



Better spaces for learning

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Contents

Foreword	4
Executive summary	7
Introduction	11
Section 1 – It pays to invest in good design	17
Section 2 – School design impacts teachers	31
Section 3 – What should the Government do?	35

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With thanks to:

All the RIBA members and other experts who have helped inform this report over the last two years.

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Foreword

Schools play an important role in widening our outlook and life chances. We all know how these environments can affect our self-esteem, performance and friendships - which in turn shape us into the adults we become.

Every pupil deserves a place at a good school. This is a key Government objective, but is becoming harder to achieve in the face of budget pressures and increasing numbers of children entering the education system. With limited funding available to provide extra school places and many existing schools in need of an overhaul, there could not be a better time to look more closely at how excellent design can help the Government's capital funding programme deliver better value for money.

Better value does not mean building schools very cheaply, but creating cost-effective environments that help drive up educational outcomes, enhance teacher and pupil wellbeing, and limit future running and maintenance costs.

The UK has a proud history of great schools and buildings, and good architecture has always played a prominent role. Last year we awarded our prestigious RIBA Stirling Prize to Burntwood School in South West London. It is the perfect example of how great design can help harness the creative energy and passions of students and teachers and stretch money further. Who (but architects) would think that bus shelters bought in bulk could provide extra circulation space for a fraction of the price of a traditional walkway roof? We were overwhelmed at the pride the new building instilled in pupils, attracting new teaching talent, and freeing funds that could be reinvested into the school through lower operating costs.

Difficult problems require creative solutions. While not every school will be able to reinvent themselves in the way Burntwood did, they can adopt many of its design approaches. This can make the difference between an adequate building and a great one.

To make sure that we get the most from the next generation of school buildings, we need to learn more about how well our school buildings perform. At present little data is collected and fed back into Government policy on school buildings on which design approaches can deliver best value, and how they can be delivered. We have set out to address this knowledge gap in this report.

With what we believe is the largest analysis of Post Occupancy Evaluations of primary and secondary schools in the UK, a nation-wide poll of teachers, and numerous conversations with stakeholders involved in delivering Government-funded school buildings, we demonstrate how good design can help ensure that capital funding stretches as far as possible, without storing up problems for the future.

School building design has fallen off the education policy agenda. We call on the Government to carry out a review of its school building programme. With the three key interventions we offer in this report, we believe every penny spent on the next big batch of Government-funding school buildings will stretch further. Our pupils, teachers, parents and taxpayers deserve top mark schools.



JANE DUNCAN
RIBA President 2015-2017



Executive Summary

It pays to invest in good design

The RIBA believes that in order for new school buildings to get top marks from pupils and teachers the Government needs to ensure that an increasingly centralised schools capital project delivery system is able to respond to the unique local circumstances of each school building project. Our proposals can be summarised around three themes:

- Reviewing how information and communication flows between the school, Government, and design and construction teams during a project
- Adopting a more flexible approach to the rules governing the design and size of new schools to allow for the best possible use of resources
- Taking a smarter approach to the use of building management equipment that controls the internal environment of modern school buildings

The Government and the Education Funding Agency (EFA), the body responsible for making decisions about where school investment is targeted, are facing a staggering challenge. In an era of austerity, improving – or even maintaining – the UK’s school estate will require architects, builders and other parts of the supply chain to deliver more for less.

The fundamental shift from a locally controlled education system to a national system that grants greater independence to schools means that there is a danger that central control drowns out local circumstances in the debate about school environments.

The RIBA believes the Government should review how the current generation of centrally planned school building projects is working. The new approach adopted by the Government when it established the EFA has succeeded in delivering schools to incredibly tight budgets, but it has also proved to be hugely restrictive in terms of the design and timeframes allowed for the construction of new schools. This one-size-fits-all approach means that opportunities to innovate or respond to local context to optimise investment are being curtailed. With the right reforms, the results could be much better.

Good design is not just about appearance; it makes a noticeable difference to outcomes and frees up resources.

At the heart of our argument is our belief that giving the teams designing and building new schools greater flexibility will enable future schools to benefit from the expertise of the professionals involved.

Our research was guided by a combination of external research, including a detailed study of how new school buildings have performed, a nationwide poll of teachers about their experiences and discussions with leading architects, academics and consultants.

Good design is not just about appearance; it makes a noticeable difference to outcomes and frees up resources. Our research showed that an overwhelming majority of teachers believe good school buildings can reduce bullying and pupil misbehaviour. It also has a positive impact on school staff's productivity, with the most comfortable and well-designed schools demonstrating a 15% increase. Good design makes schools cheaper to run – we estimate that up to £150m annually is being spent on unnecessary services and maintenance which could have been avoided if schools were better designed.

We believe three areas should be the priority for reform:

Firstly, the Government needs to ensure that more is done to **improve the flow of information** between individual schools, the Education Funding Agency (EFA), and those bidding for contracts.

Secondly, the Government needs to allow **a more flexible approach to the design of new school buildings**. Each project and each school offers a unique set of challenges and opportunities. A good design team can help deliver the best outcomes and value if the rules allow it and more time is made available. Expecting a complex new school building to be well designed in six weeks is not feasible.

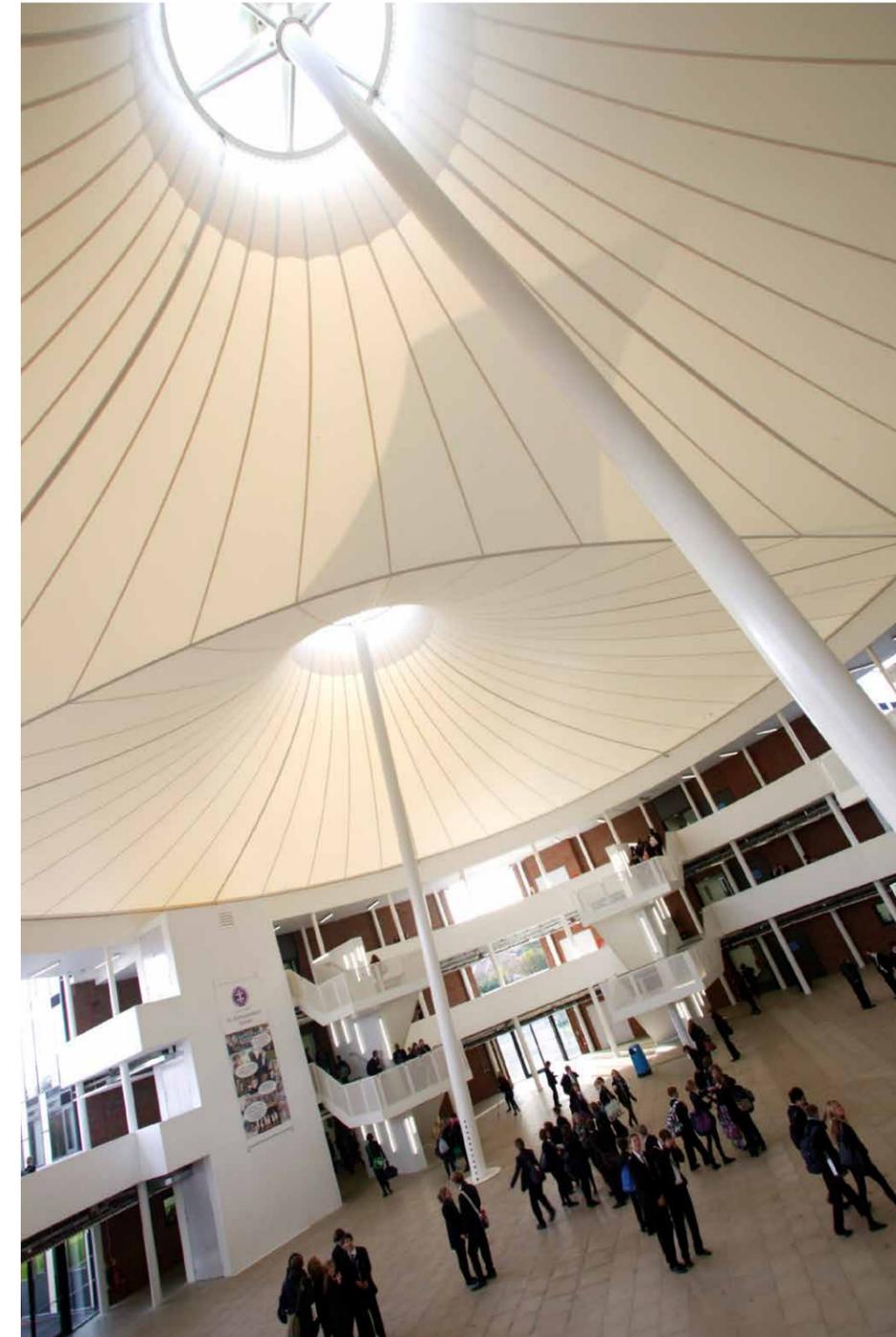
Finally, there should be a **change of focus in how we ensure that school buildings provide a good learning environment**. A combination of inappropriate processes and a one-size-fits-all approach means that many school buildings are being fitted with complex and expensive mechanical and electrical equipment that would not be needed if the right design solutions were adopted. The initial and ongoing costs of these systems can be enormous – and their failure has left many schools struggling with buildings that simply are not up to standard.

The reward is huge. By introducing these reforms, we believe the EFA will be able to achieve a capital funding programme that would work much more efficiently and effectively. Positive project outcomes would be more frequent.

This does not just mean a better use of public money – it has real implications for pupil attainment and teachers productivity.

Simpler, more environmentally and user friendly building management systems could save costs whilst providing a more comfortable environment.

Achieving this more efficient and effective system will be crucial if the Government is to meet the challenges of the future. Even though school spending has been protected over the course of this parliament, the school estate challenge remains huge and will continue to grow.



St. Bartholomew's School,
© Scott Brownrigg



Introduction

The UK faces an unprecedented school building crisis – urgent action and investment are needed

British schools are facing a perfect storm: the worst shortage of school places in decades is putting increasing pressure on school buildings. With the problem forecast to get significantly worse it adds to the ongoing challenge of dealing with a school estate that is outdated and in many cases crumbling. The Government have recognised that there is a major problem – but their approach may not be delivering the results it needs to.

Providing enough good school places is a basic responsibility for any government. But with demand for new school places rising and much of the existing school estate in need of urgent overhaul, without action there is a danger that more pupils will find themselves squeezed into overcrowded and poorly maintained buildings.

Close to a million extra pupils will enter the English school system over the next ten years¹ - half of whom will need to be accommodated in 2018/19 alone. Schools in two in five local council areas are already at or near full capacity², and the number of young children taught in classes of more than 30 pupils is at its highest for 15 years³.

Driving up standards in schools with empty places can go some way towards relieving overcrowding, but just like the housing crisis, the shortage of schools in the UK is primarily a supply-side issue. Without extra capacity things will not get better.

In London the crisis is already acute, and across England rising populations have not been accompanied by new school places. Manchester, Leeds, Bristol, Cambridgeshire, Derby and Hampshire are already seeing serious problems⁴ and experts are warning that without urgent action, over the next five to ten years⁵, as the surge in primary school pupils moves through the system, this problem will worsen and spread dramatically.

A significant part of the school estate is in poor condition or insufficiently maintained. In a 2014 survey of local councils, 23% rated the condition of the schools estate in their areas as 'extremely poor' or 'very poor', with more than two-thirds of schools 'in need of refurbishment or renewal'⁶. A further 44% were rated as 'unsatisfactory', with around half of the schools 'in need of improvement'⁷.

Just 5% of the 59,967 school buildings studied were classed as performing as intended and operating efficiently.

The Government's latest national survey of the school estate confirms the scale of the problem, with only 5% of the 59,967 school buildings studied classed as performing as intended and operating efficiently⁸.

School building policies have suffered from a lack of a long-term perspective

Capacity and maintenance issues have been exacerbated by changes to the Government's national school rebuilding programmes. Projects that were given the go-ahead have been cancelled without warning as policies have changed; where schools have been allocated funding they have often had to deal with multi-year delays, resulting in unnecessary expenses for the patching up of dilapidated buildings and renting temporary classrooms resulting in worsening learning and teaching conditions.

Between 1997 and 2010 Government spending on school building work increased dramatically. From a low of £600m in 1996 to a peak of £7.6bn in 2010, English schools benefitted from an investment boom. More than 20 funding streams for capital work existed covering schools of all types.

The most well-known and ambitious programme was the £55bn Building Schools for the Future (BSF) initiative which aimed to rebuild or refurbish all 3,500 secondary schools in England by 2020. At the Primary School level, a £7bn Primary Capital Programme (PCP) was put in place to renew half of England's 17,000 primary schools by 2023.

However, in 2010 pressure to drastically cut public spending in response to the recession led to major cuts in spending across the public sector. The entire PCP scheme and 735 BSF projects fell victim to the new Government's 60% reduction in schools capital funding⁹.

The impact of this sudden change did not just mean that things carried on as usual. Schools which had been promised funding for new or refurbished buildings had chosen not to invest in essential maintenance. When the schemes were cancelled many of these schools found themselves having to spend large sums on bringing dilapidated buildings which had been scheduled for demolition back into use. By the time a replacement initiative – the £2.4bn Priority School Building Programme (PSBP) – for improving school buildings in the very worst condition was announced in 2011, it attracted almost three times as many applications as it could afford to fund¹⁰.

Schools are no different to other parts of the construction sector: to deliver value for money they need long-term policy stability.

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Coleg Cymunedol y Dderwen,
© James Newton Photography

The school crisis is not just about buildings – it is about pupils, teachers and parents

The shortage of school places and their condition in many parts of the UK is creating a range of problems for pupils and teachers. Students have to travel further to get to school, study in crowded conditions, and are exposed to the effects of poorly maintained buildings. From damp, leaky buildings to serious issues like exposure to asbestos, too many pupils are trying to learn in classrooms that are damaging their health – and their education¹¹.

Poor learning environments are putting a strain on teachers and making it harder to retain the best staff¹². Many teachers are choosing to leave the profession, quoting stress and overcrowding as key reasons behind their career change¹³. This includes both experienced teachers as well as those who have only been in the education sector for one year¹⁴. Teacher shortages have led to the cost of agency supply teachers to increase by £50m in 2014/15 compared to the last two years¹⁵. Combined with shortfalls in new trainees which has seen the Government miss its recruitment targets for the last four years¹⁶, and rising pupil numbers, teacher recruitment and retention has been put toward the top of the education policy agenda.

Our research has shown that poor working conditions are contributing to the shortage. A nation-wide poll of teachers carried out for the RIBA in 2016 found that those teachers who rated the quality of their building as poor were more likely to have considered quitting their jobs. 1 in 20 teachers reported having

Many teachers are choosing to leave the profession, quoting stress and overcrowding as key reasons behind their career change¹³

left a school because of the condition of the buildings that they worked in¹⁷ and a further 1 in 5 teachers have considered quitting because of the condition of the school buildings in which they taught.

Running and maintenance costs are also diverting money unnecessarily away from the frontline. Between 2015 and 2018 Government will spend £4.2bn across schools, local authorities, academy trusts and voluntary aided partnerships towards essential school maintenance – a sizeable chunk of money which could have been avoided¹⁸. Our research found that over the same period, £450m will be spent on heating, cooling and lighting schools which could have been prevented if better design, maintenance and control systems were implemented in the school buildings at the onset.

With the construction of the second batch of PSPB schools underway, there could not be a more important time to look at the issues our research has highlighted. If they are addressed, we believe that the benefits can be significant: improved teacher and pupil health and wellbeing, and schools that help the Government meet its educational and spending targets.

St. Bartholomew's School,
© Scott Brownrigg



Limited funding is available to address growing school building problems; therefore it is crucial every penny spent on school buildings delivers maximum value for money

In 1997 Tony Blair set out his stall by promising a focus on 'education, education, education'. In a similar way, protecting school spending and investing in the pupil premium to provide extra funding for pupils from deprived backgrounds has been a flagship for both the Conservative/Liberal Democrat coalition Government, and their Conservative successors.

There is recognition by all parties that investing in school buildings is vital to helping ensure children across the country can enjoy schools which are safe, good quality and fit for learning.

The current capital investment in the school estate sets out to balance the need to deliver new school buildings with enormous pressure on the public finances to provide excellent value for money and, ultimately, get money to those schools and pupils that need it most.

Despite the cuts in the available budget for each new school building, achieving even the Government's more modest aspirations will not be cheap. One estimate puts the cost required to bring the existing schools estate up to a sufficient standard at £8.5bn¹⁹. Combined with around £12bn needed to deliver enough additional school places this decade²⁰, the scale of the challenge is unprecedented.

The delivery of building and maintenance programmes for schools, academies, free schools, and sixth-form colleges is overseen by the Department for Education's delivery body for funding and compliance, the Education Funding Agency (EFA).

Under the Spending Review 2015, the EFA had been allocated £23bn for opening new academies and free schools, creating additional school places, rebuilding schools and addressing maintenance needs. So far, the EFA has distributed £7bn for the creation of new school places this parliament, £4.2bn for improving the condition of schools, and £4.4bn for its flagship Priority School Building Programme (phase one and two)²¹.

While it is unclear what the remaining £7.4bn will be spent on, current levels of funding for additional places and repairing existing schools falls short of the identified need.

With limited funding available to address growing school building problems, it is critical that every penny spent offers excellent value for money to ensure as many schools in dire need of renovation and expansion as possible can benefit from the available pot.

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SECTION 1

It pays to invest in good design

Smarter investment of existing school building funds can deliver better outcomes

Good school design is demonstrably capable of achieving better outcomes at the same cost. It is therefore one of the most important things the Government can do to ensure capital funding for schools delivers value for money. Independent research commissioned by the RIBA evidences this and highlights areas of school design and procurement which should be prioritised for Government reform.

Good design is one of the few tools that is demonstrably capable of achieving the 'holy grail' of public policy: better outcomes at a lower cost.

While many people intuitively understand and feel that good design can have an impact on performance and costs of school buildings; evidence on this tends to be anecdotal. To help inform the debate, the RIBA commissioned two leading consultancies to look at quantitative and qualitative value of good school building design. The research team was led by Dr Jenny Thomas, of Performance Consultancy, and Lisa Ann Pasquale, of Six Cylinder Limited.

Their research drew on the largest collection of Post-Occupancy Evaluations (POE's) of schools in the UK, and their findings were reviewed by a range of leading academics and industry professionals.

- Good school buildings have a significant and positive impact on pupil behaviour, engagement, wellbeing and attainment.
- Good school design has a positive impact on school staff's productivity, with the most comfortable and well-designed schools demonstrating a 15% increase.
- Good school design can reduce running and maintenance costs, in some cases by more than several times a teacher's average salary a year. It could have prevented the English school estate from spending upwards of £150m annually on unnecessary operation and maintenance costs of schools.
- Cost-effectiveness and good design are mutually reinforcing if investment and spending is focused in the right way.

It pays to invest in good design. The research not only provides tangible evidence, but also sheds light on the key elements of good school design that can help the Government direct its capital funding more effectively.

What is good design, and how was it measured?

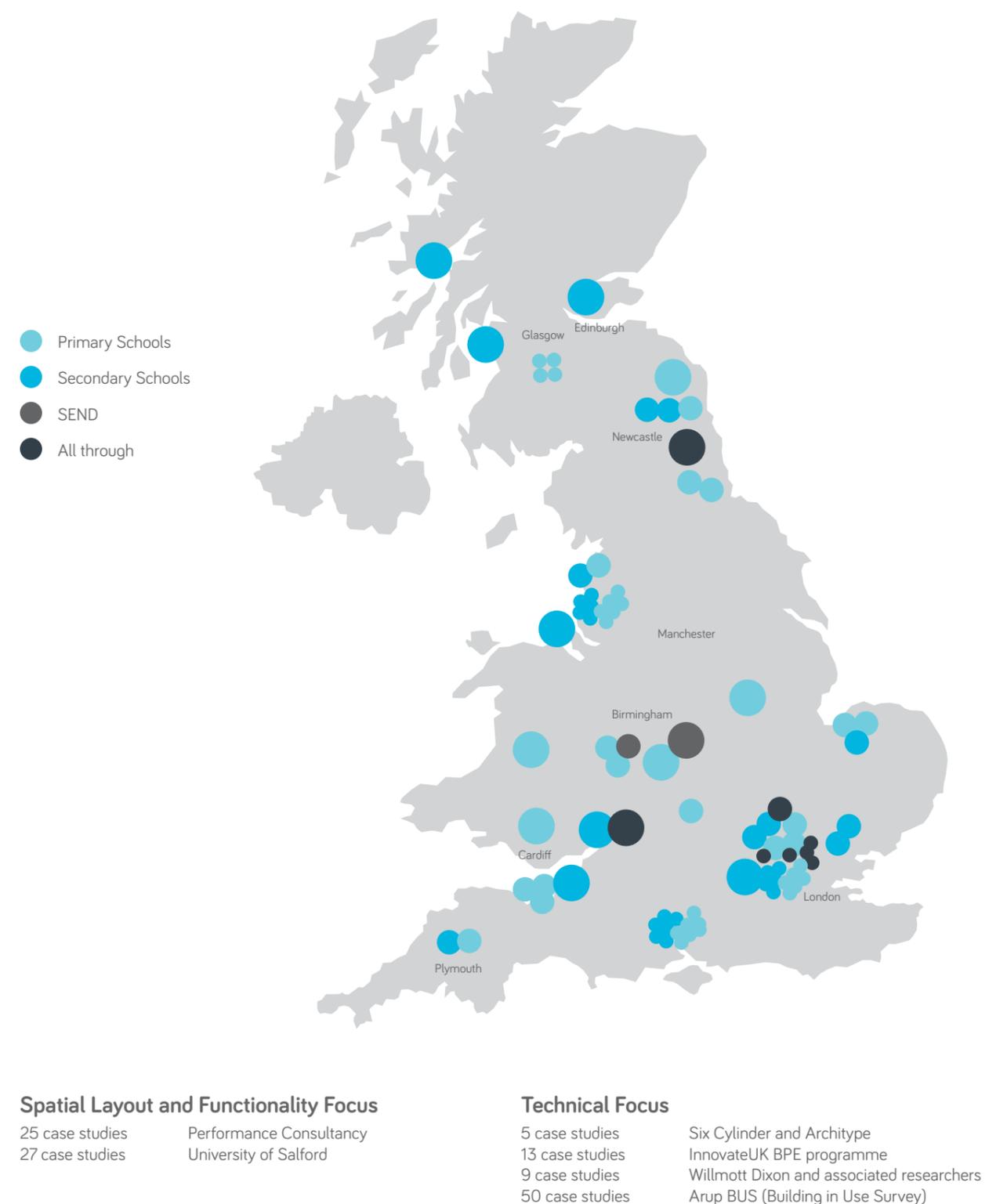
Good school design provides a comfortable, responsive environment which effectively and efficiently supports educational activities, whilst minimising operational burdens and risks. Unfortunately, the Post Occupancy Evaluation (POE) that is vital to the continuous improvement of the design and construction process is only sporadically undertaken and published in the UK.

To overcome the lack of standardised and rigorous data, the research team took a three stage approach to understand and quantify the value of good school design.

A total of 129 POEs were drawn from across the UK which included primary, secondary, and Special Educational Needs and Disability (SEND) schools. The schools in the sample ranged in age from Victorian buildings to modern school buildings. We believe that this represents the largest collective sample of POEs of primary and secondary schools available for study in the UK.

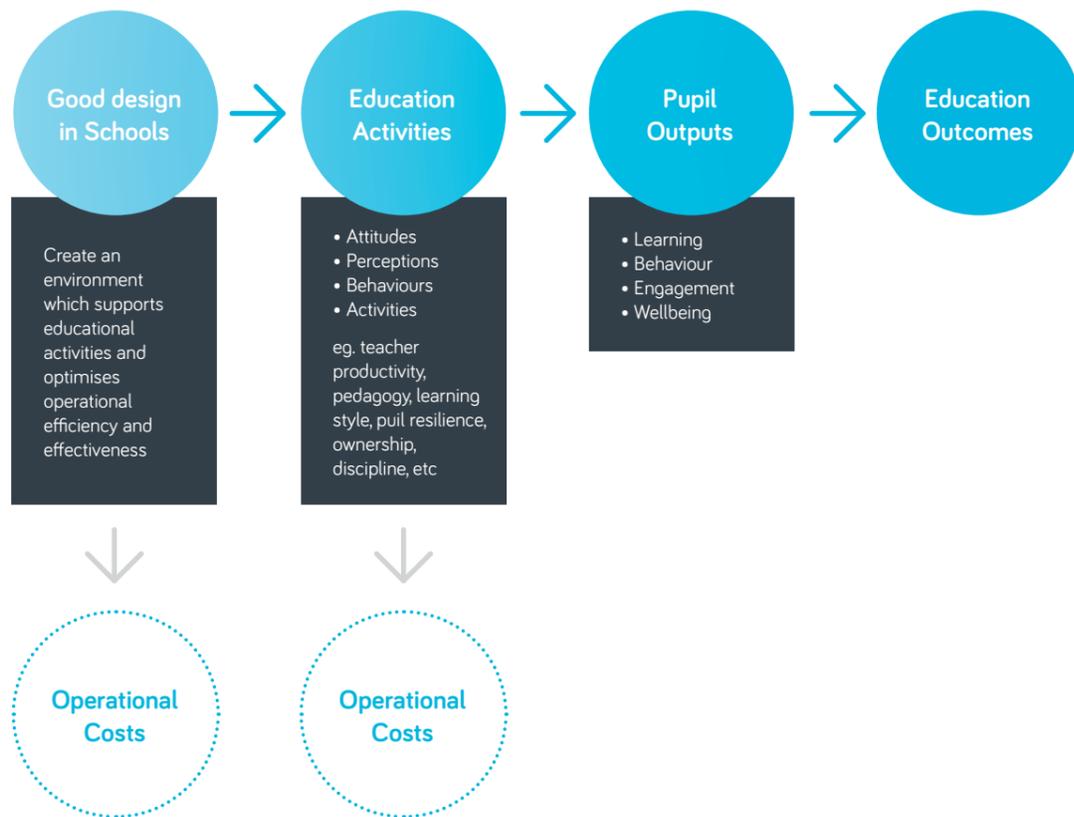
The POEs contained data which allowed the researchers to draw a range of insights. This included soft data like building users' perceptions of the school environment and its impact, and hard data which shed light on areas such as the effectiveness of spatial layout, energy consumption, and maintenance costs. Only POEs which were considered adequately robust were included in the study.

Figure 1. Geographical spread of the case studies used



A framework that the researchers developed was then used to identify the key beneficial impacts of good design, which were found to be: educational outcomes, teacher productivity, and potential cost savings in running and maintaining school buildings.

Figure 2. Outcome-based model for quantifying benefits of good design in schools

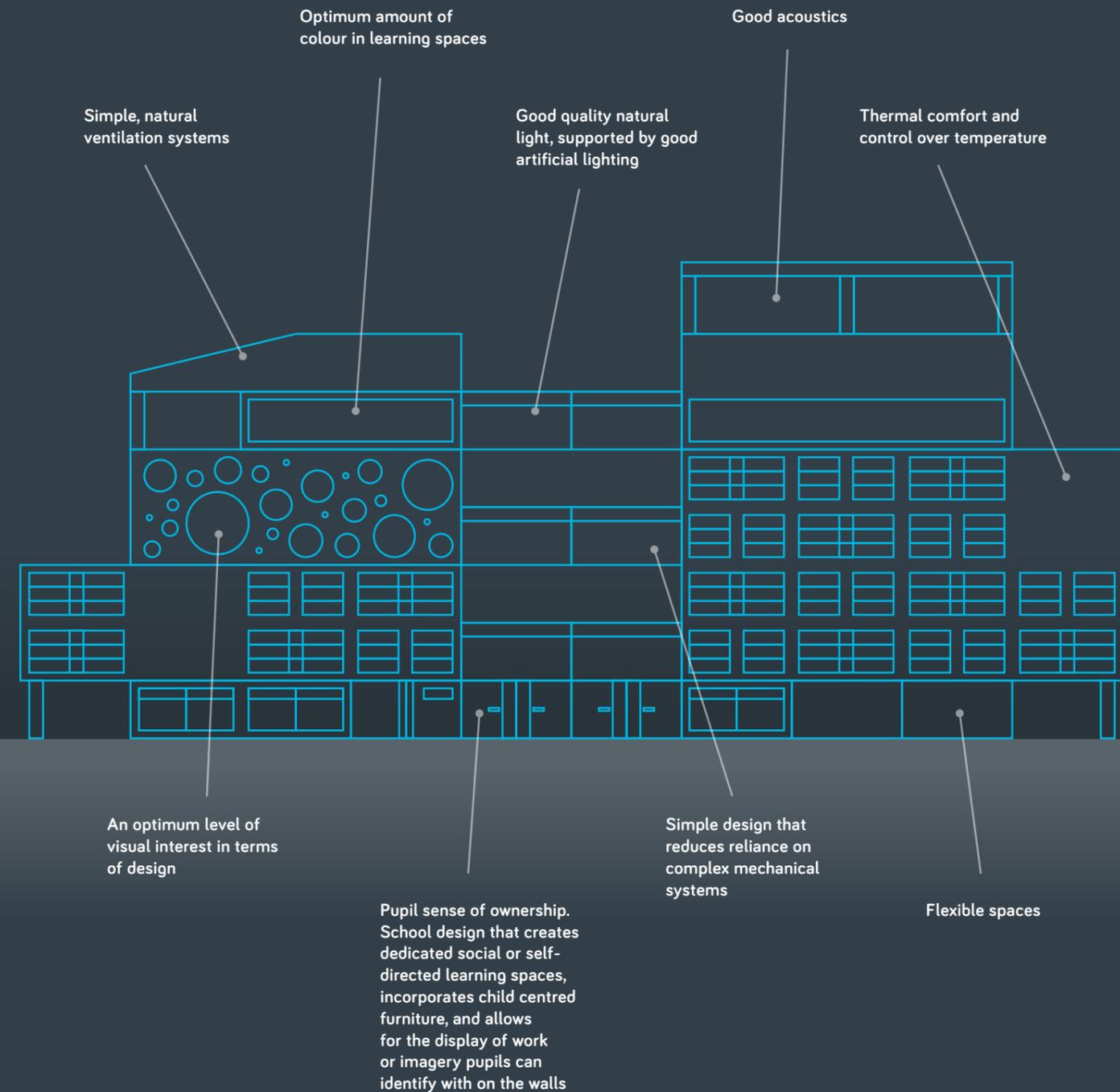


Finally, the POE data was revisited to quantify the impact of good design, through the use of an outcome based model (Figure 2).

Both the definition and framework for capturing and quantifying the value of good design were reviewed by a range of leading academics and industry professionals, including recognised experts in the field; Professor Peter Barrett, Dr Sharon Wright and Dr Peter Rickaby.

To ensure that the findings reflected the Government's methodological approach for capturing value, the research model was developed in accordance with the Treasury's guidance on measuring the social impacts of policy measures²². Measures of educational outcomes were taken from the most recent Department for Education research and policy papers, and definitions for other terms in the model have been drawn from established and commonly accepted academic and policy research.

How is good design defined?



How was good design defined?

- ✓ **Good quality natural light, supported by good artificial lighting.**
To achieve this, the lighting strategy needs to be sensibly considered early in the design process to allow for proper coordination and a good understanding of the educational activities that the lighting needs to support.
- ✓ **Pupil sense of ownership. School design that creates dedicated social or self-directed learning spaces, incorporates child centred furniture, and allows for the display of work or imagery pupils can identify with on the walls.** End users from the school should help develop these elements rather than imposing something upon the school to represent their identity.
- ✓ **Simple, natural ventilation systems.** Flexible natural ventilation with variable levels of ventilation, and higher ceilings to absorb stale air. Or where that is not possible or appropriate, mechanical ventilation, which is simple to operate and quickly responsive to allow air quality to be easily maintained.
- ✓ **Thermal comfort and control over temperature.** Thermal controls should be easy to use and quick to adapt to changing uses of space.
- ✓ **Optimum amount of colour in learning spaces.** To create interest but not become a distraction. Opportunity for this should be incorporated into design strategies.
- ✓ **An optimum level of visual interest in terms of design.** Appropriate provision for the display of work and storage solutions which are developed with the school are integral to good design.
- ✓ **Flexible spaces.** That can be zoned for various activity areas to help facilitate learning.
- ✓ **Good acoustics.** For effective learning, pupil engagement, and wellbeing.
- ✓ **Simple design that reduces reliance on complex mechanical systems.** Early stage design decisions are crucial in minimising the complexity and related costs of systems that school facilities managers or caretakers will need to manage.

Good school design has a positive impact on educational outcomes and can contribute to a significant uplift in academic progression in primary and secondary schools

The POE research we commissioned found a number of examples of how good design can positively impact pupil attainment and behaviour. The impact of design on pupil behaviour, engagement, wellbeing, and learning were especially marked.

Behaviour

Behaviour has an impact upon attainment both for those who misbehave and for other pupils whose learning is disrupted. Pupils reporting that they are disrupted in most lessons are more likely to get a grade lower in that subject in their GCSE²³, while pupils who report misbehaving in more than half their classes at the age of 14 have a 30% higher chance of being NEET (Not in Education Employment or Training) at the age of 18²⁴.

POE evidence revealed that good design can have a positive impact on behaviour through facilitating the supervision of pupils, reducing overcrowding, and allowing staff to implement behaviour management strategies. For example, teachers and pupils generally reported that toilets with more visible washing facilities or fully enclosed toilets with sinks in the cubicle reduced misbehaviour within the toilets.

Likewise, POE evidence has shown that not getting the design right can facilitate bad behaviour, particularly where circulation spaces are not wide enough, leading to crowding and greater levels of reported misbehaviour.

Engagement

Engagement has an impact upon attainment. 73% of pupils who have an attendance record of over 95% will get five or more GCSEs grade A*-C²⁵. Conversely, the lack of engagement is one of the main reasons pupils give for missing school²⁶.

Good design can help provide an environment which encourages pupils to come to school and become more engaged. POE evidence shows that schools in which there was a variety of different types of spaces and opportunities to break out from the classroom reported greater pupil engagement. Classroom design which offered interest through a well-integrated colour scheme, decoration and display, also increased engagement.

Wellbeing

Good design was found to influence wellbeing through helping pupils and staff feel a sense of ownership and belonging to their school, prompting positive social interaction and a healthy lifestyle. This is significant as a growing body of research demonstrates wellbeing has a strong impact upon attainment. Pupils who spend time working on personal development achieved between 10% and 20% higher GCSE results than those who did not²⁷. Pupils who are positive about their school also achieve higher levels of attainment²⁸.

A key part of providing pupils with a sense of ownership and identity was found to be an element of design or a building form which provided a school with a sense of identity, particularly if it provided extensive opportunity for pupil work to be displayed. Social and dining spaces that were large enough to accommodate all pupils in a school to use the space, without them feeling crowded or rushed, were also found to contribute to wellbeing through facilitating social interaction.

Apart from individual benefits, there is strong evidence that these factors interact with one another to produce an overall level of benefit that is greater than the sum of its parts.

The POE evidence revealed the importance of lighting, temperature, air quality, ownership, colour, visual interest and flexibility to pupils and teachers. The research team found that if school buildings performed well against these factors, they had a significant and positive impact on staff and pupil productivity and wellbeing. These findings are strongly aligned with the findings of research conducted by a team at the University of Salford in 2015²⁹, which found clear evidence that well-designed primary schools boost pupil attainment. They estimated that the design of the classrooms can explain a 16% variance in learning progress over a year. That is nearly the equivalent of a whole years' worth of expected pupil progress under the current National Curriculum. Given the strong similarities between the Clever Classrooms and the POE data it could be anticipated that an uplift in attainment also applies to secondary schools.

Good school design also has a positive impact on school staff's productivity, with the most comfortable and well-designed schools demonstrating a 15% increase

It is important to consider how design can influence staff productivity, as in 2013-14 approximately £21.4bn³³ was spent on school staff salaries in England alone.

Data made available to the value of school design research from the Arup Building Use Survey Methodology Database³⁴ shows that the design and comfort of schools buildings has an impact on how effectively staff are able to do their jobs. These results are comparable to extensive research carried out on productivity in UK office environments using the same survey methodology which has been widely published³⁵.

Arup's survey asked school staff to rate various aspects of the school environment including how comfortable they find the environment and their perception of the design quality, on a scale of 1 to 7. Staff were also asked to rate their perceived productivity. The correlations between these responses are plotted below, as average ratings for each school (figures 3 & 4).

The results show improving the comfort score by one point is equivalent to a 7% improvement in perceived productivity. Likewise, improving the design score by one point equates to an 8% improvement in reported perceived staff productivity.

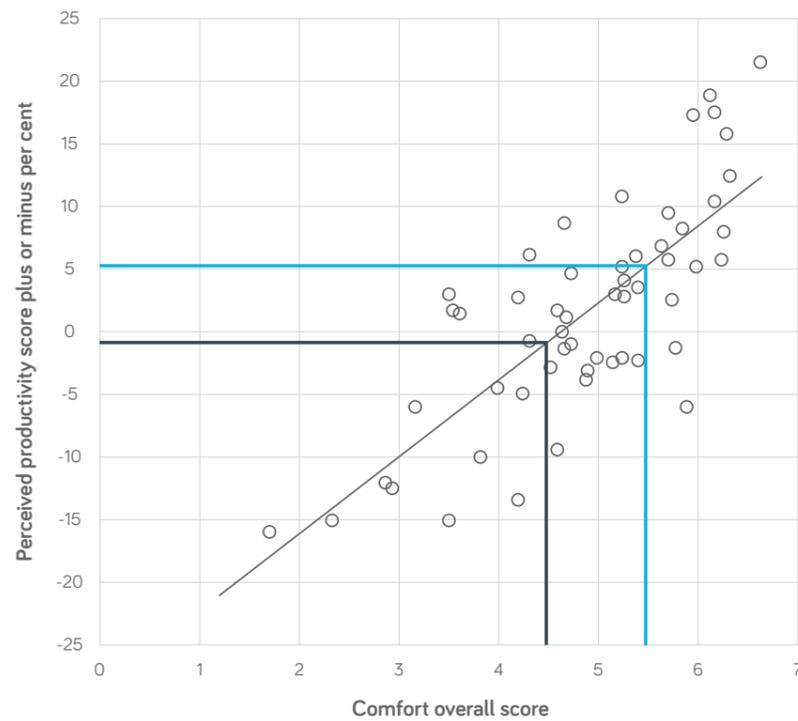
Schools which got the lowest rankings of design quality and comfort reported a 15% decrease in perceived staff productivity, whilst the top scoring schools reported a 15-20% increase in perceived productivity.

To put this into context, 7% of England's annual school staffing budgets equates to £1.5bn; and 15% equates to £3.2bn. Whilst perceived productivity is not exclusively determined by staffs' physical environment (other factors such as workload or management structure, are clearly influential), the environment has been found to have an impact.

It may not be possible for the school estate to create £1.5-3.2bn staff expenditure savings simply by improving design and comfort in schools, but the numbers clearly demonstrate that the comfort and design of schools relative to users' needs could significantly influence the effectiveness of this large portion of Government spending.

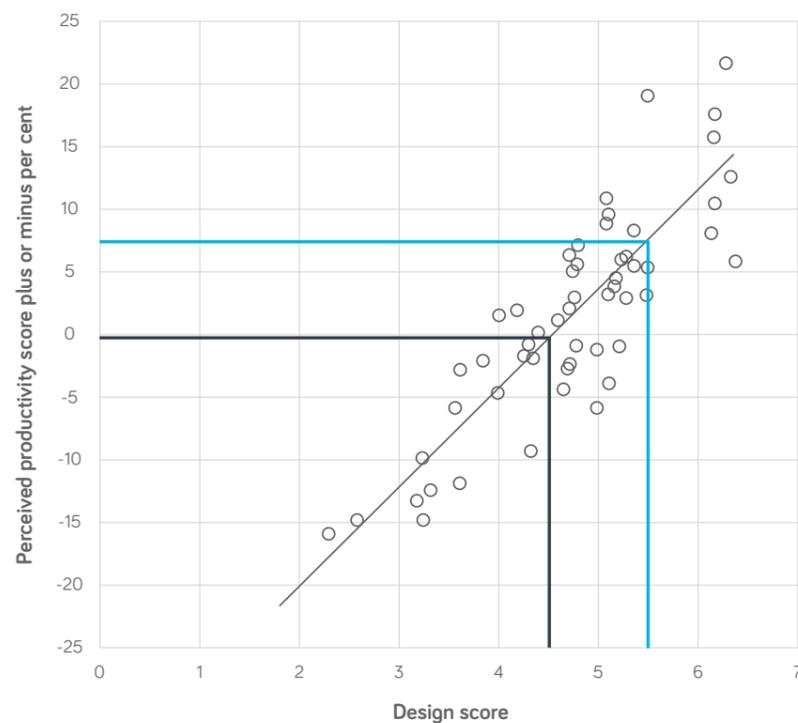
Top Scoring schools reported a 15-20% increase in perceived productivity.

Figure 3. Staff rating of perceived productivity in schools, compared with perceived overall comfort



©BUSMethodology 2015

Figure 4. Staff rating of perceived productivity in schools, compared with perceived design quality



©BUSMethodology 2015

Good school design can reduce running and maintenance costs, in some cases by more than several times a teacher's average salary a year. It could have prevented the English school estate from spending upwards of £150m annually on unnecessary operation and maintenance costs

As the previous section shows, buildings which are poorly designed and uncomfortable have the potential to significantly compromise teachers' ability to effectively do their jobs. The technical design of buildings has also been found to have a substantial impact on running and maintenance costs.

In 2013-14 the UK spent approximately £422m³⁶ on energy in schools in England. From the case studies, there were some consistent findings that 40% to 60% of schools' energy costs were incurred when they were closed i.e. overnight, weekends and in school holiday periods. Some of these costs, equivalent to £150m+, were required to run necessary systems such as security, external lighting and servers. However, only a small proportion of this was deemed by independent building performance evaluators to be strictly necessary usage.

The POE evidence consistently linked the excessive out-of-hours energy usage, with the unintended consequences of installing overly complex mechanical, electrical and controls systems in school buildings. These systems were difficult to commission, manage, and in many cases, difficult for teachers and facilities managers to operate effectively, and were often driven by design teams attempting to meet competing, conflicting or uncoordinated design guidelines.

Good design could have prevented these avoidable expenses. Simplicity is one of the most important qualities of good design, and critical to ensuring the building is good value. The easier buildings are to manage, repair, operate and maintain, the more likely they are to operate efficiently and effectively.

POE evidence had shown that school buildings which used integrated and well-executed passive design strategies were more robust and efficient in operation, and less vulnerable to unintended consequences.

The case studies also highlighted the importance of taking time to explore building energy strategies with the right expertise at the early stages of design in ensuring long-term building running and maintenance costs were minimised. There was strong evidence that complex building systems driven by ill-informed decisions decreased operational efficiency and increased operational costs due to the additional management burden. Conversely, projects that carefully implemented environmental design guidance generally did better at achieving simple system strategies that then operated efficiently in practice.

Good design needs to address holistically how winter heat loss and summertime overheating can be mitigated, adequate and efficient ventilation is provided and natural light is supplied. All these technical performance aspects need to be

Simplicity is one of the most important qualities of good design, and critical to ensuring the building is good value. The easier buildings are to manage, repair, operate and maintain, the more likely they are to operate efficiently and effectively.

balanced in an integrated way. If the buildings are designed using a 'fabric first' approach, the form and fabric will seek to provide these performance aspects passively, meaning there is a less intensive demand for mechanical ventilation, electrics and controls.

The current standard approaches to enabling schools to control, monitor and manage the building's energy were consistently found to be inadequate and ineffective. This is explored in more detail in section 3.

Cost-effectiveness and an environment that has a positive impact upon educational outcomes can be mutually reinforcing. Good design can ensure this.

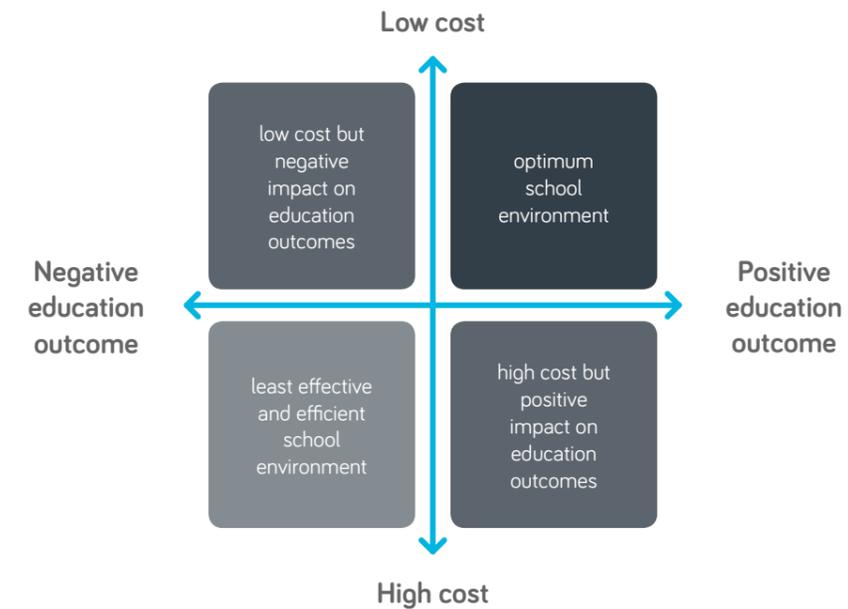
It is too early to analyse the overall performance on new schools delivered by this Government, however early signs are that there is scope for improvement

Results of the study we commissioned show that cost-effectiveness and an environment that has a positive impact upon educational outcomes can be mutually reinforcing. Good design will ensure that a school environment can both contribute to positive educational outcomes and be delivered for a low cost (Figure 5)³⁷. Achieving it does not necessarily mean spending more, but investing available money in the most appropriate solution.

Key to achieving smarter investment in good school buildings is incorporating adequate time and resources for the needs of schools to be clearly established and responded to at the initial stages of planning.

None of the schools within the case study sample were designed to current EFA standards as those buildings have been too recently completed to test in operation. However many of the school buildings analysed as part of the POE research share similar characteristics to EFA-funded school buildings, such as size and layouts. The outcomes in those schools indicate that the space standards and approach currently employed by the EFA may not be delivering good design as highlighted by post-occupancy evidence. Further research is required to determine whether schools built to the current standards are facilitating good behaviour, high levels of engagement, promoting wellbeing and ultimately improving attainment.

Figure 5. Tension between educational outcomes and cost effectiveness



More than
9 in 10
teachers believe
school design
is important

1 in 5
teachers have
considered **quitting**
because of the condition
of school buildings

NEARLY HALF
of teachers are worried
that the schools they
currently teach in are
too small

91%
teachers feel good
layout/circulation space
is important to good
pupil behaviour

SECTION 2

School design impacts teachers

How are teachers on the ground perceiving and affected by school design?

A RIBA commissioned nation-wide poll of primary and secondary teachers shows design impacts and matters to those using school buildings, confirming research findings of the value of school design research. The results have big implications for the Government's school building programme, and wider education policy.

In addition to research into the impact and value of good school design, we wanted to see whether school design matters to people on the ground. We therefore commissioned an independent polling agency to conduct a nation-wide survey of teachers in February 2016³⁸. Of the 501 teachers interviewed, 205 taught at a primary school, 270 at a secondary school and 26 at a SEND school.

School design is important; teachers say it can influence pupil educational outcomes and reduce bullying levels

More than nine in ten teachers believe school design is important, particularly for providing an effective learning environment (93%), student educational outcomes (81%), or reducing bullying (65%).

The design element most highly rated by teachers as being important to providing an effective learning environment was spacious learning areas (69% included this in their top three). This was followed by more than half (57%) who believed good lighting was important in providing an effective learning environment, and student pride in buildings (47%).

There was also clear evidence that teachers see school design as important to pupil behaviour, with a majority of teachers rating good layouts (91%), well designed toilet facilities (85%), or wide corridors (73%) as important design features to good pupil behaviour.

The majority of teachers also said that school corridors large enough to allow for easy movement of students have a high impact on reducing the risk of bullying (62%) and unsafe student behaviour (81%).

School design affects teacher productivity, their general health and wellbeing

It is clear that teachers think school design is important to their productivity, including an environment that has a positive influence on pupil behaviour (93%), a space for teachers to carry out planning, preparation and assessment (90%), and a physical environment that can be adjusted to create comfortable working conditions (87%).

A majority of teachers think that school building design is also important to their general health and wellbeing, with good lighting (92%), ventilation (91%), and spacious learning areas (83%) rated by far the most important features.

Teachers are worried about the condition and size of buildings they currently teach in

Nearly half of teachers are worried that schools they currently teach in are too small for the number of students (especially secondary schools), and a quarter rated the quality of their current school buildings as poor or very poor. Two particular features of school design that teachers said their schools failed to provide are the lack of a physical environment that can be adjusted to create comfortable working conditions, and lack of space for teachers to carry out planning, preparation and assessment.

Teachers have quit their jobs because of poor school building conditions, and those who are unhappy with the current condition of their schools are more likely to consider quitting

1 in 20 of the surveyed teachers say they have quit at least partly because of the condition of schools they taught in, and a further 1 in 5 teachers have considered quitting for the same reason. Importantly, teachers who rated the quality of their building as poor were more likely to say they have considered quitting or have quit.

School design overwhelmingly matters and impacts teachers and their pupils, Government should feed these findings into a review of its capital funding programme, and wider Department for Education policy

The results speak for themselves. Large majorities of teachers believe school design matters and has an impact on themselves and their pupils. The design elements which they see as the most important in reducing bullying and increasing their productivity, health and wellbeing should be fed into a Government-led review of the school building programme.

It is revealing that the condition of schools has either directly or indirectly influenced many teachers' decision to quit their jobs, with teachers who are unhappy with their buildings more likely to say they have considered quitting. This is not often recognised in strategies for retaining teachers in the profession but should be looked at more closely in wider Department for Education policies.



Sarah Bonnel,
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SECTION 3

What should the Government do?

The time is right for a review of how well the current school building programme is performing

The RIBA believes the time is right for a review of how the current school building programme is performing. Based on discussions with experts working on EFA-funded projects and with experience of previous programmes, independent research and a nation-wide poll of teachers, we recommend the review focuses on three key areas – information flow, layout and area allowances, and use of building management equipment. If successful, we believe reforming these areas can help deliver better outcomes and maintain a tighter control on capital and running and maintenance costs.

The Government's current approach is not always delivering the best possible results

Over the last two years we have spoken to a broad range of stakeholders involved in delivering EFA-funded projects including architects, developers, client advisors, planners, educationalists, teachers, contractors and EFA staff. These conversations indicate that while some good EFA-funded schools are being delivered³⁹, the overall standard of new buildings is highly varied, with the worst examples forcing schools to find an extra £500,000 from alternative sources to bring projects delivered by the EFA to a standard that is acceptable to open a school⁴⁰.

Poor outcomes are problematic for a number of reasons: locking in higher maintenance costs places a bigger burden on local councils and schools, pupil attainment is not maximised, there is less value for money delivered by the EFA, which impacts other pots of money it allocates (e.g. basic need, maintenance, ICT and innovation).

Some problems are intrinsic – they reflect a system which is based on cost and time effectiveness. However, others are linked to confused top-down messaging and represent false economies. More needs to be done to ensure each penny spent on school buildings creates maximum value for children, teachers and the taxpayer.

Now is the time to look in more detail at how the Government's school building schemes are developing...

With the construction of the first generation of PSBP schools now nearing completion, we believe that there is a strong case for reviewing how it and other EFA-funded schemes are working and addressing some of the challenges that have arisen.

We recommend the review focuses on three key areas – information flow, layout and area allowances, and use of building management equipment. We believe reforming these areas will help deliver better outcomes within resource constraints.

We believe that the Department for Education should ask the Education Funding Agency to examine whether the current delivery model could be improved to ensure that the £23bn slated to be spent on school buildings in the coming years is well spent.

...and take action to address the problems that have emerged

The evidence we have gathered has highlighted the need for significant technical and procedural change and greater flexibility in how new school buildings are procured, designed, built and operated. This will be vital to ensure that new schools built deliver both value for money to taxpayers and the highest possible quality working and learning environments. Where evidence had been drawn from stakeholders involved in EFA-funded projects, only information which had been widely and consistently reported by a broad range of stakeholders, across the whole country, had been used.

RECOMMENDATION 1

Information flow: To avoid unnecessary expense and deliver buildings that consistently meet the needs of users, the Government must ensure that the EFA improves the quality of information it supplies and collects for school projects

The EFA's approach to procuring new schools creates significant time pressures on all involved. At present, Government policy aims to deliver a completed design in just six weeks. Quicker, more focused procedures can produce excellent results, but this is dependent on the information needed to inform design and construction processes being available at the right time and to the right standard. Significant reforms will be needed to ensure this:

- To ensure that problems are identified early in the design process, the EFA should work with its partners to develop guidance for the assessment of proposed sites for new school buildings. The EFA should examine the timelines and budgets allocated to site assessments to ensure site assessments can provide a starting point for the development of cost-effective, environmentally sensitive and good quality new buildings.
- Feasibility studies should include more detailed drawings of proposals and better assessments of how appropriate they are for the site and situation of the school. The EFA should work with the sector to develop clear guidance and a standardised methodology for conducting these assessments.
- The Government should rethink how it engages schools on building programmes, including how it can ensure schools can meaningfully input into design briefs.
- The EFA should extend the timeframes for planning and designing schools by making the competition programme stage 2 of the planning process, as per its Regional Framework procurement model.

Incomplete or inaccurate briefs are a major source of delay and frustration.

The EFA needs to improve the quality of information it supplies to bidders during the procurement process

One of the most frequent issues raised by architects, engineers, and contractors working on school building projects relates to the quality of the initial information they are provided with by the EFA. Incomplete or inaccurate briefs are a major source of delay and frustration.

The site assessments carried out by the EFA's Technical Advisers are often simply not thorough enough. They also often do not have any experience in conducting POE so they do not know what to look for in the design that might cause problems after handover. This can lead to problems during the construction phase which could and should have been avoided. In our discussions with teams who have worked on EFA-funded school projects, a wide range of challenges have emerged during the construction of a new building which were not part of the initial brief – everything from underground streams and unstable clay soil to undocumented utilities and soil contamination have been missed in the rush to prepare projects. Addressing these problems often requires substantial and expensive remedial work that delays the project.

Even when accurate assessments are produced, the lack of consistency means many bidders feel they are unable to rely on the information provided and make arrangements to conduct their own assessments. This unnecessary duplication leads to higher costs for all parties and reduces the overall amount of money available to deliver the school buildings.

Inaccurate information isn't just an irritation – it can fundamentally change the type of building that is needed

Starting off with the wrong information is not just a source of frustration and potential delay - it can also make a design that would have been deliverable unaffordable or inappropriate. As contingency funding to address these concerns is unavailable, often these straightforward problems become amplified as a project progresses and end up taking away money from the building itself. It would be far more efficient to address these issues at the outset of the project.

A number of barriers exist to improving the quality of site assessments. Many EFA Technical Advisers have an inconsistent approach to carrying them out. EFA guidance could begin to address this issue. We would urge the EFA to work with the RIBA and other representative bodies to ensure that the new guidance leads to site assessments that are comprehensive, consistent and above all reliable.

- ✓ *To ensure that problems are identified early in the design process, the EFA should work with its partners to develop guidance for the assessment of proposed sites for new school buildings*

It is worth investing more time in getting the basic information right

However, simply having the right skills and policies will not necessarily be enough to solve the problem of information flow. The EFA also need to address the pressure on its Technical Advisers to deliver quick and therefore cheap assessments. These time pressures create a conflict between the EFA's stated policies set down in the brief Technical Advisers are handed - which acknowledges the importance of good site assessments - and the top-down messaging from the EFA which focuses on meeting very tight deadlines for the procurement of schools. We believe that pressure to save time at the beginning of school projects is leading to delays and cost escalations at later stages. Put simply, we believe the EFA's policy in this area represents a false economy.

- ✓ *The EFA should examine the timelines and budgets allocated to site assessments to ensure site assessments can provide a starting point for the development of cost-effective, environmentally sensitive and good quality new buildings.*

More detailed drawings for proposed buildings and better assessments of how the construction process will impact schools would save money and improve the quality of EFA-funded schemes

The architects, contractors and schools that we have spoken to have been very vocal about the need to improve feasibility studies on EFA-funded projects. The processes currently in place to assess the viability and suitability of proposed new school buildings in relation to sites and the level of funding available are not rigorous or consistent enough.

There have been a number of instances where background checks for feasibility studies have been carried out to a high standard, but the final stages of the assessments have not considered either the detailed drawings for the buildings – or given consideration as to how project phasing and construction methods will impact the ability of a school to run business as usual.

These factors are not insignificant. They lead to planning permission being granted for projects which later turn out to be unfeasible due to additional costs related to the construction process overlooked, such as the need to provide temporary accommodation for students while new buildings are developed. This has caused delays and additional unnecessary costs to a number of the sites we visited during the course of our research.

In other cases poor feasibility studies have led to elements of school design being scheduled in which later prove too expensive to incorporate and are therefore dropped. In one example we were shown, hydro therapy pools which had been planned at an SEND school were removed due to a late recognition of the need to reduce expenditure.

Pressure to save time at the beginning of school projects is leading to delays and cost escalations at later stages.

Improving the quality of feasibility studies can play a vital role in speeding up projects, but also in tackling issues where key parts of a project are cancelled - something that we know can be highly demoralising for teachers and their pupils.

- ✓ *Feasibility studies should include more detailed drawings of proposals and better assessments of how appropriate they are for the site and situation of the school. The EFA should work with the sector to develop clear guidance and a standardised methodology for conducting these assessments.*

Schools need better support to engage with client briefs more fully

One of the most significant changes brought about in the move from BSF to the PSBP has been the reduction in input from the people who will be most directly impacted by the new school buildings - the pupils and teachers.

Teachers understand what their school needs from new buildings....

While we recognise the need to control costs, the experience of the initial stages of EFA-funded schemes suggests that the drive towards greater standardisation has led to the voice of the user being almost completely excluded from the design process due to both policy and time reasons.

From being partners in the design of their school, teachers and pupils have found themselves in a situation where their ability to influence design is curtailed by Government policies. The main way in which schools can influence the design of their new buildings is through an EFA briefing document which school officials are asked to complete during the early stages of a project.

In general, experts we interviewed reported that engagement with the new process has been hamstrung by a lack of support for those being consulted about how design decisions can influence learning and behavioural outcomes.

Our research found that in addition to the limitations of the written consultation approach, the consultation process suffers from a number of additional shortcomings. The main issue we encountered was the short period of time to engage with the document. This is particularly true for those teachers for whom this is their first experience of a school building project. On a practical level, very few teachers are aware that the form will be their main opportunity to input into the design of new school buildings.

...architects can help make this a reality - but only if they get the opportunity to listen to teachers

To address the issues around teacher engagement in the design process, the Government needs to examine how it can promote a more accessible engagement process. We recognise that budgetary constraints may make it impossible for the EFA to hire an educationalist onto its design team to help achieve better results faster and manage expectations. However, working with architects, contractors and other experts, the EFA should seek to provide improved guidance that sets the context and helps guide inexperienced teachers through filling in the school specific brief. The Department for Education has produced excellent guidance for this process in the past which could be updated relatively quickly within the new capital funding programme context.

- ✓ *The Government should rethink how it engages schools on building programmes, including how it ensures schools are able to meaningfully input into the design brief. This could be aided by the Department for Education providing briefing guidance for teachers in addition to BB103. The RIBA would like to offer support in doing so, along with educationalists.*

More time needs to be allocated to the early phases of a project to give architects and contractors the ability to make a more accurate assessment of the circumstances of each project

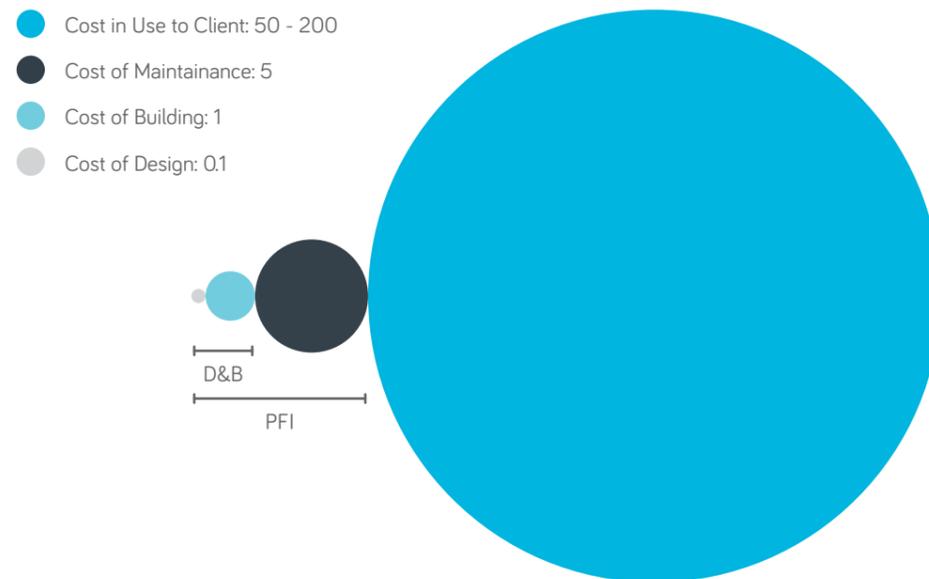
All of our stakeholders agreed that tight timescales for EFA-funded projects exacerbated issues around the quality of information provided to bidders. The EFA currently allows six weeks for the initial phases of school design. This very short timescale has a negative impact on the quality of information gathered about the sites on which new schools are to be built, and of user needs.

Seeking to make savings at this stage of the project does not just lead to lower quality and design compromises; it also increases the risk that modifications to the plans will have to be made during the build phase of the project. This almost always adds both cost and complexity to a project which is already operating to tight financial and time deadlines. As the value of good school design research has shown, a well-researched brief represents a much more cost-effective way of controlling costs and ensuring that goals are met. The Commission for Architecture and the Built Environment estimates the value of a building over its lifetime will outweigh the initial capital outlay and facilities management costs at a ratio of about 0.1:1:1.5:15 (see Figure 6 overleaf)⁴¹.

Progress is being made...

The EFA is beginning to recognise the importance of initial phases of planning and design. Their Regional Framework has a short invitation to tender competition and the selection of a contractor and design team to progress is much faster. This creates more time for school engagement, carrying out better site assessments and feasibility studies. If this approach was rolled out across EFA-funded schemes, many of the issues identified by those we spoke to could be addressed.

Figure 6: Impact of Design on Life-Costs



...but there still is not enough time available

The importance of a new approach is made more urgent when you consider the changing nature of school projects. Whereas many of the BSF and early PSPB schools consisted of the demolition of existing buildings and their replacement with all new buildings, Phase 2 of the PSBP includes a large number of small and complex projects including deep retrofit of existing buildings which are more time consuming by nature and where the professional services element of the total project cost is likely to make up a higher percentage of costs than on a bigger project.

- ✓ *The EFA should extend the timeframes for planning and designing schools by making the competition programme stage 2 of the planning process, as per its Regional Framework procurement model.*

Recommendation 2

Flexibility: To get the most out of a new building, the EFA needs to clarify how they intend to apply their standards and take a more flexible approach to the design and layout of buildings

The EFA needs to be clearer when dealing with their partners about how they want to see the baseline standards and designs used during the design process. Are the criteria a standard to which they expect everything to be built – or do they want bidders to demonstrate how they best propose to meet and exceed the standards. To enable this, we would recommend that the EFA:

- Clarifies whether the baseline designs are flexible and ensure EFA Technical and Design Advisors encourage contractors to go beyond minimum area requirements where possible, providing that enlarging an area will be done within cost limitations.
- Urgently evaluates the long-term impacts of the new baselines standards' area requirements with a particular focus on corridors and toilets
- Excludes the ability for greater area provision within cost limitations from its definition of spare money that needs to be returned by schools.

The EFA urgently needs to decide what status the baseline designs have in the procurement of schools: are they a ceiling not to be exceeded with any leftover money after the standards have been met to be returned to the EFA rather than spent on improving other areas of the design?

To incentivise excellence and innovation, the EFA needs to be clearer with its partners about what the baseline standards represent – are they a floor or a ceiling?

At the heart of the debate around how to design new school buildings lies a lack of clarity about what the EFA baseline designs represent. In general, the architects and other experts that the RIBA consulted during the course of this project expressed a view that the baseline designs represented a good compromise between the need to meet tight budgets and the needs of pupils and teachers.

However, there was considerable frustration that the EFA's procurement processes are failing to provide bidders with a framework that allows and incentivises the innovation that can make the difference between an adequate school building and a great school. There is also a high level of confusion among the construction industry as to the EFA's design standards and what flexibility there is in their application. A recent survey shows design standards was one of the aspects of the Government's school building programme that most respondents were uncertain about⁴².

To address this uncertainty, the EFA urgently needs to decide what status the baseline designs have in the procurement of schools: are they a ceiling not to be exceeded with any leftover money after the standards have been met to be returned to the EFA rather than spent on improving other areas of the design? Or are the baseline standards just that – a minimum which architects are expected to take account of but go beyond where budget and site considerations allow.

Increasingly, the procurement of schools is taking the former approach – interpreting the baseline standards as a singular standard rather than as a range of consideration. Going below them would compromise quality but going above is perceived as expensive with little impact added.

- ✓ *The EFA should clarify whether the baseline designs are flexible and ensure EFA Technical and Design Advisors encourage contractors to go beyond minimum area requirements where possible, providing that enlarging an area will be done within cost limitations.*

To ensure that long-term value is delivered, a broader assessment of value for money is needed

In addition to being more restrictive in terms of design and layout, the EFA's new baseline standards are significantly smaller than those used under BSF. Reducing the overall floor area of new buildings can lead to significant savings in the construction of new schools. However, it is also likely to increase costs and behavioural issues over the long-term which have the potential to more than offset these initial savings.

Broadly speaking, the minimum standards for PSPB schools represent a return to the standards of 15 years ago. While this is of itself not necessarily a problem, the move to reduce floor areas has the potential to create a range of additional challenges that need careful consideration in the debate about how to best assess quality and value for money.

A key area which has been repeatedly highlighted by the value of school design research and teacher poll we have commissioned has been the negative impacts of over-crowding in schools.

The focus on classrooms ignores the impact that other parts of a school have on learning

One area of particular concern is the way in which narrower corridors specified in the EFA baseline standards can create a range of easily avoidable problems. Crowded corridors impede the flow of pupils around a school, creating pinch points that increase stress levels and can exacerbate bullying problems. In addition to social problems, narrow crowded corridors also mean higher maintenance costs through faster wear and tear as pupils are pushed against surfaces. With the pressure on school places likely to increase significantly in the coming years as the growing school age population makes its way through the education system, this is an area that we believe needs urgent reconsideration.

There are early signs that these problems are already becoming apparent within the first batch of PSPB schools. During an Education Select Committee oral evidence session on the PSBP inquiry in March 2015, a head teacher of Stratford School Academy complained about the quality of his new EFA-funded school building, particularly its corridors not being able to accommodate students queuing for their lunch break without disrupting lessons on the other side of the wall⁴³. We have also heard complaints about narrow corridors from teachers in other EFA-funded schools across England which we visited over the course of our research.

A clear pattern seems to be emerging

Perhaps the most telling piece of evidence on the need to look again at corridors are examples we found where local authorities were able to supplement EFA funding to improve the quality of the new buildings above the proposals from the EFA. In one area of the UK, in 11 out of 12 projects one of our stakeholders was involved in, additional money from the local authority was spent on widening corridors.

Another part of the school building that we believe should be re-evaluated is the positioning and layout of toilet facilities. POEs of new schools built to similar space standards in the past have shown pupils and teachers experienced behavioural issues as a result of smaller and/or fewer toilets⁴⁴.

One area of particular concern is the way in which narrower corridors specified in the EFA baseline standards can create a range of easily avoidable problems.

- ✓ *The EFA should urgently evaluate the long-term impacts of the new baseline standards' area requirements with a particular focus on corridors and toilets.*

To incentivise schools and bidders to consider how best to deliver a project, the EFA should stop reclaiming unspent funds where a case for the investment can be made

Not all EFA-funded schools will be lucky enough to have access to additional funding to address issues around restricted area allowances. However, in many of the projects we have discussed with our members, there have been opportunities to change the design in a way that delivers better outcomes without increases to the budget. Unfortunately, however, in many of these examples, the EFA's messaging and policy has made this impossible.

The Little Hall,
© Jack Hobhouse



The Government needs to decide if it wants the cheapest building possible...

Firstly, there is a lack of area flexibility in the application of the EFA's suite of standardised drawings and specifications for new schools. We found the lack of flexibility on area stems from many EFA Technical and Design Advisors treating the EFA area requirements as both a minimum and a maximum, discouraging contractors from going beyond them.

These restrictions on area are being applied so rigidly on occasion that usable space in buildings has been left vacant due to an EFA advisor's decision that using the space would breach the EFA's guidance. In one case that was presented to us, outdoor space on top of a double-height atrium was not allowed even though it could have been delivered within cost limitations, due to the Design Advisor's rigid advice on maximum area being that of the EFA's minimum area requirement.

The arbitrary restrictions on floor space are having a particularly negative impact on refurbishment projects. It is not uncommon for the internal area provision of an existing building to exceed the EFA minimum. There have been a number of occasions where the existing circumstances have not been taken into account during the preparatory work, leading to funding for the refurbishment being based on a building conforming to EFA standards, not the actual size of the building.

By realigning messaging with its own guidance, the EFA could also benefit a number of schools, particularly primary schools, many of which are currently being built to fit site and area restrictions rather than best practice or the available space.

Or the best building that fits the available budget

Finally, the EFA's approach to area is creating a paradox. Architects are being prevented from proposing plans that provide greater area for the same amount of money due to the EFA's policy that any project that has 'spare money' should be returned to the EFA to be spent elsewhere rather than being used to improve the design of those particular facilities. We believe this is a harmful approach that stifles innovation and value for money that could be delivered through the capital funding.

- ✓ *The EFA should exclude the ability of greater area provision within cost limitations from its definition of spare money that needs to be returned by schools.*

Arbitrary restrictions on floor space are having a particularly negative impact on refurbishment projects.

Recommendation 3

A smarter approach needs to be taken to the use of building management equipment that controls modern school buildings.

Many EFA-funded schools are over-engineered with elements which are either unnecessary or could have been replaced with cheaper, more environmentally and user friendly technologies. This is largely down to a wasteful approach promoted under Part L of the Building Regulations which compromises efforts by the EFA to improve the environmental performance of the school buildings it funds.

However, the EFA can take steps to mitigate the negative impacts of the Building Regulations to some extent by bringing in technical expertise onto school projects earlier, and by adopting a more flexible approach on how environmental performance they require is delivered. This would also encourage innovation and further cost savings. The EFA should look to create feedback loops that can help it continuously improve its programme by conducting POE analysis of buildings they have commissioned. We believe the EFA should:

- Commission research around the impact of the use of the Simplified Building Energy Model (SBEM) toolkit and work with the Department for Communities and Local Government to allow alternative models for calculating compliance to be recognised under Part L of the Building Regulations.
- Bring in technical expertise into school projects before school designs receive planning permission, to mitigate the negative impacts of the compliance toolkit currently required under Part L of the Building Regulations
- Adopt a more flexible approach on how environmental performance is delivered, to promote simpler design despite Building Regulations, and encourage innovation and further cost savings.
- Conduct POE analysis of the costs and effectiveness of all buildings they have commissioned to better understand what works effectively and to make design interventions that both reduce costs and improve pupil and teacher wellbeing and performance.

Many EFA-funded schools are over-engineered

Our sources have indicated many EFA-funded schools are over-engineered with elements which are either unnecessary or could have been replaced with cheaper, more environmentally and user-friendly technologies.

Local authorities and school professionals are acutely aware of the importance of low running and maintenance costs. Despite the desire to create additional school places, both are highly concerned about the long-term maintenance cost of buildings. In a recent survey having a low long-term maintenance cost was seen as a much higher priority than low upfront build cost⁴⁵.

The systems are often too complicated for staff to operate

The complexity of these systems is often a major challenge which requires expert knowledge. On a practical level, staff are often not being taught how to use the systems. As a result many schools are finding themselves having to call out service staff to make changes to the systems. This leads to both poor performance and significant further costs. As a result of these factors, across the school estate, there is an unfortunate track record of complex systems that prove to be too difficult to operate and are subsequently decommissioned, abandoned, or not used after installation.

While it is too early to assess the effectiveness of systems installed in newly opened EFA schools, the experts we have spoken to believe that it is highly likely they will experience the same issues around running and maintenance costs, staff productivity and wellbeing as the schools studied under the value of good school design research. This is because EFA-funded projects face the same barrier to delivering simpler and more cost-effective buildings, namely Building Regulations relating to environmental performance (Part L).

Funding for new schools could stretch further and running costs could be reduced if schools were designed to be as simple as possible...

Simplicity is the key to achieving good quality and cost-effective outcomes. The easier buildings are to manage, repair, operate and maintain, the more likely they are to run efficiently and effectively. Where investment in long-term expert maintenance is unlikely to be available, as in the case of EFA-funded schools, building services and their controls should be kept as simple as possible, with automation and mechanisation designed out.

In particular, a fabric first approach i.e. ensuring the design of the building itself limits the need for installing expensive mechanical heating and ventilation systems, would be a more robust long-term solution in terms of maintenance costs, manageability, and operability. Schools built to this standard, in the value of good school design case study sample experienced less significant unintended consequences and lower running and maintenance costs.

EFA-funded projects face the same barrier to delivering simpler and more cost-effective buildings, namely Building Regulations relating to environmental performance (Part L).

A new approach which focused on reducing the complexity of school buildings as far as possible could play a major role in helping meet the Government's ambitious targets for the costs of new school buildings. The added value of a fabric first approach is the ability of the design to create comfortable working and learning conditions. As the value of good school design research has shown, good quality and comfortable design can contribute to a 15% increase in teacher productivity which equates to £2.7bn annually.

...However, this would require changes to Building Regulations relating to environmental performance

The current Building Regulations do not allow for architects and engineers to use their skills to simplify school building designs as far as they could. One area where we believe major change is urgently required is in regulations covering how environmental performance is assessed.

Under Part L of the Building Regulations, all EFA and non EFA-funded school projects are required to use a compliance toolkit to energy and carbon emissions targets – the Simplified Building Energy Model (SBEM). This, combined with overly prescriptive overheating, daylight and acoustic requirements, unwittingly promotes complex mechanical services.

The current assessment model for a building's performance is fundamentally flawed

Under the current SBEM model, proposals are compared against a 'nominal school'. The nominal school does not have a specification, but represents a blueprint for internal environment standards which need to be met under Part L of the Building Regulations. Planned schools need to meet the same or lower targets in order to get planning permission.

If a model for a planned school does not meet the required standards, a consultant is usually hired to change the design. In most cases, this process is carried out using the SBEM toolkit. The toolkit features a list of measures which have environmental compliance points attached to it. A building is deemed to have passed this process when it accrues enough points.

Consultants hired to carry this out usually have less than a day to assess the project on behalf of contractors. This short time-frame makes it next to impossible to explore the impact of changing the geometry of the building or its fabric to improve its environmental performance.

As a result, the default approach is almost always to apply as many mechanical and electrical measures from the list of approved measures as is needed to hit the carbon emissions target. What should be a highly collaborative process between architect, contractor and building engineers becomes a tick-box exercise that focuses on what we believe are the wrong things. In many cases, this methodology leads to a compliant but complex and expensive

configuration which gives little indication as to how the building will actually perform.

Most importantly, the calculations that underpin the SBEM model often fail to reflect what we do know about how schools operate. For example, they often omit a variety of factors like out-of-core-hours operation and the impact of poor controls and management on usage. The value of good school design research has shown these factors can increase the actual operational energy demand and carbon emissions of a building three-fold, if not more. Because the SBEM calculation does not account for these aspects, it promotes measures which will prove inadequate in making school buildings energy and carbon efficient.

Other methods of improving building performance should be explored

Processes that could help overcome the challenge of meeting regulations while keeping costs under control have already been developed. For example, Carbon Buzz is a free, online benchmarking tool that helps the construction industry to ensure measures they install in new buildings meet compliance requirements; perform as designed; minimise running and maintenance costs; and increase user comfort⁴⁶. The CIBSE's Technical Memorandum 54 methodology allows operational energy use to be taken into account in the design stages⁴⁷. Tools like these should be recognised in the Building Regulations for more cost-effective and sustainable solutions.

- ✓ *The EFA should commission research around the impact of the use of the SBEM toolkit and work with the Department for Communities and Local Government to allow alternative models for calculating compliance to be recognised under Part L of the Building Regulations.*

The EFA can introduce more immediate changes to mitigate the negative impacts of current Building Regulations, such as bring in technical expertise into school projects sooner

Additional technical expertise only tends to be brought onto school projects once the SBEM-compliant school design receives planning permission. This leaves very little scope to modify designs without causing significant project delays and additional costs.

- ✓ *To mitigate the negative impacts of the faulty compliance toolkit currently promoted under Part L of the Building Regulations, the EFA should bring in technical expertise into school projects before school designs receive planning permission*

And adopt a more flexible approach on how environmental performance is met

The EFA had overhauled its environmental standards between 2011 and 2014 through subsequent changes to the Facilities Output Specification (FOS). The changes have been welcomed by the stakeholders we have spoken to, including various environmental engineers and consultants who believe they represent a step up in standards.

However, many have raised concerns about the requirements and scoring being quite strict, which leaves little scope for proposing alternative and simpler design solutions which require less building management equipment and are therefore more cost-effective.

Building management systems like heating or ventilation are often both expensive to install and subsequently to maintain. They can constitute up to 40% of the overall school project cost. In many schools they are not a luxury - learning simply would not be possible without the technology.

However, we believe that even in areas where complex systems are needed, savings can be made by reviewing the type of systems used and the way school buildings are designed, to help stretch the Government's school rebuilding programme further.

Whilst it is noted that the FOS is only a guidance document, many stakeholders we have spoken to fear that the scoring criteria would discount projects which can deliver the same environmental performance but through alternative approaches not recognised by the FOS document at the bidding stage.

- ✓ *The EFA should adopt a more flexible approach on how environmental performance is delivered to encourage innovation and further cost savings*

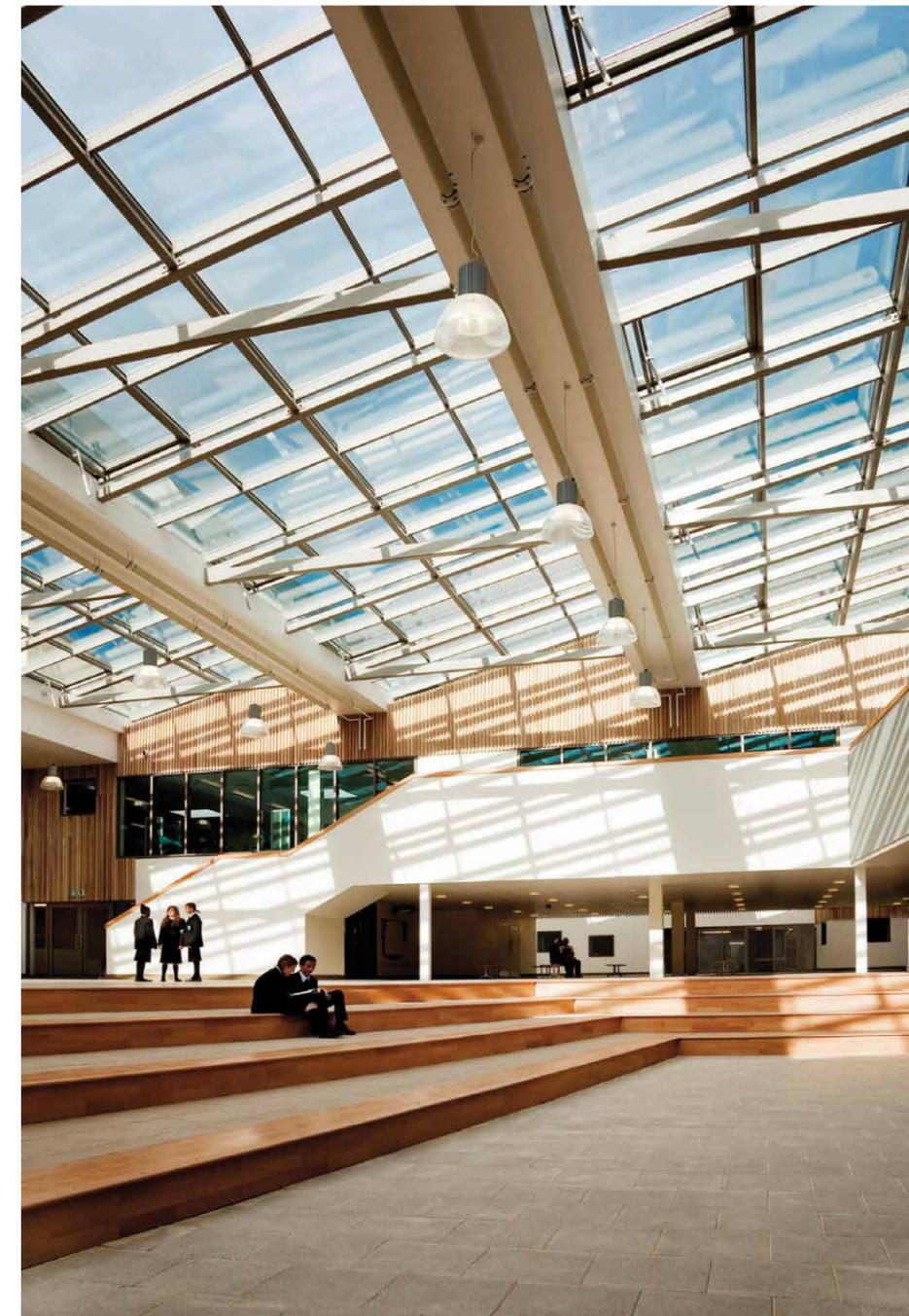
More evidence is needed about what works to effectively future-proof capital funding for schools

It is important that future school design is backed by rigorous research. In particular, we believe there is a strong case for more Post Occupancy Evaluation analysis of the performance of school buildings. Like in the value of good school design research, POE analysis would help the EFA increase their knowledge about the effectiveness and impact of the schools they commission. EFA POE analysis should include environmental and performance data, such as maintenance and energy costs; as well as indicators on pupil and teacher wellbeing to understand impact on bullying, educational outcomes and staff retention levels.

A recently completed batch of PSBP wave 2 schools in the North West highlights the need for the EFA to collect data and evaluate their projects.

Despite the school buildings being delivered on time, budget, and to EFA standards; there are concerns that the practical requirements of the EFA specification had imposed a design which will not necessarily meet user's needs.

- ✓ *The EFA should conduct POE analysis of the costs and effectiveness of all buildings they have commissioned to better understand what works effectively and to make design interventions that both reduce costs and improve pupil and teacher wellbeing and performance.*



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- The total minimum expenditure on a pupil across the 5 years of KS3 and KS4 is calculated as £20,854.
- The minimum funding level for a pupil in KS3 in 2015-16 will be £3,950 x 3yrs = £11,850
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Research and Information. Vol 35(6), pp 662-673

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