

## **Schools for the twenty-first century: school design and educational transformation**

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**Abstract:** The Building Schools for the Future programme has been established to ensure that English secondary schools are designed or redesigned to allow for educational transformation. The programme represents the biggest single UK government investment in school buildings for over 50 years. For this reason, it poses a major challenge to those involved in the design of educational buildings. Inspiration is in part sought from exemplar schools around the world. The paper draws on a multiple case study of four such exemplar schools in Scandinavia that have been designed to address changes in the educational curriculum. The analysis depicts the degree to which the building design in each case supports the school approach to teaching and learning. The disjuncture between commercial and educational issues inherent in designing 'good' schools is highlighted. The findings show how it is important to find a balance between good design, commercial realities and educational approaches.

*Keywords:*

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## **Introduction**

Increasingly, school building design is understood to play a central role in the creation of environments that improve educational attainment. This mirrors long-established international trends of promoting design of educational facilities that address the changing curriculum (cf. Woolner *et al.*, 2005; OECD, 2006; Hertzberger, 2008). In the UK, the Building Schools for the Future (BSF) programme is an example of a deliberate attempt to drive reform in the organisation of schooling, teaching and learning through the delivery of innovative school buildings (Education and Skills Committee, 2007). The key objective of the programme is to achieve ‘transformational education improvement, especially in areas of historically low performance; good design; and the provision of other services on school sites for the wider community’ (Department for Children, Schools and Families [DCSF], 2009, p. 76).

The BSF programme represents the biggest single government investment in improving UK school buildings in over 50 years at an estimated value of £52 billion over its lifetime (Public Accounts Committee, 2009). The programme involves entirely rebuilding half of the secondary schools in England, structurally remodelling 35% and refurbishing the rest, over the period 2005–2020 (National Audit Office [NAO], 2009a). The initiative comes on the back of an increasingly widely held belief that older schools, as well as those built or refurbished in recent years, are inadequate in their ability to cope with anticipated changes such as shifting pedagogy, curriculum and learning expectations (cf. Audit Commission, 2003). The aim is for the BSF schools to be designed such that pupils will learn in twenty-first century facilities that account for current and future developments in education and technology, as well as the local and global environment (4ps & Partnerships for Schools, 2008). Ultimately, the aspiration is for schools to be designed in such a fashion that they inspire and engage everyone that comes into contact with them. Building design and design quality has, as such, been given a prominent place in the BSF discourse. The significance of design is clearly articulated in the official BSF documentation and advice on how to achieve quality design is provided in abundance (e.g. Department for Education and Skills [DfES], 2004a; Commission for Architecture and the Built Environment [CABE], 2007; NAO, 2009a). However, this formal documentation falls somewhat short in describing how design quality can be fostered to achieve the aspired to ‘educational transformation’ (Cardellino *et al.*, 2009).

The purpose of this paper is to explore and highlight the relationship between the design of school buildings and the achievement of learning environments that support a school’s approach to teaching and learning. It takes as its point of departure the advice that those involved in the BSF programme should seek inspiration from ‘exemplar’ schools abroad (e.g. CABE, 2007). The paper draws on a multiple case study of four such exemplar schools in Denmark and Sweden conducted as part of a longer study of the role of design quality in the BSF programme and the design practices and processes in use. A common feature of the cases is that the design of the building was developed to support particular educational visions and approaches to teaching and learning. Specific attention is, therefore, given to the relationship between the articulation of the educational vision and the accomplishment of compatible learning environments. The discussion compares and contrasts how the design of the physical environment supports pedagogical ideas in forming the learning environments. Before presenting the case study, the discussion turns first to a brief exploration of the BSF programme and the importance given to design in the BSF discourse. Attention is then turned to the growing literature on learning environments and the role of spatial design in affecting the behaviour of individuals.

## **Building schools for the future**

The period 1997–2003 saw rising investment in schools in the UK through the Private Finance Initiative (PFI). Following concerns regarding the quality and cost of the schools delivered through this procurement route (Audit Commission, 2003), the BSF programme was launched in February 2003 with the documented aim of achieving educational transformation by:

- improving learning and achievement for every child and young person;

- using new thinking and opportunities and being creative in designing for learning;
- enhancing school diversity and parental choice;
- increasing the use of schools by the community;
- seizing opportunities through new technologies; and
- producing places for learning that are exciting, flexible, healthy, safe, secure and environmentally sustainable. (4ps & Partnerships for Schools, 2008)

Thus, whilst still heavily reliant on private finance (NAO, 2009a) BSF was, in contrast to what had gone before, put in place not solely as a financing route for new school buildings, but as a vehicle to ensure that schools are designed or redesigned to allow for ‘educational transformation’. Ultimately, the target for the programme is the achievement of learning environments in which ambitious education outcomes can be delivered that inspire teachers to innovate and young people to engage. Such environments, it is stated, should inspire new ways of learning and comprise ‘excellent’ facilities that enforce a sense of community within the school environment, whilst at the same time being integrated into, and benefiting, the larger community (NAO, 2009a). The emphasis on excellent facilities and how state-of-the-art buildings provide a means for improving educational standards has become an integral part of the BSF discourse and good quality, thoughtful design is considered key to the success of the programme (Cardellino *et al.*, 2009). Indeed, the commitment to design quality is fundamental (cf. DfES, 2004b; CABE, 2007; NAO, 2009a) and the expression of positive links between the design of buildings and school performance is commonplace in the BSF literature. The potential positive effects of the school facilities on pupils, teachers and the wider community are clearly stated in a number of publications (e.g. CABE, 2002; Building Futures, 2004; DfES, 2004a; CABE, 2006). So too is the belief that good design facilitates efficient school environments (e.g. Pricewaterhouse Cooper [PwC], 2001, 2003; CABE, 2007). Indeed, the design of flexible and adaptable environments is presented as enabling the adoption and adaptation of emerging changes in education and is seen as a necessary precursor for a step-change in the process of educational transformation (DfES, 2004b).

The BSF has, since its launch, been subjected to a number of reviews on the ability of the programme to deliver educational transformation through the provision of innovative school buildings (e.g. Education and Skills Committee, 2007; PwC, 2007; NAO, 2009a). In 2006, the Department for Children, Schools and Families (DCSF) initiated a longitudinal review with the aim of measuring the educational impact of BSF capital investment. In a recent report from this annual evaluation (PwC, 2008), it was concluded that BSF schools in general have been built to higher specifications and space standards than pre-existing schools. Yet, concerns were raised about the programme’s effectiveness in improving the quality of education. Thus, at present, there is insufficient evidence of the design of new buildings having significantly contributed to changing pedagogy in practice (NAO, 2009a).

To put the BSF discourse into perspective, the following sections review and illuminate established and purported links between the physical environment and behaviour, motivation, learning and achievement. Attention is also given to if, and how, ‘users’ can be engaged in the design process. This is deemed relevant as, within the latest proposal for improving the BSF programme, it was recommended ‘to scale up the innovative and successful emerging practice in pupil involvement in school design and encourage the involvement of teachers, parents and the wider community in school design more widely’ (DCSF, 2009, p. 76).

### **Linking design and behaviour in the school environment**

It is commonly argued that the physical environment plays an important role in shaping behaviour in schools (e.g. Day & Midbjer, 2007; Durán-Narucki, 2008). This follows a long tradition of studies targeting the impact of the built environment on performance in general (e.g. Herzberg, 1966) and the benefits of good design in particular (e.g. Macmillan, 2004).

#### *School environment and learning attainment*

The existence of a link between aspects of design and school effectiveness and educational outcomes is increasingly recognised in the literature (Dudek, 2000; Clark, 2002). There is no shortage of

studies that have sought to establish a relationship between the physical environment in which students learn and the learning outcomes associated with these environments (e.g. Weinstein, 1979; Fisher, 2000; Tanner, 2000; Clark, 2002; Green & Turrell, 2004; Higgins *et al.*, 2005; Williams, 2006). The majority of these studies have focused on the tangible physical aspects of design and its functionality. In this respect, findings are presented exclaiming correlations between the physical school environment and improved levels of teaching and learning. For example, increased use of natural ventilation and lighting has been found to support concentration (Dudek, 2000) and overall pupil performance (Hathaway, 1995). Similarly, the provision of 'green' schools (Edwards, 2006) is also claimed to enhance educational performance. So, too, is the provision of good acoustics (Woolner *et al.*, 2007a). Indeed, in their literature review of the impact of school environments on students' behaviour, motivation, learning and achievement, Higgins *et al.* (2005) concluded that there was consistent evidence for basic physical variables (natural ventilation, colour, temperature etc.) having an effect on learning. But, they emphasised that once minimal standards were achieved the effect was less significant. Thus, clear links are drawn in the literature between the improvement of poor learning environments and increased pupil motivation and attainment. The benefits of improving what are already adequate environments for teaching and learning are less clear (Feilden, 2004; Higgins *et al.*, 2005).

There is, however, a danger in focusing too narrowly on these tangible physical aspects of the design of facilities since the less tangible and perhaps less obvious aspects of the design are more difficult to capture and assess (Macmillan, 2006). While it is axiomatic that basic physical characteristics affect student perceptions, any study of the impact of the physical environment on education needs to take into consideration the complexity of the school environment. In the immediate school environment, the physical environment is as much a social phenomenon as it is a physical phenomenon. Behaviour is also influenced and constrained by pedagogical, socio-cultural and motivational factors, amongst others (Barker, 1968). In truth, the relationship between people and their environment is complex and multifaceted in nature (Proshansky *et al.*, 1976; Gifford, 2002) and it makes little sense to think about physical space without considering how it is used. For the argument put forward in this paper, a useful distinction is, therefore, that between 'space' and 'place'. A 'space' becomes a 'place' when people make use of it by carrying out activities and providing it with its own character (cf. Lawson, 2001).

It is also worth looking past the immediate school environment to its extension into the wider community. The individual, physical characteristics of the school will affect student perceptions, but different schools, children, cultures and contexts will, at different times, create a variety of conditions for potential learning. It has, for example, been argued that children living in poor neighbourhoods relate differently to the environment than children living in less disadvantaged areas, especially in urban environments (Castonguay & Jutras, 2009). Children's positive or negative spatial perception is, in this sense, believed to be related to their neighbourhood area. Whilst such arguments might seem contentious, it is not unreasonable to assume that the demands and resources provided by the external environment impact on a person's emotional life. The school location could therefore have an indirect impact on pupils' behaviour and in consequence their attainment (cf. Moore & Lackney, 1993).

#### *The design and use of open and flexible spaces*

School buildings provide for a variety of social groups within their premises. Spaces govern and support interactions between these groups and individuals. Ultimately, spatial design both facilitates and inhibits behaviour and relationships between different actors (cf. Penn *et al.*, 1999; Heerwagen *et al.*, 2004; Rashid *et al.*, 2006). The possible interactions within a given space are governed by the degree of control the individual retains over her or his surroundings, at times described as the dichotomy between privacy and community (cf. Lawson, 2001). In simple terms, privacy allows individuals to control their interaction with others (Weinstein, 1979), whilst open spaces can make this control almost impossible. Thus, open and flexible spaces encourage a sense of community, but eliminate or severely impede the possibility of privacy.

Significant attention has been given to the impact that aspects of the physical environment, such as classroom and school size, and the degree of openness of the spaces have on educational outcomes (e.g. Bennett & Hyland, 1979; Horne-Martin, 2002). The social interaction within these spaces is commonly put forward as a critical factor in establishing the relative success of the learning environments (e.g. Tanner, 2000). Even so, the degree to which open plan areas improve attainment is debatable (cf. Woolner *et al.*, 2007a). A plethora of studies have indeed tried to establish the extent to which teachers make use of available spaces and the degree to which the physical environment dictates how they teach (e.g. Moore & Lackney, 1993). Whilst there is relatively strong agreement on the existence of a link between the style of teaching and classroom organisation (cf. Horne-Martin, 2002; McGregor, 2004), the findings differ on the implications. For example, in the case of the open-plan movement in the 1970s (Bennett *et al.*, 1980), some commentators were adamant that more open classrooms have a direct effect on how teachers teach (e.g. Ahrentzen & Evans, 1984); others argued that the strong policy push and the provision of classrooms with more flexible layouts did not radically change behaviour as many teachers kept to 'teaching from the front' and did not alter the disposition of the furniture (e.g. Rivlin & Rothenberg, 1976). Hence, flexible layouts, i.e. the provision of multiple arrays of possibilities and options, might have negative effects on users leading them to revert back to the tried and tested. Likewise, the tendency simply to cope with the given environment rather than actively attempting to manage it should not be underestimated (Higgins *et al.*, 2005).

#### *User participation in design*

User participation in decision-making activities in school design has been given much consideration (e.g. Burke & Grosvenor, 2003; Clark *et al.*, 2003) and is becoming increasingly common in practice. It has been suggested that environments designed through user involvement generate a greater sense of end-user satisfaction and ownership of the space (Higgins *et al.*, 2005). It is further claimed that participation in the design process provides users with a sense of control over the school environment (Horne-Martin, 2002; Woolner *et al.*, 2007b). Several studies thus recommend the involvement of staff and other users in the school design process (e.g. Dudek, 2000; Clark, 2002; Koralek & Mitchell, 2005). Some go as far as portraying user participation as fundamental to the achievement of a well designed school facility (e.g. Higgins *et al.*, 2005) and that a truly 'fit for purpose' educational facility can only be achieved through the participation of teachers in the design process (DfES, 2004a).

The inclusion of children in the design and planning process is also increasingly being encouraged (Francis & Lorenzo, 2002). The input of pupils has been claimed to have a positive impact on innovative design and in overcoming adult conservatism (Rivlin & Wolfe, 1985). The consultation process is portrayed as creative and educational for the pupils (Chiles, 2003). Additionally, it is commonly held that issues concerning the environment are relatively comfortable topics for teachers to explore with children. Moreover, this kind of exercise has a positive impact on the teacher-pupil relationship, building a climate of trust and openness (Flutter, 2006). Questions can, however, be raised about the longevity of such benefits and whether or not the majority of the pupils' opinions can be represented.

#### **Research methods**

The paper draws on a multiple case study conducted as part of a larger study of the role of design in the BSF programme undertaken over a period of three years, 2006–2008. An international perspective was taken in response to the expressed advice to those involved in the BSF design process to look abroad for inspiration (e.g. CABE, 2007). Scandinavia was chosen because the past decade has seen a host of schools in Denmark and Sweden built or refurbished on the basis of a design that is believed to reflect their particular educational approach. A multiple case study approach was used to investigate the design of the learning environments in four exemplar schools in Sweden and Denmark. The aim of the study was to investigate how these schools had been designed and built to achieve learning environments that are compatible with, and aid, specific educational approaches. Particular focus was given to the relationship between the design of school environments and the daily running of the school. The schools in the sample were chosen as cases for their international recognition of excellence in design. The two schools in Denmark have been



identified as exemplar schools by the British Council for School Environments (BCSE). Both Swedish schools have won design awards and are put forward by their local councils as modern exemplar schools.

### **Case study**

The empirical data were collected in Denmark in the autumn of 2007 and in Sweden in the spring of 2008. A variety of data collection techniques were used. Guided tours of the school buildings in combination with formal presentations by head teachers and designers and a variety of other consultants initially provided for an in-depth understanding of the school vision, organisation and design. These initial steps were then followed by observations of classes and other activities undertaken in the school and informal discussions with a wider range of end-users. Interviews were undertaken with head teachers, teachers and other related staff. For each school, background information was sought in the form of written documentation including formal policy statements and official documents such as annual reports, as well as unofficial internal progress reports, briefing documents and educational visions. Photographs were taken of design solutions, as additional information, enabling the particularities of each case to be addressed.

The following sections present brief accounts of the key issues observed in each school. Space restrictions limit the breadth and depth of the descriptions. Each case is divided into three parts portraying, in turn: the organisation of the physical environment; how users utilize the building in relation to the teaching and learning activities; and the design process.

#### *Hellerup Skole*

The Hellerup Skole is located in a wealthy residential area in the outskirts of Copenhagen. The school was built in 2002 and accommodates 550 pupils between the ages of 6 and 16.

*The physical environment.* The school is a three-storey building. It is characterised by the interplay between the outwardly rational relatively severe cubic form and an open, organic interior design. The building is largely open plan with an auditorium stairway in the centre. Plain and clear routes lead in all directions from the central stairway area to nine flexible home bases complete with kitchen areas and ‘chill-out’ spaces. Six of these areas house 75 pupils and the other three bigger rooms accommodate 100 pupils. Flexibility is achieved through the use of mobile units—cupboards, shelving and screen walls—that allow the home areas to be divided into smaller spaces. Each home area has a number of hexagonal moveable seating areas that can accommodate 15 to 20 children. Further flexibility is achieved through the active use of the stairway, which has been designed to provide extra seating and performance spaces. A variety of activities take place in this space: traffic to and from different areas of the school, teaching, group work and larger assemblies and it is also where many pupils eat their lunch. The floor areas are a modelled landscape with staircases, balconies and bridges. The spaces provided for pupils are large compared to traditional school environments.

*How the facilities are used.* The school embraces educational and pedagogical initiatives based on project and team-oriented teaching. The emphasis is on the multiple intelligences concept (cf. Gardner, 1993) where pupils develop their own particular strengths in order to access the project-based curriculum. Teachers work in teams of 6 to 13, put together on the basis of combining a wide spectre of skills. Each team has the responsibility for three or four classes and is totally independent from the others. All teachers have been given training on how to use the building to support the school’s approach to education. Central functions take place in the atrium/staircase, whilst most of the teaching takes place in the home areas. The home area is the children’s base in their daily routine. These areas also have ‘tutor-rooms’ that are the workplace of the teachers. The moveable seating areas are used to gather the pupils at the start of each school day to brief them on their daily activities. Thereafter, the pupils have a large degree of freedom to work in the fashion they choose. Allowing the children to feel in control of their own activities contributes to the perception of secure environments; thus, the spaces become ‘places’.

*The design process.* Concerns and ideas of how to organise the day-to-day learning process were pivotal to the design of the school. The local municipality requested that inspiration should be sought from around the world and that the design should reflect the challenges of the modern 'global' society. The end-users and members of the wider community, including, for example, the police, were engaged in defining the vision for the school. Through workshops and group discussions parents, staff and pupils developed the vision into educational frameworks that governed the architect's work. Thus, the building was designed through direct communication between the architect and the future end-users, with the particular involvement of the head teacher of the school. No architectural drawings were used during the one-year consultation period. This was generally considered to have enabled a more fluent dialogue between the users and the architects, as the same language was shared. Money was put aside in the budget to allow for 100 hours of training per staff member on the new pedagogical philosophy and how to use the building to support it.

*Heimdalsgades Overbygningsskole*

The school is a converted bread and paper factory located in a deprived, immigrant dominated area of Copenhagen. It was opened in 2001 and caters for 230 pupils between the ages of 14 and 17. The school hosts one of Copenhagen's 10th grade classes, an alternative grade for students who opt to stay in school for an additional year.

*The physical environment.* The old factory has been converted into an aesthetically pleasing building with flexible interiors. There are no classrooms *per se* in the building. Instead there are five curriculum areas. These competence environments are flexible in their physical design and arrangement. All furniture is immediately movable, with desks on wheels and mobile workplaces. There are plenty of facilities and niches available for those pupils who work best in peaceful, quiet surroundings as well as for those who are not able to sit still for long. The five curriculum areas are: The Studio—a physical/arts theme area; The Workshop—a practical and aesthetic area; The Station—international and cultural area; The Laboratory—scientific and experimenting area; and the 10th grade environment. Each of these individual competence environments has particular furniture and fittings in accordance with their themes. The Studio has a stage and is fitted with the necessary lighting and sound equipment, a fitness room, a music practice room with a sound studio, group rooms and an outdoor climbing wall. The Workshop allows for both practical and artistic work. The Station has all types of virtual equipment. The Laboratory has a physics laboratory and a greenhouse with a solar cell system for conducting natural science experiments. The 10th grade environment has a traditionally equipped area but also uses the four theme areas.

*How the facilities are used.* The school philosophy follows an 'extended learning' concept, i.e. the entire time the pupils spend in the school is considered to be learning time. Students have a logbook and are responsible for keeping track of their activities. The organisation of the teaching is project-oriented, with significant emphasis given to teaching pupils to work on projects. Notwithstanding, each semester also contains more conventional subject modules. Over two years, each student spends six months in each of the curriculum areas. The teaching is divided into themes for the subjects that fall naturally under each of the competence areas. The pupils can, however, choose to work in other areas around the school, for example, the pedagogical centre, which is designed as a quiet work zone. This gives pupils the chance to find their individual space that will become their own 'place' within the school building. The school has 28 teachers. Their workplaces are spread across the different curriculum areas in an attempt to make them a natural, integrated part of the learning environment.

*The design process.* By necessity much pedagogical thought was put into the design of the school. The design process was shaped by budgetary constraints and the structural characteristics of the old factory building. Converting an existing building rather than opting for a new build provided several limitations for the design, but was also considered an opportunity for trying something different. The project-based teaching pursued by the school required great flexibility of the building. The main challenge

was, therefore, converting awkwardly shaped rooms into flexible learning environments. The solution adopted was one of having autonomous teams of teachers, varying work schedules and plans, flexible physical settings and extensive use of IT. The involvement of the local community was crucial for the acceptance of the school in the area and the design process included extensive consultation with these stakeholders.

#### *Bällstabergsskolan*

Bällstabergsskolan is located in a middle-class northern suburb of Stockholm. The school opened in September 2002 and provides for 150 children between one and five years old and approximately 550 pupils aged 6 to 16.

*The physical environment.* The school is a two-storey building divided into five units or 'home' areas. The pre-school unit, with children aged one to five years old, is independent from the rest of the school, with its own entrance and a fenced outdoor area.

The four other school units are divided into two areas with students from 6 to 11 years old and two areas with children aged 12 to 16. Each of the home areas is self-sufficient in terms of classrooms, recreation spaces and eating areas and has direct access to outdoor areas. In particular, the school is characterised by the large proportion of relatively small classrooms. There are also a number of shared facilities: art and craft rooms, workshops, laboratories, music studios, library, gym and football field. The building has a proportionately large number of external windows and all the classrooms have interior windows that visually link the spaces in the home areas.

*How the facilities are used.* The general philosophy of the school is to create a student-centred environment that encourages pupils to discover their own learning path along with the ability to function as a team member. The teaching is centred on the multiple-intelligence concept, with the aim of developing pupils' sense of creativity through social, verbal, musical and aesthetic intelligences. Each home area has a dedicated team of teachers. Each teacher is a leader for a smaller group of approximately 15 pupils of the same school year. The pupils and the teachers remain in their home area all day. Thus, the teachers work closely with a small number of pupils on a daily basis and support them both as a team and individually. The transparent nature of the building serves the dual purpose of providing the pupils with a sense of security and the teachers with more control over what is taking place outside their classrooms. The library is considered to be the 'heart of the school', where pupils are encouraged to gather to work in groups. The walls are predominantly of glass connecting the space with the rest of the building and the outside. This includes the corridor leading to the library and a balcony from where pupils and staff can feel connected to this space. The windows are specially designed with tinted glass in an attempt to provide the space with a sense of peacefulness.

*The design process.* The design of the school was guided by two clear visions. The first vision concerned inclusivity, i.e. how the school was to blend into the external environment. As a result of the wish to have the school blend into its surroundings, the facades of the building differ significantly between the front and the back. Furthermore, as part of this vision, the envisaged culture of the school was one of freedom of movement on and off the school grounds (with the exception of the pre-school unit). There was also a wish for the building to be inclusive in the sense of providing a clear connection between outdoors and indoors, which manifests in the many windows. The second vision concerned the indoor environment and the wish to create a learning environment for the students that encourages them to develop individually. This vision was inspired by the idea that teaching and learning in small groups encourages better interaction between the pupils. There was, therefore, a deliberate push for many small but visually connected rooms in which teaching could take place. The school was designed to have small classrooms only, with no more than 24 pupils per class.

#### *Östra Gymnasiet*

This 'new build' school in a southern suburb of Stockholm opened in the autumn of 2005. It hosts 650 students from 16 to 19 years old from a catchment area characterised by cultural diversity and clear differences in family incomes.



*The physical environment.* The school is a two-storey building divided into three distinct kinds of student areas: 'class' areas, such as classrooms and auditoriums; 'study' areas, for individual studies and group work; and 'break' areas, including lunch facilities, cafeterias and access to computers, photocopiers and telephones. The classrooms vary in size fitting between 8 and 30 students. The school also has conference facilities, a large sports hall and a gym. A defining feature of the building is the very large front entrance followed by an 'open area' school reception similar to those found in corporate offices. All the doors and doorframes in the building are higher than normal to provide a feeling of openness and space. Another defining feature is the quality of the acoustics with subdued noise levels throughout the building. A speaker system provides background music. The school has won several prizes for its use of lighting and bright colours that create a relaxed and inviting atmosphere.

*How the facilities are used.* The school has adopted a 'resource-based' approach to teaching. In this respect, the school is looked upon as a compilation of resources for teaching, where the classrooms are viewed as one such resource. There are no set guidelines on how the teaching should be undertaken and the teachers are allowed the freedom to choose the style that best suits them. This approach makes the flexibility of the spaces crucially important. The building design is characterised by open and transparent spaces. The students belong to a variety of programmes, which all have dedicated home areas or 'places of residence'. These home areas are not separated by age group in order to encourage interactions and, hopefully, learning between students. The school hosts art exhibitions and conferences and provides offices for a number of local sport clubs that use the sports facilities after school hours.

*The design process.* The head teacher was involved in the design process from the very beginning. Over a period of 15 months, he led a team of four educationalists in putting together a vision for how the school was going to function. As part of this work, interviews were conducted with representatives from all the different categories of staff who would work in the school, as well as with student representatives from a range of schools in the area. National and international study trips were also undertaken. The vision was then developed into a report outlining key themes and demands on the school design. The report formed the brief for the architects who were forced to justify to the school board how their design addressed the themes and demands raised. As a consequence almost everything in the school was purpose-designed; for example, the furnishing and decoration and the use of colour and the lighting. The vision for the interior was to accentuate comfort and well-being, colour and youthfulness. The impression of light and space is achieved through glass and high ceilings. The monumental entrance to the school was originally intended to represent the positive force of the school in the local community. Similarly, the reception area was designed with the aim of accentuating the welcoming culture of the school.

## **Discussion**

The BSF programme has been put in place as a vehicle to ensure that schools are designed or redesigned to allow for educational transformation. The programme approach is seen to create an opportunity for transforming the way secondary schools function, by developing buildings for the twenty-first century with teaching and learning to match (CABE, 2006). It is important to note that ideas such as architecture serving as an instrument for educational and social change are by no means new (cf. Cooper, 1981; Russel, 1981; Brogden, 2007). The current call for educational transformation and the importance given to building design echoes the official discourse of the post-WWII period (cf. Burke, 2010). It is also important to note that the exact nature of the 'transformation' called for within the BSF is not evidently clear and the term 'educational transformation' remains ambiguous. This is certainly the case amongst those charged with designing and constructing the buildings (cf. Cardellino *et al.*, 2009). Building Schools for the Future documents do draw on a variety of the recent educational agendas such as 'every child matters' and 'personalized learning' (e.g. CABE, 2007), yet it is left for the schools and local authorities to provide their educational visions that, in turn, inform the procurement and design processes. Those involved in the design and delivery of the school will, however, be

concerned mainly with the physical aspects of the building.

The case descriptions detail the role of the design of buildings in creating learning environments in 'exemplar' schools in Denmark and Sweden. The guiding visions of these schools embody a range of concepts such as dialogue, ownership, innovation, flexibility, equality, democracy, individuality and freedom. These concepts have then been translated into concrete objectives for the schools, making an impact on the physical design of the learning environments. In essence, the schools have integrated a wide range of complementary ideas and measures to achieve learning environments that respond to their particular educational approach. The cases show that it is possible for schools to develop a holistic approach to design with a significant degree of user participation. However, the cases also show that the complexity of the school environment cannot be overlooked. Even these four exemplar schools, with clear visions and buildings designed to accommodate specific approaches to teaching and learning, have encountered a variety of unforeseen problems and have had to adapt and compromise. There are contradictions between the common perception of high quality design and the commercial and educational realities of running a school. Finding a balance between them is by no means trivial: examples are outlined below.

#### *The school and the community*

The BSF programme encourages the integration of the school into the community in general. It also encourages the involvement of teachers, parents and the wider community in the school design process (DCSF, 2009). From our case descriptions it is clear that the particular circumstances under which the school environment was designed cannot be ignored in evaluating the finished product. Hellerup Skole is a good example of this point. The school has achieved something of an iconic status and is frequently heralded in the architectural design domain as the epitome of space suited to teaching and learning (cf. Hertzberger, 2008). Much is made of how the school's staff and pupils were at the heart of the design process, allowing for a sense of co-creation and active input into the design of the spaces. The school has also been accused of getting too much attention and setting a precedent that is impossible for schools in other areas/regions to emulate. The number of pupils per teacher is, for example, much smaller than the norm and the space (in square meters) per pupil is larger (Hertzberger, 2008). It is also difficult to overlook the characteristics of the school's catchment area. The school's open and flexible layout and approach to teaching and learning demands that the pupils receive significant support at home. It is also fundamentally dependant on individual behaviour of the pupils, which in part could be attributed to their upbringing. As such, the school is not for everyone and it is not meant to be for everyone.

In Heimdalsgades Overbygningsskole, the design process was similarly characterised by significant user involvement. Key stakeholders from the surrounding neighbourhood were consulted regarding the design of the school. Significant effort was put into gaining acceptance from, and achieving the active input of, the wider community as well as end-users in the design work. However, contrary to Hellerup Skole, many of the pupils' parents felt that the innovative solution proposed for the school did not match their own views of how education should be delivered. Indeed, a number of requests were made for the transfer of pupils, i.e. parents opted to try and put their children in a school with a more 'traditional' approach to teaching and learning. In simple terms, not all communities are the same and context matters.

#### *Open, transparent and flexible spaces*

Open and transparent designs are encouraged in the BSF and flexible learning environments are consistently promoted as facilitating changes in teaching and learning approaches (e.g. DfES, 2004b; CABE, 2007). Several forceful arguments for the benefits of open and transparent spaces were put forward in the four cases, especially in the context of making comparisons with more traditional building designs. It was apparent, however, that trade-offs had been made on the amount of privacy afforded to individuals in the name of openness and there was ample evidence of the downside of increased transparency. In the case of Bällstabergsskolan, for example, it was

evidently clear that not all pupils had responded well to the transparency created by the high proportion of windows in the classrooms. The intention was to provide a space where people could see in and children could be more aware of what was happening outside. Some pupils found this distracting and were at times unable to concentrate on their own work. There was agreement amongst teachers and parents that the extreme transparency of the space had a negative effect on certain pupils' behaviour. A similar issue was encountered in Hellerup Skole. It had been agreed during the design process that there were to be no interior walls in the building. But not all pupils managed to adapt to the extreme openness of the spaces. In fact, a couple of months after the opening of the school it was decided that the auditorium would have walls built to enable children to find a place where they could concentrate and avoid becoming distracted, as well as to enable better use of this space and improve the acoustics.

From the above discussion, it appears that a high proportion of interior windows or the lack of interior walls altogether eliminates any chance of privacy for the pupils. Of course, the lack of privacy also affects teachers. The headmaster at Bällstaberghsskolan went as far as using expressions such as 'prisoners not being able to escape' in order to describe his teaching staff's working situation. The teachers at both Heimdalsgades Overbygningsskole and Östra Gymnasiet expressed concern that they had less control over their surroundings than previously and that a downside of the open design was that they were never left alone and did not have a place to 'hide away for a while'.

It follows that the many positives put forward regarding open and flexible design solutions (e.g. DfES, 2004b) come at the expense of the level of privacy afforded to individuals; moreover, it is clear that striking a balance between privacy and community is a very difficult task.

#### *Adapting to new settings*

Compared to the other schools in our sample, the design of Bällstaberghsskolan is not especially flexible; an excess of walls has become a cause of problems. The school prides itself on being one of the most modern schools in Sweden. Pupil and parent satisfaction is very high and the school is consistently ranked in the top band in the region on this measure. Even so, the school has since its opening consistently operated at a loss. At the time of the study (spring 2008), the school was operating at 2% under budget. In practice, the school needs to increase the pupil-teacher ratio, i.e. more children per classroom. However, this is not possible due to the size of the classrooms. The building simply is not flexible enough to accommodate an increase in pupil numbers. The problem could be alleviated by changing the underlying philosophy, partially rethinking the approach to teaching or providing training in making effective use of the building. The latter would entail the least degree of intervention. Yet, to date no such training has been offered to the teachers.

Then again, even if the teachers were to be trained in how to use the facilities that would not necessarily mean that all of them would be able to, or want to, cope. This position was found to be the case in Hellerup Skole. The school design is so different to a traditional design that not all teachers were willing to work in the building without induction. Hence, the teachers were provided with training on how to use the building. Nonetheless, some teachers considered the space to be too open and chose to work elsewhere. There is, as such, a relationship between teacher traits and their ability to adapt to open spaces. Or, as argued by Brogden (2007), teachers who work in open plan schools have an inclination to work in such environments.

#### *Intention and use*

It is clear from the discussion above that there needs to be a balance between the design of the building, how teaching is undertaken and the economy of the school. Reaching this position not only necessitates a degree of flexibility in the design, but also in the underlying vision. Furthermore, no matter how clear the vision and strong the reasons for certain design solutions, the resulting use is a consequence of individual interpretations. It is, thus, inevitable that there will be differences between the intended and actual use of the buildings. Whilst a strong case can be made for

user-participation in design, it is worth remembering that the school is not completed when the building is (cf. Sundstrom, 1987; Clark, 2002). The school setting is a complex environment that needs to mature. Post-occupancy evaluation processes and user feedback are therefore important complements to front-end user participation in design, as they facilitate an understanding of user needs and how the spaces are used in practice (cf. Chiles, 2003). Östra Gymnasiet illustrates this point. The original idea of the design of the school building was to have home bases with students working individually or in groups in open areas. In practice, this was never implemented. The spaces that were originally designed as study areas are used as communal areas with student lockers and plenty of other distractions for those who wish to study. As a consequence, the school is short of classrooms and is struggling over ways to provide more. In practice, the reception area is not needed and is never used, but it is left as it is because it retains significant symbolic value.

#### *Limitations*

We readily acknowledge that there are limitations inherent in the kind of study presented here. The Scandinavian and UK educational systems are not the same. Secondary schools in England are in general larger than those in our Scandinavian sample and usually host between 800 and 1200 pupils (DfES, 2004b). There are also differences in the age range; BSF schools accommodate children between 11 and 16 years old, whilst our sample schools cover a wider age range. We cannot claim any statistical significance to our sample, hence we make no attempt at presenting the schools as statistically representative, neither do we draw statistical generalisations. The study focuses on the link between building design and the achievement of learning environments to support the school's approach to teaching and learning. Our focus has been on how the design of a school has been developed in accordance with its educational vision and how the resultant buildings are used. The schools in our sample have been identified as exemplars of good design and in all cases a marked effort has been made to develop the school design in accordance with a pre-determined educational vision, i.e. they embody the particular characteristics that were investigated. This approach to sampling allows for analytic generalisation and permits for lessons to be learnt across contexts (cf. Eisenhardt 1989; Yin 1994). We would also like to point out that we have made no judgements on the suitability of the educational visions or the underpinning pedagogical philosophies upon which they are based. We leave it to the education experts to review the data and make judgements about the suitability of the visions and philosophies and the quality of the education provided in the four schools.

#### **Conclusion**

The BSF programme uses capital investment in new buildings as a catalyst to improve educational outcomes (Public Accounts Committee, 2009). The main bulk of the official programme documentation draws heavily on architectural aspects of building design and prescribes an architectural approach towards specifying design quality. The design of flexible and functional environments is put forward as making possible the adoption and adaptation of emerging changes in education and is seen as a necessary precursor for a step-change in the process of educational transformation. Whilst several reports set out the attributes of a well-designed school, and the benefits thereof, scant attention is generally given to the complexity of the school environment in which the buildings are just one of many interacting factors. This echoes past change agendas and in many ways the approach taken is reminiscent of precedent initiatives that also put architecture at the epicentre of change (Burke, 2010). It would, of course, be highly erroneous to suggest that those involved in the programme are not aware that for the BSF to improve the quality of education, or indeed achieve educational transformation, there is a need to do more than merely provide new buildings. Yet, the official documentation and the discourse to match tends to exaggerate the rather tenuous link between the design of school buildings and the achievement of learning environments that support a school's approach to teaching and learning (cf. NAO, 2009a).

This paper has explored how four 'exemplar' schools in Scandinavia have used design to help them achieve learning environments suitable for their chosen educational

approach. The findings show how these schools have developed buildings that relate to a defined school vision and how they have effectively used design to support the learning process. These designs have made use of popular, modern concepts of openness, flexibility and transparency and the design process has in all cases been characterised by user involvement. In essence, all four cases have used innovative design solutions to address changes in how to deliver education. Three of the four cases have also succeeded in expanding the learning environment to the entire building. All the cases also reveal some divergence between espoused and real outcomes, forcing trade-offs to be made. Hence, the importance of discussions regarding the consequences of different design solutions for specific learning situations cannot be stressed enough. Such discussions need to be held with key stakeholders, i.e. those charged with producing educational visions and representatives from the school and wider community.

In light of the above, the most significant finding from our multiple case study is that the underlying learning intentions and values of the schools can be successfully incorporated into, and supported by, design. It means bringing these issues to the forefront of the discussion and ensuring that adequate investments are made in the early stages of the process in the form of time and resources (n.b. NAO, 2009b). Educationalists charged with producing educational visions and those responsible for the design and realisation of schools would benefit from participation in such discussions, so too would the eventual end-users. Design solutions that do not fit underlying values are unlikely to have a significant positive impact on the delivery of teaching, indeed they might have an entirely opposite effect. Similarly, schools that already achieve high quality teaching through traditional modes have few incentives to look into innovative designs that accommodate alternative modes of teaching and learning. Put slightly differently, the ‘Churchillian’ view that ‘first we shape our buildings and then they shape us’ might still ring true, but innovations in building design should not be allowed to outpace developments in teaching methods. This might seem obvious, but we do need to underscore the difficulty inherent in balancing expectations of educational transformation, perceptions of high quality design and the commercial realities involved in running a school. The BSF programme has the potential to bring unprecedented change, but it is by no means a foregone conclusion.

## References

- 4ps & Partnerships for Schools (2008) *An introduction to Building Schools for the Future, 2008 edition* (London, Department for Children, Schools and Families).
- Ahrentzen, S. & Evans, G. (1984) Distraction, privacy and classroom design, *Environment and Behavior*, 16(4), 437–454.
- Audit Commission (2003) *PFI in schools* (London, Audit Commission).
- Barker, R. (1968) *Ecological psychology: concepts and methods for studying the environment of human behaviour* (Oxford, Oxford University Press).
- Bennett, N., Andrae, J., Hegarty, P. & Wade, B. (1980) *Open plan schools: teaching, curriculum, design* (Windsor, NFER Publishing).
- Bennett, N. & Hyland, T. (1979) Open plan—open education? *British Educational Research Journal*, 5(2), 159–166.
- Brogden, M. (2007) Plowden and primary school buildings: a story of innovation without change, *FORUM for Promoting 3–19 Comprehensive Education*, 49(1–2), 55–66.
- Building Futures (2004) *21st century schools: learning environments of the future* (London, Building Futures).
- Burke, C. (2010) About looking: vision, transformation and the education of the eye in discourses of school renewal past and present, *British Educational Research Journal*, 36(1), 65–82.
- Burke, C. & Grosvenor, I. (2003) *The school I'd like: children and young people's reflections on an education for the 21st century* (London, RoutledgeFalmer).
- Cardellino, P., Leiringer, R. & Clements-Croome, D. (2009) Exploring the role of design quality in the Building Schools for the Future Programme, *Architectural Engineering and Design Management*, 5(4), 249–262.
- Castonguay, G. & Jutras, S. (2009) Children's appreciation of outdoor places in a poor neighbourhood,



- Journal of Environmental Psychology*, 29(1), 101–109.
- Chiles, P. (2003) Classrooms for the future: an adventure in design and research, *Architectural Research Quarterly*, 7(3–4), 244–260.
- Clark, A., McQuail, S. & Moss, P. (2003) *Exploring the field of listening to and consulting with young children* (London, Department for Education and Skills).
- Clark, H. (2002) *Building education: the role of the physical environment in enhancing teaching and learning—issues in practice* (London, Institute of Education).
- Commission for Architecture and the Built Environment (CABE) (2002) *The value of good design* (London, Commission for Architecture and the Built Environment).
- Commission for Architecture and the Built Environment (CABE) (2006) *Assessing secondary school design quality: research report* (London, Commission for Architecture and the Built Environment).
- Commission for Architecture and the Built Environment (CABE) (2007) *Creating excellent secondary schools: a guide for clients* (London, Commission for Architecture and the Built Environment).
- Cooper, I. (1981) The politics of education and architectural design: the instructive example of British primary education, *British Education Research Journal*, 7(2), 125–136.
- Day, C. & Midbjer, A. (2007) *Environment and children: passive lessons from the everyday environment* (Oxford, Architectural Press).
- Department for Children, Schools and Families (DCSF) (2009) *Your child, your schools, our future: building a twenty-first-century schools system* (London, the Stationery Office).
- Department for Education and Skills (DfES) (2004a) *Exemplar designs, concepts and ideas* (London, Department for Education and Skills).
- Department for Education and Skills (DfES) (2004b) *Briefing framework for secondary school projects: building bulletin 98* (London, Department for Education and Skills).
- Dudek, M. (2000) *Architecture of schools: the new learning environments* (Oxford, Architectural Press).
- Durán-Narucki, V. (2008) School building condition, school attendance and academic achievement in New York City public schools: a mediation model, *Journal of Environmental Psychology*, 28(3), 278–286.
- Education and Skills Committee (2007) *Sustainable schools: are we building schools for the future?* Seventh report of session 2006–2007, 1, House of Commons (London, The Stationery Office).
- Edwards, B. (2006) Environmental design and educational performance, with particular reference to ‘green’ schools in Hampshire and Essex, *Research in Education*, 76(1), 14–32.
- Eisenhardt, K. M. (1989) Building theories from case study research, *Academy of Management Review*, 14(4), 532–550.
- Feilden, R. (2004) Design quality in new schools, in: S. Macmillan (Ed.) *Designing better buildings* (London, Spon Press), 86–99.
- Fisher, K. (2000) *Building better outcomes: the impact of school infrastructure on student outcomes and behaviour. Schooling Issues Digest* (Canberra, Department of Education, Training and Youth Affairs).
- Flutter, J. (2006) ‘This space could help you learn’: student participation in creating better school environments, *Educational Review*, 58(2), 183–193.
- Francis, M. & Lorenzo, R. (2002) Seven realms of children’s participation, *Journal of Environmental Psychology*, 22(1–2), 157–169.
- Gardner, H. (1993) *Multiple intelligences: the theory in practice* (New York, Basic Books).
- Gifford, R. (2002). *Environmental psychology: principles and practice* (Colville, Optimal Books).
- Green, D. & Turrell, P. (2004) School building investment and impact on pupil performance, *Facilities*, 23(5–6), 253–261.
- Hathaway, W. (1995) Effects of school lighting on physical development and school performance, *Journal of Educational Research*, 88(4), 228–243.
- Heerwagen, J., Kampschroer, K., Powell, K. & Loftness, V. (2004) Collaborative knowledge work environments, *Building Research and Information*, 32(6), 510–528.
- Herzberg, F. (1966) *Work and the nature of man* (Cleveland, OH, World Publishing Company).
- Hertzberger, H. (2008) *Space and learning* (Rotterdam, 010 Publishers).
- Higgins, S., Hall, E., Wall, K., Woolner, P. & McCaughey, C. (2005) *The impact of school environments: a literature review* (London, Design Council).
- Horne-Martin, S. (2002) The classroom environment and its effects on the practice of teachers, *Journal of Environmental Psychology*, 22(1–2), 139–156.
- Koralek, B. & M. Mitchell (2005) The schools we’d like: young people’s participation in architecture, in: M. Dudek (Ed.) *Children’s spaces* (Oxford, Architectural Press), 114–153.
- Lawson, R. (2001) *The language of space* (Oxford, Architectural Press).
- Macmillan, S. (2004) Design as a value generator, in: S. Macmillan (Ed.) *Designing better buildings* (London, Spon Press), 1–12.
- Macmillan, S. (2006) Added value of good design, *Building Research and Information*, 34(3), 257–271.
- McGregor, J. (2004) Space, power and the classroom, *FORUM*, 46(1), 13–18.

- Moore, G. & Lackney, J. (1993) School design: crisis, educational performance and design applications, *Children's Environments*, 10(2), 1–22.
- National Audit Office (NAO) (2009a) *The Building Schools for the Future programme: renewing the secondary school estate* (London, The Stationery Office).
- National Audit Office (NAO) (2009b) *Private finance projects*. A paper for the Lords Economic Affairs Committee (London, National Audit Office).
- Organization for Economic Cooperation and Development (OECD) (2006) *PEB compendium of exemplary educational facilities* (3rd ed) (Paris, OECD Publishing).
- Penn, A., Desyllas, J. & Vaughan, L. (1999) The space of innovation: interaction and communication in the work environment, *Environment and Planning B*, 26(2), 193–218.
- PricewaterhouseCooper (PwC) (2001) *Building performance: an empirical assessment of the relationship between schools, capital investment and pupil performance*. Research report No. 242 (London, Department of Education and Employment).
- PricewaterhouseCooper (PwC) (2003) *Building better performance: an empirical assessment of the learning and other impacts on schools capital investment*. Research report No. 407 (London, Department for Education and Skills).
- PricewaterhouseCooper (PwC) (2007) *Evaluation of Building Schools for the Future: first annual report* (London, Department for Children, Schools and Families).
- PricewaterhouseCooper (PwC) (2008) *Evaluation of Building Schools for the Future: second annual report* (London, Department for Children, Schools and Families).
- Proshansky, H., Ittelson, W. and Rivlin, L. (1976) *Environmental psychology: people and their physical settings* (New York, Holt, Rinehart and Wiston).
- Public Accounts Committee (2009) *Building schools for the future: renewing the secondary school estate*. Twenty-seventh report of session 2008–2009, House of Commons (London, The Stationery Office).
- Rashid, M., Kampschroer, K., Wineman, J. & Zimring, C. (2006) Spatial layout and face-to-face interaction in offices: a study of the mechanisms of spatial effects on face-to-face interaction, *Environment and Planning B*, 33(6), 825–844.
- Rivlin, L. & Rothenberg, M. (1976) The use of space in open classrooms, in: H. Proshansky, W. Ittelson and L. Rivlin (Eds) *Environmental psychology: people and their physical settings* (New York, Holt, Rinehart and Wiston), 479–489.
- Rivlin, L. & Wolfe, M. (1985) *Institutional settings in children's lives* (New York, Wiley).
- Russell, B. (1981) *Building systems, industrialisation and architecture* (London, Wiley)
- Sundstrom, E. (1987) Work environments: offices and factories, in: D. Stockol and I. Altman (Eds) *Handbook of environmental psychology* (New York, Wiley), 733–782.
- Tanner, C. (2000) The influence of school architecture on academic achievement, *Journal of Educational Administration*, 38(4), 309–330.
- Weinstein, C. (1979) The physical environment of the school: a review of the research, *Review of Educational Research*, 49(4), 577–610.
- Williams, B. (2006) Building performance: the value management approach, in: D. Clements-Croome (Ed.) *Creating the productive workplace* (2nd edn) (London, Taylor and Francis), 434–457.
- Woolner, P., Hall, E., Wall, K., Higgins, S., Blake, A. & McCaughey, C. (2005) *School building programmes: motivations, consequences and implications* (Reading, The Centre for British Teachers).
- Woolner, P., Hall, E., Higgins, S., McCaughey, C. & Wall, K. (2007a) A sound foundation? What we know about the impact of environments on learning and the implications for Building Schools for the Future, *Oxford Review of Education*, 33(1), 47–70.
- Woolner, P., Hall, E., Wall, K. & Dennison, D. (2007b) Getting together to improve the school environment: user consultation, participatory design and student voice, *Improving Schools*, 10, 233–248.
- Yin, R.K. (1994) *Case study research: design and methods* (2nd edn) (Thousand Oaks, CA, Sage).