209.5
School 2	223.3	219.7	222

[7] http://www.dcsf.gov.uk/performancetables/

3.2 Results of Focus Groups

We report here only on the focus groups and the factual findings. There was however ample confirmation of the groups' comments when we subsequently surveyed a wider selection of pupils.

3.2.1 Composition

The composition of each group was left to the school concerned. Participants had volunteered and been reassured that they could be as open as they liked. All the schools involved appeared to have selected a balanced cross-section (Table 5).

3.2.2 Overall impression

Overall the two schools present, as might be expected, diametrically different impressions (Plates 1 and 2). Participants readily agreed describing School 1 *as very cold, old* and *a bit dark and dull* whereas in School 2 we recorded the following telling and seemingly flattering comment:

> *The colour, it's bright inside, it's basically like an adult environment really.*

The following verbatim comment from a pupil in School 1 seemed to us to sum up the whole session, and justify the theme of the research.

> ***It's important because you don't feel like trying hard in a building that is not particularly nice visually.***

The pupils in School 2 clearly noticed the improvements. They were also alert to design drawbacks (see below). In the older school less was said about design and more about condition. There is already a suggestion that condition matters, at least where it is manifestly poor.

School 1

School 2

Plate 1: General views of School 1 and School 2

TABLE 5: Composition of the focus groups

	School 1	School 2
Number	6	6
Gender	M4 F2	M3 F3
Years	7–9	10–13
Favourite subjects	Art (2)	Drama
	Drama	French
	ICT	Geography
	Maths	Maths
	Music	Music
		P.E.

> *Fields… you have to kind of make your own entertainment, there's nothing provided, it's just there, you have to just walk around.*

3.2.3 Social spaces

One of the most strongly articulated and frequent set of comments concerned informal social spaces. The original design of School 1 included a series of interior courtyards which had been closed off (Plate 2). In School 2 some outside seating had been added (Plate 3) but we were told that the only place to gather outside was under an access bridge (Plate 4).

Plate 2: Blocked off Courtyard: School 1

Plate 3: Benches rearranged at School 2

Plate 4: Pupils' congregation space under the bridge and (inset) the sign on the door

Because schools, as well as a place of learning, a place where you socialise and you see your friends for more time than in any other place, unless you live with them, so it's really important to have somewhere to socialise. I suppose for lads it's alright because we play football on the Astroturf, but for girls there is absolutely nowhere, they just end up sitting anywhere and lounging about, like stairwells and stuff.

[S2]

The form rooms can be fun but some of the teachers lock it so you just have to wander around and then eventually you have to succumb to the library. Some form rooms they only let people in the form go in them. Or if you've got mates outside the form, or in a different year you are not allowed.

[S1]

Exterior space was either part of the socialisation or used because of the lack of any alternative. In School 2 space under the entrance bridge served (Plate 4).

Fields… you have to kind of make your own entertainment, there's nothing provided, it's just there, you have to just walk around.

[S1]

They put benches around for people to sit and talk. I think we should have more recreational areas outside, covered or something for everyone because there are just a few benches around and in lower school you don't have the common room or anything, you just have to find a spot outside to sit in a corner or something, they should make something, you know if it's raining with a roof over and you know a bit more seating areas. A lot of people just congregate around the Astroturf area.

I think they could do something different with that car park. Sometimes if you go around the front of the school, you're either getting in the way of cars or cars are in the way and if they had a car park per site and an entrance out there for cars to just go through, that might be easier. There would be less accidents if the entrance wasn't right next to the main road.

[S1]

It was unclear whether pupils saw whiteboards differently in a crumbling school, that is a waste of money relative to say broken toilets, or whether there was some difference in the teaching. The reactions were very different, and startling.

In both schools the unavailability of the canteen as a social space outside of meal times was drawn to our attention.

> *The canteen, but you have to be eating to go in there, you can't just sit in there.*
>
> [S1]

> *Canteen, yeah canteen, it's nice but again the room is too small, you feel packed in like sardines. The tables have got little seats that are attached to them and they are really uncomfortable, you can't eat properly. If it was a bit bigger it would be better. They've made an effort to make designated queuing areas but it's not really worked properly. When you go towards the canteen, there is a corridor that is absolutely packed with kids, which you try and avoid.*
>
> [S2]

We could not probe behind the reasons in either case and wondered if it was an example of cost management by the FM contractor or equivalent. FM as a discipline is littered with examples of apparent cost minimisation actually resulting in ineffective utilisation of buildings (May and Price, 2009; Price and Clark, 2009). It is arguably an endemic problem (Price and Williams, in prep). In PFI facilities the FM providers have a contractual incentive to maintain the building in good condition. We have encountered situations in other PFI projects where increased demand was seen as a problem from the provider's point of view (Price and Clark, 2006). We are however assured by the LA concerned that at School 2 the canteen should be available for school use 40 minutes after the finish of the designated lunch interval. *'The fact that it is not so used is (a) down to school preference and (b) not unusual.'* Feedback from the headteacher at School 1 in particular reminded us that under current capital guidelines for school projects interior socialisation space is categorised as teaching space and the allowable amount is strictly controlled.

3.2.4 Stimulating spaces

A second common design theme concerned stimulation. Pupils in School 1 talked about the lack of it, or emphasised individual teaching areas such as studios which they found more stimulating whereas in School 2 there was more comment on particular stimulating spaces but also a slight comment about lost variety from pupils who had experienced the previous buildings.

> *I think the thing that I liked about the old school was that there was actually a bit of variation in classrooms, that's the only thing I liked.*
>
> [S2]

3.2.5 Interactive whiteboards

A totally unexpected but marked difference was noticeable in pupils' comments on whiteboards (the following are composite comments). It was unclear whether pupils saw whiteboards differently in a crumbling school, that is a waste of money relative to say broken toilets, or whether there was some difference in the teaching. The reactions were very different, and startling.

> *What I think is a bit of a waste of money, I know people say that it is needed but the whole interactive whiteboard I think a teacher with any lesson plan, they don't need a computer, if they have a whiteboard and a pen they can just teach off that and too much money is going, they say they are going to spend millions, they may as well spend it on training of teachers or improving the state of classrooms.*
>
> [S1]

compared to

> *I think they are really good, they do help, they are marvellous to be honest.*
>
> [S2]

While Higgins *et al.* (2005) speculate that the interactive whiteboard and the atrium could be the typing suite and flat roof of the middle decades of the 21st century, the evidence from these first focus groups suggests that the former is valued and the latter is desired, at least if spaces are produced underneath the atria that are stimulating and or conducive to social learning. In School 2 a lightwell passed through three storeys down to the ground floor (Plate 5) and the group told us they liked it. They commented at that stage of the discussion that the old

> *There's mould everywhere, the place is crumbling. The classrooms are all falling to bits, writing on the tables and on the walls and paint peeling off and broken blinds. There's an English room which is mouldy and there's like a damp patch in our form room.*

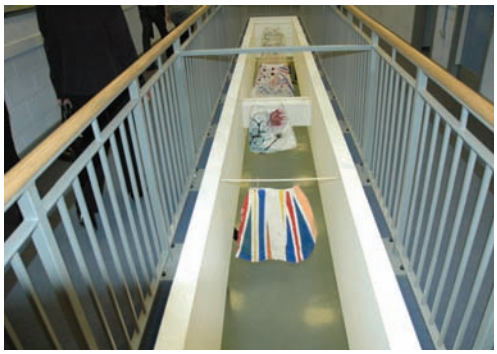


Plate 5: Lightwells in School 2 were much appreciated

building, the previous school, was more open. Having to go from the main building to portacabins etc. during the day meant they actually saw daylight. They missed that in the new building.

It was equally clear that the pupils noticed, and disliked, the poor condition of School 1. Again the composite comments give a flavour.

> *There's mould everywhere, the place is crumbling. The classrooms are all falling to bits, writing on the tables and on the walls and paint peeling off and broken blinds. There's an English room which is mouldy and there's like a damp patch in our form room.*

In School 2 the newer facilities were respected. The following extract (emphasis added) makes the point.

> ***I think people kinda respect the school.*** *Because it (the old school) was all old and grotty, people would just write on the tables and toilets especially, stick chewing gum under the desk* ***but now you don't really get that****.*

Again the message is that condition matters and if standards are allowed to start slipping a threatened side effect is a faster rate of decay. The situation at School 2 did appear to be one that the FM contractor was monitoring. CCTV made pupils feel monitored and one of the group attributed the lack of graffiti to *pupils feeling they would be watched if they did anything.*

Chewing gum under desks and tables was something the School 1 focus group had been keen to emphasise, and insist that we photographed (Plate 6). It led them to request, firmly, that we capture a catalogue of other results of deferred maintenance and visit the pupils' toilets (Plate 7).

> *Some of the rooms are quite dusty, yeah it's like quite thick dust, in the cubicles when you look down there is a thick layer of dust and you leave your bag there and it gets all dusty and then you've got your coat and you're not allowed to put your stuff on the table. I reckon they should have somewhere that you can hang your bag.*

Plate 6: Chewing gum and general deferred maintenance, School 1

3.2.6 Plumbing and ventilation

The state of the toilets in School 1, dark, flooded and smoky, as one pupil put it, hardly needs more comment. Anecdotal evidence from the headteacher and parents suggests that girls in particular will avoid using them all day if possible, even going without a drink of water in the process. One of the group commented *it's usually worse than this but I think they have cleaned it because they knew you were coming*.

The last observation contrasted with reactions in School 2, where an interesting observation was made about a design issue and we detected an early warning sign about maintenance versus covering up. The girls in particular were vociferous about the absence of mirrors which

> *"The group did comment that the toilets 'sometimes smell a bit but that can't really be helped' and were shown air fresheners in a girls' toilet which were not there in the adjacent boys' toilet."*

School 1

School 2

Plate 7: Contrasting sanitary standards

had been deliberately omitted to discourage lingering. That was a decision by the school and we are not seeking to be judgmental. We were shown how perspex-covered displays in the corridors were used as substitutes.

The group did comment that the toilets *'sometimes smell a bit but that can't really be helped'* and were shown air fresheners in a girls' toilet which were not there in the adjacent boys' toilet. The school insisted afterwards that this was a mistake and noted air fresheners were in fact normally placed in all the toilets. We had been taken to one that had been overlooked. There is however a hint that 'value engineering' in the design and construction process left a lurking problem of inadequate ventilation.[8]

3.2.7 Impact on teachers

There were hints of new space influencing teachers. In School 1 we were specifically asked by the headteacher not to engage with staff because he was aware of levels of stress, especially as the design consultation for the replacement building was in progress. There was little spontaneous involvement in the walkabout. In contrast, in School 2, where the pupils wanted to show us various classrooms and other teaching areas, teachers welcomed us to take photographs. In corridors teachers stopped to participate in the discussions (and support the research). Our notes from the tour record being invited into more classrooms here than the last focus group school. Pupils suggested it was because the teachers are proud of their school. A teacher, in one of the spontaneous discussions, volunteered the opinion that the wider corridors in the new buildings created *'more spaces to use, you can send kids out in the corridors to do work'*. She described the previous corridors as *'horrible, dingy and narrow'* and referred to changes in the National Curriculum *'having meant a change in the way classrooms are used'* and a need for different spaces.

3.2.8 Design for impression

School 1 had a single main entrance apparently shared by pupils, staff and visitors. The condition of the areas immediately adjacent to the entrance did strike the researchers as better than the rest of the school but, with exception of the library, it was not highlighted as such by the focus group. They wondered if the school had been cleaned up for our visit.

School 2 was built on a sloping site. Staff and visitors entered by a bridge onto the middle floor. Pupils came and went through what were still designated fire exits on the ground floor. It struck the researchers as a reasonably blatant form of discrimination, but It must be admitted that the arrangement did not arouse much comment from the pupils. We are assured by the LA that separate entrances are quite normal and that it is not a case of a Facilities Management company on a condition-based maintenance contract seeking to minimise wear and tear at the main entrance. It does perhaps illustrate Maxwell's

[8] We are not intending to be judgmental about a specific project. The lack of joined-up thinking between construction and FM arms of PFI vehicles has been noted in other projects (Price and Clark, 2006).

> *I like the fact that they have the set up of an actual library and with the computers as well.*

(2000) point about the parts of the school visitors do not see.

In School 1 the main facility adjacent to the entrance, in a sense at the core of the school, was the Library. In School 2 the Hall and Library were on the third floor. Again the focus group was not especially vocal but the researchers did note the difference as something to follow up. School 1 struck us as a learning centred design. The entrance to School 2 seemed to emphasise performance to parents and visitors.

3.2.9 Other matters

At the time the fieldwork was carried out (November 2008) there was considerable media attention given to a report (from the British Educational Suppliers Association) that school chairs were not sufficiently large for today's pupils. Our participants did not confirm that specific finding but were vocal on the subject of chairs (Plate 8):

School 1

School 2

Plate 8: Cracked chairs (School 1) and uncomfortable ones (School 2)

Some of the chairs are newer and can't break as easily, but half the chairs are broken and are not very good.

[S1]

Chairs generally seem to lean inwards so you can't lean back on the chair. It's important to have comfortable chairs for good learning.

[S2]

Heating remained an issue. Whereas in School 1 it was described as *'either really hot or it's broken'*, in School 2 the group commented that *'the the top floor is far too hot in the Summer'* and that *'the windows don't open very widely'*. They speculated as to a cause: *'probably H & S, as students might throw themselves out of them'*.

Storage was perceived as inadequate in School 1 and lacking in School 2 (Plate 9) and contra to some reports of a switch to digital learning, libraries are still seen as important:

We haven't talked about the Library, I like the Library, yeah the library is good. If anything ***though I think you could have more books to be honest****. I like the fact that they have the set up of an actual library and with the computers as well. Like it is nice and quiet, if you go in there you can expect to do work, the reason you go into the library is to finish off homework that you haven't done.*

[S2]

3.2.10 Proactive FM

Finally, we should mention signs of proactive engagement on the part of the FM company managing School 2 (Plate 10). The focus group showed us a board displaying the results of a recent survey and the actions that would result. They also showed us pupils spending detention periods on litter duty. We have been informed of other actions taken following the feedback of the results of our visit. It is our experience from case studies of other privately financed facilities (Price and Clark, 2006) that such proactive engagement is a feature of success stories. It is hard to contract for, and rarer than it should be on both client and supply sides of many PFI/PPP projects.

School 1

School 1

School 1

School 2

Plate 9: The first three pictures are from School 1 which show lockers provided along corridors. They are very small, several are broken and broken ones are used as rubbish bins, but they were regarded as better than nothing. The fourth picture, from School 2, shows open lockers provided within classrooms which are not secure and can only be used while the lesson is taking place. Pupils have to carry all their bags and books around with them the rest of the time.

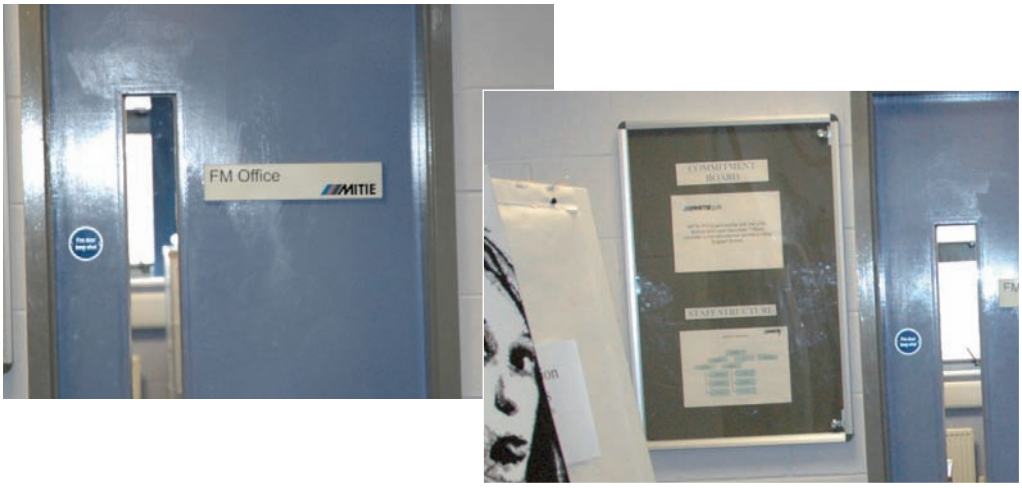


Plate 10: Branding and consultation by the FM service provider in School 2. The notice board next to the MITIE office door is a 'Commitment Board' with a statement from MITIE saying 'MITIE Pfi in partnership with the LEA school and Land Securities Trillium provides a non-educational service to XXXX school'. Below this statement is the MITIE staff structure.

> *This servay was realy well made esey to read and asked all the right questions i was impressed with it.* (sic)

3.3 Survey

3.3.1 Coding and questionnaire design

Every aspect of either school pointed out during the focus groups was converted into a question asking either how satisfied the responding party was or how much they agreed or disagreed with a particular statement. We had so much to ask that we could not include reverse statements to test for consistency. We did try to use terminology that matched the words of the group participants. A colleague's son and a student on a placement year in our centre kindly agreed to check the intelligibility of the questions and to identify, so far as possible, any ambiguity. Piloting the actual questionnaire in the schools before the full survey was not feasible. The university's marketing department, for whom schools are a target audience, did however assist with the design and deployment of the finished survey. We decided to use a seven point Likert Scale to allow a greater range of expression, despite debate as to whether seven points are or are not more revealing than five (Dawes, 2008). Recipients were asked which year they were in and their gender (with an option not to say) but no other questions about their identity. An internet address for the questionnaire was distributed to each school and the school had the freedom to decide how it was completed. Both chose to offer opportunities in selected lessons and nearly all replies arrived in batches.

In the first set of questions we endeavoured to set the scale in pupil-focused language viz, *How satisfied are you with the following? Please answer using a scale of 1–7 with 1 = very dissatisfied (i.e. it has a really bad effect on you) and 7 = very satisfied (i.e. it has a really good effect). Please use 4 where something is OK and has no real effect either way.* The full content of the questionnaire can be found in the appendices below. The second set asked in similar terms that respondents rate the scale of their agreement or disagreement with a series of statements. The third asked about the importance of various aspects of the school.

The questionnaire concluded with five open-ended questions giving respondents the chance of a written reply.

- Which is your favourite classroom and why?
- What is your least favourite aspect about the school and why?
- Do you think the parts of the school which are seen by visitors and parents are kept in a better condition than the rest of the school? Please give your comments
- Do you think the physical environment impacts on teachers? If so, how?
- Are there any other comments you want to make?

The majority of respondents took the opportunity and some used capitalisation and even deliberate text effects such as 'SLOOOOWLY' to emphasise their points. Others were uninhibited in their comments, an observation which adds to our confidence that neither school tried to edit or influence the responses.

We received 283 replies. The standard statistical tests of reliability – a Cronbach Alpha coefficient of .974 and split half values of .955 – suggest high reliability. The following verbatim comment offered to the last open-ended question is one of the indications that we succeeded with the design:

> *this servay was realy well made esey to read and asked all the right questions i was impressed with it.* (sic)

3.3.2 Satisfaction

Appendix 7.1 shows the – very predictable – results of the satisfaction questions. Table 6 shows some selected items with particularly large differences; having said which, a statistically significant difference (calculated in most cases with a confidence level approaching 100%) was revealed in every item except the supply of books to the libraries. In every case except one the higher satisfaction is reported from School 2. The single exception is the provision of personal storage facilities. They had deliberately not been provided in the new building and as the focus group had told us, pupils noticed. The scale of the differences tends to confirm the other opinions expressed in the focus groups, with the biggest being the satisfaction with the excellent indoor sports facilities at School 2. The second largest difference

TABLE 6: Selected average satisfaction scores. The higher score is highlighted in each case where the difference is significant, at a confidence level of 90% or higher. Satisfaction averages of 4.00 or above are shown in blue. Dissatisfaction averages of 3.00 or below are shown in red. A complete table with the same highlighting is at Appendix 7.1

How *satisfied* are you with the following?	School 1		School 2		Total		Sig
	Mean	N	Mean	N	Mean	N	
Your work area (i.e. desks in the classrooms)	3.19	167	4.91	114	3.89	281	0.000
The standard of decoration of the inside of your classrooms	2.34	166	3.73	113	2.90	279	0.000
The state of repair of furnishings and fittings in your classrooms	2.42	169	4.51	113	3.26	282	0.000
The use made of electronic whiteboards in your classrooms	3.45	168	5.75	114	4.38	282	0.000
Your personal storage facilities outside classrooms (e.g. lockers)	3.65	165	2.52	112	3.19	277	0.000
The availability of informal indoor areas to socialise with friends (e.g. corridors etc.)	2.54	169	3.55	110	2.94	279	0.000
The availability of outdoor areas to socialise with friends	3.12	165	4.89	114	3.85	279	0.000
The amount of litter inside the school including chewing gum under tables	1.67	169	3.33	111	2.33	280	0.000
The cleanliness of toilets	1.38	169	3.69	112	2.30	281	0.000
The provision of mirrors inside the toilets	1.81	168	2.34	111	2.02	279	0.021
The smell of the toilets	1.44	169	2.85	114	2.01	283	0.000
The general facilities provided by the library	4.03	165	4.37	111	4.17	276	0.109
The provision and suitability of outdoor sports areas	3.21	168	5.37	113	4.08	281	0.000

concerns the use made of interactive whiteboards vindicating the most surprising – to the researchers – comments made in the focus groups.

The focus groups' other complaints were similarly vindicated. The lack of mirrors in the toilets, the smells and the canteen furniture scored an average of less than 3.00 in both schools. The satisfaction with library facilities and IT suites averaged 4.00 or higher in both schools: an understandable case in School 1 of keeping the essential functioning. The specific question about the standard of decoration in the classrooms was one of the few responses from School 2 which did not achieve an overall score above 4.00. The availability of indoor social space was another. Again both results support comments about a slight lack of variety, and concern at the colour scheme which the focus group had reported. A question about litter and chewing gum may reveal an early warning sign for School 2. It was the item which received the second lowest response, after toilets, in School 1 but also a below average response from School 2. See Table 7.

A very similar picture is suggested by the agreement questions (Appendix 7.2). Again the differences are all very significant. The lack of external covered areas in School 2 is confirmed and the nature of the chairs and the canteen seating receives a milder criticism. The Library having sufficient books is the only statement to average over 4.00 in both schools. The state of the windows and the sense of pride in the buildings are the two biggest differences. The absence of outdoor covered areas is confirmed in both schools as is the respect for buildings that are in good condition. The different standard of the display boards is confirmed but interestingly the agreement with the statement about regularly

TABLE 7: Selected average agreement scores. Highlighting as for Table 4

How strongly do you *agree or disagree* with the following statements?	1		2		Total		
	Mean	N	Mean	N	Mean	N	
I can take pride in the school buildings	2.46	167	4.76	113	3.39	280	0.000
There are suitable places to go outside during break times when it's raining	1.72	165	2.64	111	2.09	276	0.000
Others respect the school's fixtures and fittings	2.28	169	4.14	113	3.02	282	0.000
The classrooms provide a creative physical environment	2.42	168	4.09	111	3.08	279	0.000
The seats within classrooms are in good condition	2.29	167	4.37	113	3.13	280	0.000
The seats within classrooms provide comfort and back support	2.35	169	3.50	111	2.81	280	0.000
The seats within classrooms are at an appropriate height for desks and tasks to be undertaken	3.66	167	4.59	111	4.04	278	0.000
The library has sufficient books	4.44	161	5.01	112	4.67	273	0.015
The display boards provide relevant and up to date information	3.24	169	4.27	109	3.64	278	0.000
The display boards are used as a means of highlighting work pupils are currently undertaking	3.05	168	4.38	112	3.58	280	0.000
I regularly read the information on the display boards	2.24	165	3.40	112	2.71	277	0.000
There are quiet areas for personal study outside lessons	2.53	167	4.08	110	3.15	277	0.000
I use these quiet areas	2.88	168	3.60	110	3.17	278	0.011
The overall physical environment of the school motivates me	2.22	165	3.99	111	2.93	276	0.000
There are sheltered meeting areas outside for when it is raining	1.58	167	2.60	112	1.99	279	0.000

reading them is lower! The same difference shows up in the question about the availability of quiet areas and the use made of them.

3.3.3 Importance

The Importance questions were designed primarily to test the generality of the views expressed by the focus groups. They were amply confirmed. The difference between the two schools is less marked and in many cases not significant at the 90% level of confidence (≥ 0.100). The school buildings in School 2 are rated as significantly more important, as is outdoor space, security and space outside lessons. Pupils apparently value, and rate as important, that which they have experienced.

Social spaces, indoors and out, are on average the two most important items. The differences are small and this ranking cannot be confirmed as absolute. It does, however, point to social space being seen, by pupils, as at least as important as classrooms. In higher education (e.g. JISC, 2006) and modern offices (e.g. Price, 2007) the importance of informal interactive space is increasingly recognised. The results here suggest pupils not only endorsing the point for secondary schools but, if anything, showing stronger appreciation of social learning space.[9] Table 8 shows the complete results for the Importance questions.

[9] Some years ago focus groups with office-based workers did not identify spaces for informal interaction but when specifically asked, respondents rated it the highest influence on their perceived productivity.

TABLE 8: Averages of responses to the importance questions. Highlighting as in Table 4

How *important* are the following aspects of your school to you?	1		2		Total		
	Mean	N	Mean	N	Mean	N	
Outdoor space to socialise with friends	4.91	167	5.54	111	5.16	278	0.014
Indoor space to socialise with friends	5.14	168	5.09	112	5.12	280	0.839
The classrooms	4.99	168	5.22	111	5.08	279	0.339
Heating, lighting and ventilation	4.83	168	5.10	111	4.94	279	0.277
The library	4.85	167	4.82	112	4.84	279	0.903
The school building	4.52	165	5.29	111	4.83	276	0.002
The outdoor environment	4.50	167	4.99	110	4.69	277	0.043
The general security	4.43	167	5.06	112	4.68	279	0.010
The provision of spaces to do work outside lessons	4.21	167	4.73	112	4.42	279	0.042
The availability of storage space	4.26	168	4.36	111	4.30	279	0.705

3.3.4 Open-ended questions

The question about Which is your favourite classroom, and why? was included in order to test for particular areas or as a means of classifying respondent preferences. In the event no easy pattern was detected. Asking What is your least favourite aspect about the school, and why? produced a volume of replies from School 1 with the individual who replied *'The Toilets, The Canteen, The lack of places to go at lunch/break & The heating'* (sic) capturing the main themes of his or her peer group. Virtually all the pupils from School 1 answered this question compared to only some 50% from School 2. However 13 pupils from School 2 still identified the lack of social space and 11 the lack of mirrors in, and/or smell from, the toilets.

Asked Do you think parts of the school which are seen by visitors and parents are kept in a better condition? some 33% of School 1 pupils said yes and approximately the same number said no because the whole school is so bad. About 20% of School 2 pupils commented on the better condition of the main reception area.

Some 50% of responses from School 1 to the question Do you think the physical environment impacts on teachers? If so how? were affirmative and universally identified negative effects.

Fewer affirmative responses came from School 2 but those that there were tended to comment on positive effects. A few did mention the lack of storage space provided for staff.

The final question, Are there any other comments you want to make? did elicit from School 1 a few comments about the morale of the school despite the building, and a number of expressions of regret and even anger that the rebuilding was not happening more quickly.

> *I think it is important to point out that the teaching and academic standard at this school compensate for the building's upkeep. I've seen the BSF plans and think they're going to be amazing.*

> *Our school is being re-built SLLOOOWLY so they won't pay for any improvements since it's all getting done sometime but at the minute it's cramped and falling apart.*

In short, design and condition do matter and are at least a plausible influence on attainment (cf Tables 3 and 4). We do not, however, claim that a comparison of only two schools proves that point. Our next challenge was to try and reduce the questionnaire to a more manageable length so as to produce a version which could be further tested in the proposed schools network to gather more data.

"Lighting, whether artificial or natural is a logical factor, though the weak correlation of this item with car parks is not immediately explainable."

3.3.5 Factor analysis

We set out to achieve that reduction using factor analysis, a statistical technique which tests for similarities of the variation in responses to questions in a survey, or other analytical observations. The output is a matrix showing what are in effect coefficients of co-variance between individual items (Appendices 7.3 and 7.4). Values above 0.3 or sometimes 0.4 tend to be treated as significant in social science investigations (Field, 2000). It is important when scrutinising results to be aware that the method will always field a matrix so any apparent correlation (loading of a variable on a factor) should be scrutinised for logical consistency. It is also necessary to be aware that apparent loadings can be affected by choosing to search for fewer or more factors. Appendices 7.3 and 7.4 represent the best solutions found by the authors after repeated analyses of the whole data set and the individual responses to the two schools.

It is important also to remember the aim of the research. We were not seeking to produce, or claim on the basis of two very different schools, firm conclusions about correlated factors. We were seeking to reduce the number of questions somewhat. Some factors reveal a confusing mix of different correlations some of which probably result from the very different state of the two schools sampled. Where that is the case we have taken several questions forward to the next stage. Where there is apparently clear agreement we have shortened the questionnaire more. In Appendices 7.3 and 7.4 the coloured sections indicate factors. The lines break some of those into sub-sections that we have elected to retain as separate items for investigation with a second, shorter survey instrument.

Factors are conventionally presented in the order of the total variance in the sample that they explain. **In this case of the satisfaction questions** (Appendix 7.3) the first factor, i.e. the set of questions whose individual answers explain the largest variance of any in the sample, is fairly clear and is related to the satisfaction or dissatisfaction with provision and suitability of specialised teaching areas; art rooms, drama studios, IT suites, science labs and the general facilities provided by the library. The strong correlations that these items show with each other are hardly surprising given an excellent set of new facilities in School 2 and a paucity of the same, in poor condition, in School 1.

The second factor is more heterogeneous and covers questions about classrooms and general design of the school. Responses to questions about the state of repair of the classrooms also show some correlation with the responses to questions about the state of the toilets (factor 3). In School 1 in particular the overall dissatisfaction with maintenance contributes to this result. In a similar vein, responses concerning the decoration of classrooms also correlate with those on lighting and the question about quiet areas outside classrooms also correlates with other questions about exterior areas. We have decided to keep five separate questions on this item at the next stage.

The third factor, the state of the toilets, appears very logical. The fourth is, at first glance, confusing in that it comprises the provision and suitability of indoor and outdoor sports facilities with reactions to the use made of electronic whiteboards in classrooms and to the external general appearance/decoration of the building. The apparent co-variance is an artifact of big differences between the two schools. The new sports facilities in School 2 are in good condition and tend to correlate with the general satisfaction expressed with other special facilities (factor 1). The dissatisfaction with whiteboards in School 1 tends to show a correlation with the general views on the condition of the school (factor 2). We have accordingly kept three separate questions going into the next stage.

Lighting, whether artificial or natural, is a logical factor, though the weak correlation of this item with car parks is not immediately explainable. Similarly views on the approach to the school, the main entrance and reception area for visitors (if it is different) and the entrances to the school which pupils use are a natural factor. In School 1 in particular the general safety of the car parking adjacent to the entrance was an issue raised in the focus group and it is not surprising to see responses on safety correlating with this item as well as with responses on general design

"Networking spaces, internal and external, litter and personal storage are other natural factors with two questions loading on each."

and maintenance. We have however taken separate questions forward.

Networking spaces, internal and external, litter and personal storage are other natural factors with two questions loading on each. Otherwise the remaining responses only show weak mutual correlations and we have elected to treat each as a separate item going to the next stage.

For the agreement questions (Appendix 7.4) four overall factors emerged from the basic statistical analysis concerned respectively with the building, facilities other than classrooms, classrooms and quiet areas. There is however considerable correlation between factors. The largest factor, which explained the largest variance in the sample, concerned the appropriateness and quality of the physical environment inside and outside the school building. The co-loading of the existence of external shelter, and colour schemes seems likely to be a sampling artefact and we have retained seven separate questions. The overall physical environment and the windows also contribute to the classrooms factor, as do questions of respect for the school's fittings and pride in the building. Again these are not surprising.

The second main factor was concerned with the provision and quality of facilities such as display boards, the dining room, CCTV and being able to work in groups in lessons without being disturbed by others. It is again replete with logical sub-correlations but we have chosen to retain five separate items. The third factor contained three logical groups, namely the environment within classrooms, the provision and suitability of seats, and the ability to work outside classrooms without being disturbed. The fourth had just one question in it which was the use of these quiet areas for personal study outside lessons.

Overall the results from the factor analysis of the Agreement questions is even more heterogeneous than that for the Satisfaction questions, with most answers correlating with two or more factors. Rather than reducing the number of Agreement questions down to four, as the factor analysis might suggest, we have only reduced the number of questions from 22 to 16. The horizontal lines in Table 12 (Appendix 7.2) show where two or more questions have been combined or where they remain individual questions.

As this data was so heterogeneous we ran the factor analysis for the Agreement questions on each individual school. The results are shown in Tables 13 and 14 (Appendix 7.4).

For School 1 (Table 13), the first factor identified comprised the six questions where disagreement was greatest regarding the physical environment, condition and outside space. The second group concerned the display boards, library, CCTV, dining room and group work and with the exception of the dining room, was amongst the highest-scoring Agreement questions. The third group concerned the classrooms, the seats, the library and the quiet areas. This group was heterogeneous but contained the three most agreed-with questions – 'The library has sufficient books', 'The seats within classrooms are an appropriate height for desks and tasks to be undertaken' and 'The classrooms are not overcrowded'. The other four questions ranged from 11th to 16th in terms of pupil agreement and had a strong representation in the first group that the factor analysis identified which contained topics that the pupils did not agree with. The fourth group contained three items: 'I can work in groups outside the classroom without being disturbed', 'I can take pride in the school buildings' and 'Others respect the school's fixtures and fittings'. Again this was quite a heterogeneous group with the questions being the 9th, 12th and 17th most agreed-with statements. The final group contained just one question, 'I use these quiet areas' and was the 10th most agreed-with statement.

For School 2 (Table 14) the items that the factor analysis placed in the first group concern the seats in the classroom (three out of three questions), the display boards (two out of three questions) group work (two out of two questions) and CCTV (one question). These questions were those that the students tended to agree with – i.e. they were happy with. 'There is effective use made of CCTV' was the 3rd most agreed with statement, 'The seats within the classrooms are an appropriate height for desks and tasks to be undertaken' was the 5th most agreed with. All the other questions

were the 9th, 10th, 11th and 12th most agreed with apart from 'The seats within the classrooms provide comfort and back support' which was only the 19th most agreed with. However, it is logical that this question remains in the factor analysis for this group as it is with the other questions concerning chairs, and we know from the focus group interviews that the chairs were not comfortable as their backs lean inwards so pupils cannot sit back in their seats. The two questions concerning group work also have a strong representation in the fourth group which contains questions that pupils did not agree with, i.e. were not happy with. Again this is logical as we know from the focus group interviews that there is limited space for pupils to study outside classrooms.

The second group that the factor analysis identified contains questions relating to the classrooms, library, the physical school environment and pupils having respect and taking pride in the school building. This group contains the first, second and fourth most agreed-with statements and these three questions also have a strong representation in the first group that the factor analysis identified. The other questions are fairly mid-league in terms of pupils' agreement with them – 6th, 8th, 13th and 14th, apart from 'The colour scheme used throughout the school makes the building an attractive and pleasant environment' which is only 17th. During the tour of the school the pupils pointed out a corridor that was a very bright yellow which they did not like – which is probably why this question scored relatively badly whereas the rest of the school was light and cheerfully decorated. This question was also strongly represented in the third and fourth groups by the factor analysis which contain the least agreed-with questions.

The third group identified by the factor analysis contains the four least agreed-with questions from the survey and concerns places to go outside at break times, reading the information on display boards and the seating in the dining room.

The final group identified by the factor analysis contains three questions: 'There are quiet areas for personal study outside lessons', 'The overall physical environment of the school motivates me' and 'I use the quiet areas'. These aspects had relatively poor scores and were only ranked as 15th, 16th and 18th most agreed-with statements.

4 Discussion

"Perhaps the most surprising and unexpected observation was the strong confirmation in the survey of the different perceptions of the usefulness of interactive whiteboards in two schools where the overall physical condition is so different."

It is dangerous to speculate too far from two examples where the differences in the standard of the physical environment are so marked. Our original research intention had been to seek to carry out six focus group sessions and initial surveys. As explained above, that proved impossible to negotiate on the time-scale involved. With hindsight it would also have generated more data than could have been analysed within the time and resources available.

There is strong evidence from the sample that large differences in the condition of school facilities are noticed. Some unsolicited comments point to poor condition being demoralising and vice versa. The reported importance of the school buildings varies with their condition.

Perhaps the most surprising and unexpected observation was the strong confirmation in the survey of the different perceptions of the usefulness of interactive whiteboards in two schools where the overall physical condition is so different. We cannot explain the difference without further work and testing but two explanations seem plausible. It is possible that pupils are sceptical of investment in technology when buildings are leaking and the basic condition is frankly appalling. A complementary explanation may be the added difficulty of teaching in a substandard environment.

What also seems clear is the perceived importance of the social geography of the school, the space or lack of it for informal interaction: socialising with friends. In part this is a design issue. In part it perhaps reflects day-to-day management, with FM focused on, for example, keeping a BSF building in good condition rather than seeing it used as intensively as possible. As with research in other areas it seems that the psychosocial aspect of school design and management has more potential to impact on outcomes than the direct physical factors studied in most research. There are clear hints to the effect that the psychosocial impact also applies via its influence on teachers. That is certainly the perception of a number of those who completed the survey described above.

Returning to the propositions with which we concluded the literature review:

- It seems clear that intangible factors and overall condition are perceived by pupils as having a much greater influence on their educational experience than single, isolatable, tangible physical variables. We have demonstrated a consistent means of capturing these views and devised a shorter questionnaire for future use.
- The tendency on the part of educational researchers to view many such studies as unduly deterministic is, in one sense, supported. That said, the evidence above points to condition and design being major influences on pupils. We have justified the progress to the next stage, an attempt to validate a more manageable pupil questionnaire.
- Maxwell's (2000) contentions that pupils do not see aspects of design, such as storage, as convenient and that visitors may not see the real school are both amply confirmed in these examples.
- Views reported to PricewaterhouseCoopers by headteachers that design and condition influence teacher motivation and, directly or indirectly, pupil motivation are amply supported. Key points of that influence are suggested as is the prospect of rendering them quantifiable.
- A similar view that the effectiveness of teaching might be correlated to, or at least influenced by, a school's condition is strongly supported by this study, even though that was not an original aim of the research.
- A claim that leadership in schools is correlated to condition is not directly supported. Some pupils' unsolicited comments about pride in School 1 despite its condition suggest that leadership can be exercised even in a terrible environment. However the results do evidence the burden of trying to lead in such circumstances.

- Support in the policy literature for the increasing role of school facilities for other purposes was not directly examined. We have seen, for whatever reason, underutilisation of canteen space outside of meal times.
- We have seen high degrees of consistency as to what pupils regard as important in two schools in a very different condition. There is hope of at least simplifying a complicated, multi-faceted problem with many variables.
- The study provides very direct evidence, for the hypothesis that the influence of intangible or psychosocial factors might be more important than the tangible. In particular the perceptions regarding interactive whiteboards, the difference in perceived influence on teachers and the importance of social space were all evidenced with a very high degree of confidence.

Inter alia the study has added to a body of case evidence for the value of proactive FM and the importance of it not being seen as a matter that can be outsourced and forgotten.[10]

[10] A suggestion made by one reviewer of our original proposal

5 Next steps

"We plan to separately develop an equivalent project looking at their perceptions of their built environment once a network is in operation."

A shorter questionnaire has been devised and we are seeking an opportunity to pilot it in a further four schools. Simultaneously the current study has been reported to interested parties from Local Education Partnerships and BSF Providers as the basis for a network comparable to that used to benchmark government accommodation (Price and Clark, 2009). A number have indicated a desire to subscribe to such a project. Their feedback gives us confidence that a reliable means can be achieved for assessing the facilities quality of schools through the eyes of pupils. While it could be argued that a quantitative survey might miss some detail, the standard comparison it offers is seen, by that target audience, as being useful. By way of example here is feedback from the Facility Manager of a London High School:

> *I found Tuesday very interesting indeed. I agree that your main proposal will need to be aimed at Local Authorities and BSF providers but it would be great if you could come up with an affordable package for individual schools as well. I will also be happy to pass on to other colleagues within the London Borough of Hillingdon details of your network proposal when you are ready.*

As we acknowledge above, in response to a reviewer's comment (Footnote 5) there are other voices to consider especially those of staff working in the school. We plan to separately develop an equivalent project looking at their perceptions of their built environment once a network is in operation. The open-ended questions have proved a source of a considerable amount of qualitative data which merits more detailed examination. Our primary goal of enrolling those who provide and manage schools has been met.

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7 Appendices

7.1 Satisfaction scores

TABLE 9: Average satisfaction scores. The higher score is highlighted in each case where the difference is significant at a confidence level of 90% or higher. Satisfaction averages of 4.00 or above are shown in blue. Dissatisfaction averages of 3.00 or below are shown in red.

How *satisfied* are you with the following?	School 1		School 2		Total		Sig
	Mean	N	Mean	N	Mean	N	
Your work area (i.e. desks in the classrooms)	3.19	167	4.91	114	3.89	281	0.000
The layout of your classrooms	3.69	166	4.65	112	4.08	278	0.000
The standard of decoration of the inside of your classrooms	2.34	166	3.73	113	2.90	279	0.000
The state of repair of furnishings and fittings in your classrooms	2.42	169	4.51	113	3.26	282	0.000
The use made of electronic whiteboards in your classrooms	3.45	168	5.75	114	4.38	282	0.000
The general safety of your classrooms (e.g. wires/electrical leads not trailing across the floor)	4.11	167	5.54	114	4.69	281	0.000
The soundproofing of classrooms (e.g. not being disturbed by lessons in adjacent classrooms/noise from corridors)	2.83	168	3.96	112	3.28	280	0.000
Your personal storage facilities within your classrooms	2.28	166	2.94	112	2.55	278	0.003
Your personal storage facilities outside classrooms (e.g. lockers)	3.65	165	2.52	112	3.19	277	0.000
The availability of indoor rooms to socialise with friends (e.g. common rooms, halls etc.)	2.49	167	3.27	113	2.80	280	0.000
The availability of informal indoor areas to socialise with friends (e.g. corridors etc.)	2.54	169	3.55	110	2.94	279	0.000
The availability of outdoor areas to socialise with friends	3.12	165	4.89	114	3.85	279	0.000
The provision of quiet areas – spaces to do work outside lessons	2.77	167	3.95	114	3.25	281	0.000
The corridors, stairs and other walkways	3.11	168	4.58	112	3.70	280	0.000
The amount of litter inside the school including chewing gum under tables	1.67	169	3.33	111	2.33	280	0.000
The location of toilets	2.50	169	4.71	110	3.37	279	0.000
The cleanliness of toilets	1.38	169	3.69	112	2.30	281	0.000
The provision of mirrors inside the toilets	1.81	168	2.34	111	2.02	279	0.021

How *satisfied* are you with the following?	School 1		School 2		Total		Sig
	Mean	N	Mean	N	Mean	N	
The smell of the toilets	1.44	169	2.85	114	2.01	283	0.000
The smell in other parts of the school	2.70	168	4.16	114	3.29	282	0.000
The food in the canteen	3.17	166	4.45	110	3.68	276	0.000
The quality and comfort of furniture in the canteen	2.54	164	2.91	112	2.69	276	0.047
The general facilities provided by the library	4.03	165	4.37	111	4.17	276	0.109
The heating	2.35	165	4.19	110	3.08	275	0.000
The amount of daylight throughout the school	3.66	167	4.44	113	3.98	280	0.000
The artificial lighting throughout the school	3.40	167	4.71	112	3.93	279	0.000
The ventilation system	2.79	167	4.10	113	3.32	280	0.000
The noise levels throughout the school	2.76	167	4.05	112	3.28	279	0.000
Your overall security while at school	3.01	168	4.50	112	3.61	280	0.000
The amount of litter in the school grounds	2.23	167	3.49	112	2.74	279	0.000
The entrances to the school which you use	3.60	168	3.96	113	3.74	281	0.092
The main entrance and reception area for visitors (if it is different)	3.98	168	4.91	109	4.34	277	0.000
The approach to the school	3.77	168	4.41	110	4.03	278	0.005
The external general appearance/decoration of the building	2.72	167	4.49	112	3.43	279	0.000
Any outdoor seating	1.60	166	3.48	111	2.35	277	0.000
The location of car parks in relation to the school buildings	3.10	167	4.68	112	3.73	279	0.000
The provision and suitability of science labs	3.14	166	4.86	111	3.83	277	0.000
The provision and suitability of art rooms	3.58	168	4.54	112	3.96	280	0.000
The provision and suitability of IT suites	4.00	169	5.12	112	4.44	281	0.000
The provision and suitability of drama studios	3.86	163	5.18	110	4.39	273	0.000
The provision and suitability of indoor sports halls	3.00	166	5.63	112	4.06	278	0.000
The provision and suitability of outdoor sports areas	3.21	168	5.37	113	4.08	281	0.000

7.2 Agreement scores

TABLE 10: Average agreement scores. Highlighting as for Table 4

How strongly do you *agree or disagree* with the following statements?	1		2		Total		
	Mean	N	Mean	N	Mean	N	
I can take pride in the school buildings	2.46	167	4.76	113	3.39	280	0.000
There are suitable places to go outside during break times when it's raining	1.72	165	2.64	111	2.09	276	0.000
Others respect the school's fixtures and fittings	2.28	169	4.14	113	3.02	282	0.000
The classrooms provide a creative physical environment	2.42	168	4.09	111	3.08	279	0.000
The classrooms are not overcrowded	3.52	167	4.55	112	3.94	279	0.000
The seats within classrooms are in good condition	2.29	167	4.37	113	3.13	280	0.000
The seats within classrooms provide comfort and back support	2.35	169	3.50	111	2.81	280	0.000
The seats within classrooms are appropriate height for desks and tasks to be undertaken	3.66	167	4.59	111	4.04	278	0.000
The dining room has adequate seating for all pupils	2.33	167	3.23	110	2.69	277	0.000
The library has sufficient books	4.44	161	5.01	112	4.67	273	0.015
The display boards provide relevant and up to date information	3.24	169	4.27	109	3.64	278	0.000
The display boards are used as a means of highlighting work pupils are currently undertaking	3.05	168	4.38	112	3.58	280	0.000
I regularly read the information on the display boards	2.24	165	3.40	112	2.71	277	0.000
The school has windows that fit well and can be opened and closed	2.17	168	5.12	112	3.35	280	0.000
I can work in groups outside of the classroom without being disturbed	3.01	168	4.43	109	3.57	277	0.000
I can work in groups as part of lessons without being disturbed by other groups	3.04	167	4.39	111	3.58	278	0.000
There are quiet areas for personal study outside lessons	2.53	167	4.08	110	3.15	277	0.000
I use these quiet areas	2.88	168	3.60	110	3.17	278	0.011
The overall physical environment of the school motivates me	2.22	165	3.99	111	2.93	276	0.000
The colour scheme used throughout the school makes the building an attractive and pleasant environment	1.88	166	3.97	112	2.72	278	0.000
The library is a place conductive to work	3.46	165	4.40	105	3.83	270	0.000
There is effective use made of CCTV	3.28	167	4.88	112	3.92	279	0.000
There are sheltered meeting areas outside for when it is raining	1.58	167	2.60	112	1.99	279	0.000

7.3 Factor analysis of satisfaction responses

TABLE 11: Final results from the authors' factor analysis of the combined responses from both schools to the satisfaction questions. Colours highlight separate factors. Horizontal lines show the groups or individual items taken forward to the next stage: a shorter survey.

Rotated Component Matrix

	Component													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
The provision and suitability of art rooms	0.788													
The provision and suitability of drama studios	0.755													
The provision and suitability of IT suites	0.743													
The provision and suitability of science labs	0.578													
The general facilities provided by the library	0.563													
The layout of your classrooms		0.717												
The state of repair of furnishings and fittings in your classrooms		0.606	0.357											
Your work area (i.e. desks in the classrooms)		0.588												
The corridors, stairs and other walkways		0.567												
The standard of decoration of the inside of your classrooms		0.503			0.466									
The provision of quiet areas – spaces to do work outside lessons		0.484										0.421		
The location of toilets		0.329												
The smell of the toilets			0.843											
The cleanliness of toilets			0.718											
The smell in other parts of the school			0.463											
The provision and suitability of indoor sports halls	0.460			0.653										
The provision and suitability of outdoor sports areas	0.463			0.641										
The use made of electronic whiteboards in your classrooms		0.364		0.592										
The external general appearance/decoration of the building				0.342										

	Component													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
The artificial lighting throughout the school					0.709									
The amount of daylight throughout the school					0.630									
The location of car parks in relation to the school buildings					0.404							0.375		
The approach to the school						0.736								
The main entrance and reception area for visitors (if it is different)	0.434					0.504								
The entrances to the school which you use						0.496								
The general safety of your classrooms (e.g. wires/ electrical leads not trailing across the floor)		0.410	0.360			0.474								
The availability of informal indoor areas to socialise with friends (e.g. corridors etc.)							0.828							
The availability of indoor rooms to socialise with friends (e.g. common rooms, halls etc.)							0.808							
The noise levels throughout the school								0.719						
The ventilation system							0.355	0.468						
Your overall security while at school								0.442						
The heating					0.364			0.440						
The soundproofing of classrooms (e.g. not being disturbed by lessons in adjacent classrooms/noise from corridors)		0.361		0.376				0.428						
The amount of litter inside the school including chewing gum under tables									0.714					
The amount of litter in the school grounds									0.683					
The quality and comfort of furniture in the canteen										0.744				
The food in the canteen										0.670				
Your personal storage facilities within your classrooms											0.731			
Your personal storage facilities outside classrooms (e.g. lockers)											0.690			
The availability of outdoor areas to socialise with friends												0.774		
Any outdoor seating													0.690	
The provision of mirrors inside the toilets														0.789

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 14 iterations

7.4 Factor analysis of agreement responses

TABLE 12: Final results from the authors' factor analysis of the combined responses from both schools. Colours highlight separate factors. Horizontal lines show the groups or individual items taken forward to the next stage: a shorter survey.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
There are suitable places to go outside during break times when it's raining	.741			
There are sheltered meeting areas outside for when it is raining	.705			
The colour scheme used throughout the school makes the building an attractive and pleasant environment	.700			
The overall physical environment of the school motivates me	.604		.367	
The school has windows that fit well and can be opened and closed	.575		.429	
I regularly read the information on the display boards	.573			.361
Others respect the school's fixtures and fittings	.560		.555	
I can take pride in the school buildings	.559		.430	
There are quiet areas for personal study outside lessons	.485			.352
The display boards provide relevant and up to date information		.787		
The display boards are used as a means of highlighting work pupils are currently undertaking		.742		
There is effective use made of CCTV		.617		
The library has sufficient books		.547	.453	
The library is a place conducive to work		.528	.388	
The dining room has adequate seating for all pupils	.467	.518		
I can work in groups as part of lessons without being disturbed by other groups		.497	.392	.398
The classrooms are not overcrowded			.788	
The classrooms provide a creative physical environment	.562		.619	
The seats within classrooms are at an appropriate height for desks and tasks to be undertaken		.395	.636	
The seats within classrooms are in good condition	.446	.397	.539	
The seats within classrooms provide comfort and back support		.434	.441	
I can work in groups outside of the classroom without being disturbed		.371	.447	.375
I use these quiet areas				.848

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
[a.] Rotation converged in 19 iterations.

TABLE 13: Final results from the authors' factor analysis from School 1. Colours highlight separate factors.

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
There are sheltered meeting areas outside for when it is raining	.813				
The colour scheme used throughout the school makes the building an attractive and pleasant environment	.738				
There are suitable places to go outside during break times when it's raining	.619			.414	
The school has windows that fit well and can be opened and closed	.532	.389			
I regularly read the information on the display boards	.531				.420
The overall physical environment of the school motivates me	.431			.379	
The display boards provide relevant and up to date information		.789			
The display boards are used as a means of highlighting work pupils are currently undertaking		.775			
There is effective use made of CCTV		.624			
The library is a place conducive to work		.523	.465		
The dining room has adequate seating for all pupils	.389	.475			
I can work in groups as part of lessons without being disturbed by other groups		.466		.458	
The seats within classrooms are at an appropriate height for desks and tasks to be undertaken			.777		
The seats within classrooms provide comfort and back support	.443		.678		
The seats within classrooms are in good condition	.457		.643		
The classrooms are not overcrowded			.588	.540	
The library has sufficient books		.501	.548		
The classrooms provide a creative physical environment	.393		.512	.489	
There are quiet areas for personal study outside lessons	.450		.505		
Others respect the school's fixtures and fittings				.782	
I can take pride in the school buildings				.593	.356
I can work in groups outside of the classroom without being disturbed				.577	
I use these quiet areas					.844

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
[a] Rotation converged in 8 iterations.

TABLE 14: Final results from the authors' factor analysis of the agreement questions from School 2. Colours highlight separate factors.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
The seats within classrooms are in good condition	.769			
The seats within classrooms are at an appropriate height for desks and tasks to be undertaken	.730			
The seats within classrooms provide comfort and back support	.692			
The display boards provide relevant and up to date information	.647	.399		
I can work in groups as part of lessons without being disturbed by other groups	.633			.506
There is effective use made of CCTV	.629			
The display boards are used as a means of highlighting work pupils are currently undertaking	.588	.350		
I can work in groups outside of the classroom without being disturbed	.578			.538
The classrooms provide a creative physical environment		.792		
The classrooms are not overcrowded		.762		
The library is a place conducive to work		.628		
Others respect the school's fixtures and fittings		.618		
The library has sufficient books	.453	.603		
The colour scheme used throughout the school makes the building an attractive and pleasant environment		.472	.440	.352
The school has windows that fit well and can be opened and closed	.422	.456		
I can take pride in the school buildings	.391	.397		
There are suitable places to go outside during break times when it's raining			.744	
There are sheltered meeting areas outside for when it is raining			.689	
I regularly read the information on the display boards	.351		.597	
The dining room has adequate seating for all pupils	.386		.573	
I use these quiet areas				.794
The overall physical environment of the school motivates me		.367	.430	.592
There are quiet areas for personal study outside lessons			.383	.567

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
[a]. Rotation converged in 7 iterations.

CfBT Education Trust
60 Queens Road
Reading
Berkshire
RG1 4BS

0118 902 1000
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