

RESEARCH SERIES
NUMBER 16
JUNE 2010

**DESIGNING
PRIMARY
SCHOOLS
FOR THE
FUTURE**

**Merike Darmody
Emer Smyth
Cliona Doherty**



ESRI

THE ECONOMIC AND SOCIAL RESEARCH INSTITUTE

RESEARCH SERIES
NUMBER 16
SEPTEMBER 2010

DESIGNING
PRIMARY
SCHOOLS
FOR THE
FUTURE

**MERIKE DARMODY, EMER SMYTH
AND CLIONA DOHERTY**

*This paper is available online at www.esri.ie
The Economic and Social Research Institute (Limited Company No. 18269).
Registered Office: Whitaker Square,
Sir John Rogerson's Quay, Dublin 2.*

Merike Darmody is a Research Officer, Emer Smyth is a Research Professor, Cliona Doherty was a Research Analyst at the Economic and Social Research Institute.

The paper has been accepted for publication by the Institute, which does not itself take institutional policy positions. Accordingly, the authors are solely responsible for the content and the views expressed.

RESEARCH SERIES
NUMBER 16
SEPTEMBER 2010

DESIGNING
PRIMARY
SCHOOLS
FOR THE
FUTURE

**MERIKE DARMODY, EMER SMYTH
AND CLIONA DOHERTY**

© THE ECONOMIC AND SOCIAL RESEARCH INSTITUTE
DUBLIN, 2010

ISBN 978 0 7070 0303 0

ACKNOWLEDGEMENTS

The research described in this study was supported by a grant from the Research and Development Committee of the Department of Education and Skills. The authors of this report are grateful to the steering committee of the Department of Education and Skills for invaluable input into, and ongoing support for, this research. Thanks go to John Dolan (Senior Engineer, Building Unit), Larry McEvoy (Technical Manager, Building Unit), Pat O'Neill (Primary Divisional Inspector, Inspectorate) and Tony Sheppard (Technical Manager, Building Unit). The authors would also like to thank internal reviewers and the publishing team in the Economic and Social Research Institute, as well as Professor Philip O'Connell, Head of the ESRI Social Research Division and Professor Frances Ruane, Director of the ESRI. Special and heartfelt thanks are due to the pupils and teachers of the six case-study schools who gave generously of their time and to key informants from a number of educational organisations.

CONTENTS

<i>Chapter</i>	<i>Page</i>
<i>List of Tables and Figures</i>	viii
<i>Executive Summary</i>	xi
CHAPTER 1: CONTEXT FOR THE STUDY	1
CHAPTER 2: REVIEW OF EXISTING RESEARCH	4
2.1 SCHOOL ENVIRONMENTS	4
2.1.1 School Size	5
2.1.2 Class Size	6
2.1.3 School Buildings and Classroom Practice	7
2.2 CLASSROOM DESIGN, TEACHING AND LEARNING	13
2.2.1 Classroom Layout and Seating Arrangements	13
2.2.2 Use of Information and Communications Technology (ICT) in Schools	14
2.3 INDIVIDUAL ENVIRONMENTAL FACTORS, TEACHING AND LEARNING	17
2.3.1 Density (Schools and Classrooms)	17
2.3.2 Lighting	17
2.3.3 Noise	18
2.3.4 Colour	19
2.3.5 Air Quality and Temperature	20
2.3.6 Using Student Artwork to Boost Belonging	20
2.3.7 Classroom Furniture	21
2.3.8 Facilities and Teachers	21
2.4 THE FUTURE OF PRIMARY SCHOOLING	22
2.5 CONSULTING PUPILS	25
2.6 SUMMARY	26
CHAPTER 3: DATA AND METHODOLOGY	28
3.1 DATA SOURCES AND METHODOLOGY	28
3.1.1 Case-Studies of Primary Schools	28
3.1.2 Interviews with Interest Groups and Stakeholders	31
3.1.3 Survey of School Inspectors	32
3.2 THE IMPORTANCE OF CONSULTING PUPILS	32
3.3 VALIDITY AND OTHER METHODOLOGICAL ISSUES	33

CHAPTER 4: PERCEPTIONS OF PRIMARY SCHOOL DESIGN AMONG EDUCATION STAKEHOLDERS AND INTEREST GROUPS	34
4.1 DEVELOPMENTS IN SCHOOL DESIGN	34
4.1.1 The Perceived Importance of School Design	34
4.1.2 Trends in School Design	35
4.2 INDOOR SPACE IN PRIMARY SCHOOLS	37
4.2.1 School Size and Layout	37
4.2.2 Classroom Size and Layout	39
4.3 OUTDOOR SPACE IN PRIMARY SCHOOLS	41
4.4 TEACHING AND LEARNING IN PRIMARY SCHOOLS	42
4.4.1 Class Size	42
4.4.2 Teaching Approaches and Methodologies	43
4.4.3 Using Technology in Primary Classrooms	44
4.5 FACTORS TO CONSIDER WHEN BUILDING A NEW PRIMARY SCHOOL	46
4.6 CONCLUSIONS	48
 CHAPTER 5: TEACHER PERCEPTIONS OF SCHOOL DESIGN AND TEACHING AND LEARNING IN PRIMARY SCHOOLS	 49
5.1 SPACE IN PRIMARY SCHOOLS	51
5.2 FACILITIES IN THE SCHOOLS	55
5.2.1 Facilities for Pupils	55
5.2.2 Facilities for School Staff	59
5.2.3 Facilities for Parents and the Wider Community	59
5.3 OUTDOOR SPACE	61
5.4 TEACHING AND LEARNING	62
5.4.1 Trends in Teaching Methods	62
5.4.2 Approaches to Teaching in the Case-study Schools	63
5.4.3 The Use of ICT and Audio-visual Equipment in Primary Schools	64
5.5 ENVIRONMENTAL FACTORS THAT INFLUENCE TEACHING AND LEARNING	66
5.5.1 Noise	66
5.5.2 Temperature	67
5.5.3 Light	67
5.5.4 Air Quality	68
5.6 SIGNIFICANT FACTORS IN DESIGNING PRIMARY SCHOOLS	68
5.7 TEACHER EDUCATION AND TRAINING	69
5.8 CONCLUSIONS	70
 CHAPTER 6: SCHOOL DESIGN – THE PUPIL PERSPECTIVE	 71
6.1 INTRODUCTION	71
6.2 GENERAL PERCEPTIONS OF SCHOOL SPACE	71
6.2.1 The School Day	71

6.2.2	The Classroom	72
6.2.3	Common Areas in the School	74
6.2.4	School and Class Size	75
6.2.5	Pupils' Favourite Places	76
6.3	LEARNING IN THE CLASSROOM	82
6.4	LEARNING AND PLAYING OUTDOORS	84
6.5	CONCLUSIONS	91
CHAPTER 7: ISSUES IN SCHOOL DESIGN – A SYNTHESIS OF RESEARCH FINDINGS		92
7.1	THE IMPORTANCE OF SPACE – SOCIAL AND SPATIAL DENSITY IN SCHOOLS	93
7.2	CLASSROOM LAYOUT AND ARRANGEMENT – IMPLICATIONS FOR TEACHING APPROACHES	94
7.2.1	Seating Arrangement	94
7.2.2	Toilets	95
7.2.3	Display and Storage	96
7.3	ENVIRONMENTAL FACTORS	97
7.3.1	Lighting	97
7.3.2	Noise	98
7.3.3	Colour	99
7.3.4	Air Quality, Temperature and Heating	99
7.4	OUTDOOR SPACES	100
7.5	TEACHING AND LEARNING	101
7.6	SUMMARY	104
CHAPTER 8: A BRIEF FOR FUTURE SCHOOL DESIGN		105
8.1	SCHOOL SIZE AND LOCATION	106
8.2	CLASS SIZE AND LAYOUT	107
8.3	OTHER INDOOR SPACES	108
8.4	OUTDOOR SPACE	109
8.5	TEACHER EDUCATION AND TRAINING	109
8.6	FURTHER RESEARCH	109
REFERENES		111
APPENDIX I: DESIGNING SCHOOLS FOR THE FUTURE – QUESTIONNAIRE FOR INSPECTORS		126
APPENDIX II: FURTHER REFERENCE MATERIAL ON SCHOOL DESIGN ACROSS THE WORLD		148

LIST OF TABLES AND FIGURES

	<i>Page</i>
Table 3.1: Profile of the Case-study Schools	29
Table 3.2: Participants in the Study	30
Table 5.1: Profile of the Case-study Schools	50
Table 5.2: Facilities in the Case-study Schools	56
Table 5.3: The Use of Indoor and Outdoor Facilities for Teaching and Learning	61
Figure 6.1: My Favourite Place, Pear Tree Row School	77
Figure 6.2: My Favourite Place, Oak Leaf School	78
Figure 6.3: My Favourite Place, Lake View School	79
Figure 6.4: My Favourite Place, Riverbank School	80
Figure 6.5: The School I Would Like, Oak Leaf School	81
Figure 6.6: My Favourite Place, Lake View School	87
Figure 6.7: My Favourite Place, Oak Leaf School	88
Figure 6.8: My Favourite Place, Hillcrest School	89
Figure 6.9: The School I Would Like, Maple Lane School	90

ACRONYMS AND ABBREVIATIONS

DES	Department of Education and Science
GRD	Generic Repeat Design
PIRLS	Progress in International Reading Literacy Study
STAR	Student Teacher Achievement Ratio
LGA	Local Government Association, UK
DfES	Department of Education and Skills, UK
NCCA	National Council for Curriculum and Assessment
INTO	Irish National Teachers' Organisation
IPPN	Irish Primary Principals' Network
NCTE	National Centre for Technology in Education
DEIS	Refers to Schools Designated as Disadvantaged Under the DEIS School Support Programme
HSE	Health Service Executive
IWB	Interactive Whiteboard

EXECUTIVE SUMMARY

International research has indicated the importance of school design for pupil engagement, learning and achievement. Aspects of the school environment, including school and classroom density, class size, quality of lighting, ventilation and absence of noise, have been found to significantly enhance pupil experiences and outcomes. However, many commentators have argued that trends in school design have not kept pace with changes in teaching and learning, with many classroom settings remaining teacher-focused rather than child-centred and insufficiently flexible to accommodate new technology.

There has been very little empirical research in the Irish context on the implications of school design for teaching and learning in primary schools, in spite of revisions to the guidelines for school design in 1978 and 2000, culminating in the current guidelines which date from 2007. National population projections indicate that the number of enrolments into primary schools will continue to rise in coming years. This will require new school buildings and it is, therefore, timely to consider the nature and quality of these schools. This study, *Designing Primary Schools for the Future*, explores the perceptions of students, teachers and key stakeholders of the interaction between school design and teaching and learning in the Irish context, specifically focusing on primary schools. In particular, the study draws on interviews with key stakeholders along with detailed case-studies of six primary schools. The research encompasses perceptions on existing primary schools, covering the range from older buildings to those built according to current design guidelines. This summary presents the main findings of our research and indicates the implications for the future design of primary schools.

The Primary Curriculum (1999) is seen as having contributed to a greater diversity in teaching methodology and the use of more active learning approaches within the classroom. In keeping with previous research, however, our study indicates a persistence of teacher-focused approaches and scope for greater usage of group work and play-based learning in order to enhance pupil engagement. School design is seen by education stakeholders as playing an important role in potentially facilitating or constraining the effective delivery of the primary curriculum. In the remainder of this summary, we discuss the role of school design in terms of: school and classroom size; indoor space within the school; use of new technologies; outdoor space; and the implications for future design.

School and Classroom Size

Three aspects of size were found to be important: the overall size of the school, class size (that is, the number of pupils in each class), and classroom density (that is, the amount of space available to each pupil in a class). Stakeholders, teachers and pupils favoured small or medium-sized

schools, which were viewed as allowing for more personal interaction among members of the education community and a greater sense of ownership over school life, in line with international research. Class size and classroom density were seen as of even greater importance than school size. Smaller classes were seen as allowing for the use of more active learning methods and for more individual attention to pupils. In contrast, larger class sizes were seen as contributing to more directive, teacher-focused methods. Opinions on the optimal class size varied (with estimates ranging from 16 to 25 pupils); having a higher proportion of pupils with special educational or language needs was seen as requiring smaller class sizes than the norm. In keeping with international research evidence, stakeholders indicate that the success of smaller classes depends on an array of other factors, including the kind of teaching approach taken.

Significant variation was found across the case-study schools in the physical size of classrooms, with classrooms in the newer schools, especially the school built according to current DES guidelines (Pear Tree Row), being the largest. Variations in physical size combined with variations in the number of pupils per class have obvious implications for the amount of space available for each child. In the older schools, restricted space was seen as constraining the range of teaching methodologies, particularly group work, while in the newer school, staff and pupils were more satisfied with the space available for teaching and for storage. From the perspective of stakeholders, the ideal classroom layout is comprised of seating in small groups (with the flexibility to move furniture if required) with various activity areas within the room for different learning activities. Again, constrained space in the older schools meant that many pupils were seated in rows facing the teacher, thus hindering the possibility of group work.

Indoor Space Within the School

The nature of pupil intake to primary schools has changed in recent years, with a move towards mainstreaming pupils with special educational needs and immigration patterns resulting in a significant number of pupils with language needs. In older schools, rooms for resource/supplementary teaching were often adapted from other spaces, and staff criticised their lack of suitability and failure to provide a stimulating environment for those pupils who need it most. Even in the newer school model, such spaces were seen as too small to allow for active learning methods. The DES enrolment audit indicates significant variation across schools in the proportion of pupils with learning disabilities, pupils with language needs and Traveller children, thus indicating the importance of flexibility within schools in providing designated spaces for supplementary teaching.

In terms of other aspects of the school environment, staff and pupils in the newer school (Pear Tree Row) built to current DES design guidelines were more satisfied with the use of natural lighting and ventilation, flexibility in temperature control and lack of noise travelling between rooms, than those in older schools, where noise in particular could disrupt pupil concentration.

Stakeholders, teachers and especially pupils suggested two particular aspects of existing school design which could be improved: storage for pupils, and lunch facilities. Many pupils reported a lack of adequate storage for their own books and personal possessions, which in some cases hindered movement around the classroom. Furthermore, most pupils ate

their lunch in their classroom (or outside, weather permitting), an arrangement with which they were dissatisfied in terms of comfort and hygiene.

The design template provides the ‘shell’ for the school but it is important to note that the way in which the school community interacts with its environment varies across schools. In particular, pupils value having their work displayed and such display enhances their sense of ownership over the school. Similarly, the perceived suitability of classroom furniture varies across schools, with many pupils reporting that their seats and desks are uncomfortable. International research has indicated an issue with the suitability of classroom furniture for the (changing) physical dimensions of children, even in countries like Finland seen as to be at the forefront of school design.

Use of New Technologies

Stakeholders, principals, teachers and pupils were critical of available computer facilities in their school, findings which echo those presented in a number of other reports on the topic. Criticisms centred on the small number of computers available in each class, the outdated nature of the equipment, lack of suitable software, and the absence of technical support. School design has moved away from stand-alone computer rooms to within-classroom provision, although many older schools continue to have separate computer rooms. This is also likely to be more common with larger primary schools (DES, 2008). However, ICT has not generally been integrated into day-to-day teaching and learning. This is the case despite the fact that pupils themselves are very positive about the potential contribution of computers and other ICT tools to their engagement and learning. The more effective integration of ICT into the curriculum would require a combination of improved equipment, teacher professional development and curriculum planning (see ICT Strategy Group, 2008).

Outdoor Space

Our study indicates the central importance of outdoor space in children’s experience of school. However, outdoor spaces attracted the most criticism, with respondents highlighting inadequate space, the lack of variation in surfaces, the absence of play equipment and the lack of shelter during inclement weather. As a result, outdoor space is currently only very rarely used for teaching and learning. The findings clearly suggest the potential for increasing the use of outdoor spaces in day-to-day teaching, for using play as a tool for learning, and for engaging pupils in the learning process through the use of school gardens and other habitats.

Implications for the Future Design of Schools

Our study indicates that schools built according to the current design guidelines are seen more positively than older school types in terms of classroom size, accessibility, lighting, heating, ventilation and storage, while incorporating principles of environmental sustainability. However, the research findings suggest a number of amendments which would enhance pupil experiences and contribute to more effective delivery of the primary curriculum:

- Greater attention should be paid to the design and layout of outdoor space, incorporating a variety of play surfaces and playground equipment (appropriate for different age-groups) along with a school garden and other habitats. Schools should, therefore,

be located on sites large enough to permit the use of the outdoor space for teaching and learning as well as play and sports. The size of the site should also allow for future expansion to reflect population growth.

- Schools are an important part of the local community and so should be located close to the centre of the community. Parental involvement in school life should be facilitated by providing space for parents to meet within the school during and after the school day. Building on the DES Primary Circular 16/05, schools should be encouraged to share facilities with the local community. The potential to move towards an 'extended school' model with early childhood care and education along with local social and community services provided within, or close to, the school should be explored.
- The full integration of ICT into teaching and learning requires adequate access to up-to-date computers (especially laptops for flexibility), appropriate software, broadband services, data projectors or interactive whiteboards, and technical support and maintenance services (see NCTE, 2008). Such provision should be underpinned by continuing professional development for teachers regarding the effective use of ICT in teaching.
- The increased diversity and fluidity of the pupil population requires the allocation of more and larger rooms (on a flexible basis) for supplementary teaching activities to support special educational and language needs.
- Greater attention should be paid by school management to the fit-out of schools, especially in providing ergonomic and age-appropriate furniture appropriate to differing pupil needs.
- A designated space should be provided for pupils to eat their lunches. Any practical difficulties in using General Purpose rooms for such a function should be investigated.
- Adequate storage space for pupil books and belongings should be provided within the classroom.
- Since schools and school populations change over time, on-going consultation with teachers, parents and pupils is a vital component in future planning of schools.

The study points to the potential role of teacher education and training in enhancing the use of space for educational and social development. It is, therefore, recommended that attention should be given to the creative use of indoor and outdoor space in initial and continuous professional development.

Improved school design has the potential to enhance pupil learning and engagement by providing a more positive environment which facilitates more active learning methodologies. However, school design cannot be considered in isolation and on-going professional development for teachers and smaller class sizes than are currently the case emerge as vital components in reaching the full potential of the primary curriculum.

1. CONTEXT FOR THE STUDY

In the developed world, building new schools is taking place at a time of considerable changes in the societal context as well as in the field of education (Heppell *et al.*, 2004; OECD, 1996). Kirkeby (2002) from Finland notes that extensive changes have taken place within schools during the last decade, involving new curricula and the introduction of new ways of approaching teaching and learning. The author also argues that increasingly schools are considered responsible for laying the foundation for lifelong learning. Furthermore, teaching and learning methods have changed in recent years and new technologies have been introduced into educational settings (Heppell *et al.*, 2004). These factors must be taken into account when designing the physical environment of a school. New developments are also taking place in terms of partnerships between education and industry, concern for the environment and the school as a focus for community development. Schools today are increasingly expected to be flexible and to fulfil additional functions by, for example, offering sporting and cultural activities, and specific programmes for local or regional industrial apprenticeships (OECD, 1996).

Growing interest in school design and the recognition that built environments have an impact on children's experiences have given rise to numerous international research studies and reports (see, for example, OECD, 2000; 2001a; 2001b; 2003a; 2003b; 2004a; 2005; 2006). However, in some countries, like Ireland, relatively little empirical research exists about how the architectural design and layout of schools impacts on students. Within the international research community, there seems to be a general consensus that knowledge about children and their interaction with the built environment can be used to improve the design of children's settings (Weinstein and David, 1987). However, existing international research on children's environments has tended to be fragmented and isolated (Weinstein and David, 1987), despite the fact that globally there has been much good work exploring the future shape and design of schools (Heppell *et al.*, 2004). The main reason for this fragmentation is the lack of attention to a 'joined up' analysis of the views of the different stakeholders, including educationalists, architects, policymakers, children and teachers:

Environmental psychologists have looked at density or privacy or the 'degree of openness' of design; designers look at physical properties such as scale, texture, and light or more abstract attributes like mood and 'sense of place'. (Weinstein and David, 1987, p. 5)

Furthermore, apart from international reports, principally from the OECD, on school design and recent documents related to the Building Schools for the Future movement in the UK, very little empirical research has been conducted internationally in this area in recent years outside the UK and the US. The Scandinavian countries in particular have produced sparse empirical evidence with regard to effective school design, despite the fact that Finland has been in the forefront in innovative design, as is evident in reports in the public domain.

Existing international research has shown that the physical dimensions of the school environment have important effects on students' behaviour and attitudes to learning (Weinstein and David, 1987; Tanner 2000). Research has shown that the quality of indoor environments can affect the health and development of children and adults (BICE, 2006). A number of factors, including light, colour, density, noise and general physical environment as well as design of the school have been found to have an impact on pupils' experiences at school (Maxwell 2003; Killeen *et al.*, 2003; Tanner, 2000). However, some research shows that, despite changes taking place in society in general and educational practices in particular, schools have often remained unappealing buildings designed for easy supervision and maintenance rather than offering an inspiring environment for children (Wolfe and Rivlin, 1987). In addition, Proshansky and Fabian (1987) note that, while there has been some variability over time in the physical characteristics of the school, there has been remarkably little change in both popular and professional conceptions of what constitutes an appropriate classroom learning environment.

Design issues are closely associated with teaching and learning practices in school settings. While teaching environments can be innovative, traditional modes of instruction and outdated practices can still be carried out there (Weinstein and David, 1987; Tanner, 2000), hence diminishing the potential benefit of innovative and pupil-centred design. Dimmock (2000) argues that school design and re-design should be based on the concept of the learning-centred school. It follows that, in order to design schools for the future, one must consider innovative child-centred design that encourages learning as well as innovative curriculum and teaching approaches. In addition, Proshansky (1978) suggests that a changed physical environment, in this case a flexible classroom design, cannot improve the quality of education without corresponding changes in curriculum, teaching strategies, and methods of evaluation. The latter in turn requires a shift in educational philosophy and goals.

The aim of the current exploratory study – commissioned by the Department of Education and Science – is to identify and chart various perspectives with regard to school design, in order to inform future design practices. In so doing, it explores international research on school design and its relationship with teaching and learning. More specifically, the study aims to examine the strengths and weaknesses of existing primary school building design in Ireland from the perspective of key stakeholders, teachers and pupils, and seeks to offer recommendations for the future development of educational institutions for primary school children. While reference is made throughout the report to current DES guidelines on school design, the capacity of the study does not allow for a detailed critique of these guidelines but rather to an overview of perspectives on school design across different school settings.

Being exploratory in nature, the study does not seek to offer a specific 'model' for future school design. Rather, it addresses the gap in existing research with regard to bringing together teachers', students' and stakeholders' perspectives on existing primary school buildings in Ireland. Combining these different perspectives by involving pupils and teachers is particularly important as lay and expert perceptions and opinions about architecture vary, necessitating the involvement of ordinary users (see Dudek, 2000 and Clark, 2002).

The issue of school design will remain relevant for the foreseeable future. Over the period 2000-2006, 63 new primary schools were built in total. However, more recently school building has accelerated dramatically, in response to changing demographic patterns. In 2008, 48 new primary schools were completed, with the bulk concentrated in 'rapidly developing areas'. For 2009, a total of €613.5 million was allocated for the primary and post-primary school building and modernisation programme. Total enrolment at primary level for 2008/2009 reached just under 500,000, and high birth rates are expected to have consequences for future enrolment. Overall, children of primary school age are expected to increase in number by at least 10 per cent, and possibly even higher, by 2025 (CSO, 2008). As a result, primary school enrolment is expected to increase significantly to a peak of between 554,000 and 624,000 in 2018/19 (DES, 2010). Such population trends are likely to require an on-going programme of new school building in years to come, an issue which motivated the Department of Education and Science to commission this study. Our study is, therefore, extremely timely in providing an evidence base for the design of on-going and future school buildings. Well-designed schools have the potential to enhance children's school experiences, thus promoting adult life-chances; the importance of planning and designing school buildings cannot, therefore, be underestimated.

The following sections give a brief overview of international empirical studies on school design and its impact on teaching and learning. The report takes the following format: Chapter 2 reviews the existing literature on school design while Chapter 3 presents the methodology used in this study and describes the data sources utilised. Chapter 4 focuses on stakeholders' perceptions of current primary school design in Ireland and its impact on teaching and learning. Chapter 5 discusses the perceptions of school personnel in the six primary schools that participated in the study while Chapter 6 focuses on the perspectives of primary school children. Chapter 7 presents a synthesis of research findings from the study. The concluding chapter highlights the implications of the study findings for the future design of primary schools.

2. REVIEW OF EXISTING RESEARCH

This chapter outlines the main findings of existing research on school design and its impact on pupil experiences and outcomes. The first section explores the effects of school size and class size on educational experiences, issues which have been subject to a good deal of debate in the educational community. The second section focuses on classroom layout and the use of information technology within schools. The third section examines the impact of specific environmental factors, such as lighting, noise and colour, on teaching and learning. The fourth section of the chapter explores the future for primary schooling while the fifth section looks at ways in which pupils have been consulted in designing schools.

2.1 School Environments

Numerous research studies on school and learning environments carried out over a number of decades demonstrate the salience of the topic. These studies have focused on different aspects of the school environment, including school size (see Cotton, 1996, 2001; Wasley *et al.*, 2000; Lamdin 1995) and classroom size (see Blatchford *et al.*, 2006; Molnar *et al.*, 1999; Anderson, 2000). Other researchers have dealt with specific aspects of the physical environment of the school, namely density (Maxwell 2003), seating arrangements (Marx *et al.*, 2000), air quality (Rosen and Richardson, 1999), lighting (Benya, 2001), noise (Haines *et al.*, 2001), and colour (Read *et al.*, 1999). Weinstein and David (1987) point out the importance of school environments since exposure to a variety of group and institutional settings leads to new understandings for children about social roles and norms in the world beyond the home. They argue that built environments have both direct and symbolic impacts on children. In other words, these elements have an impact on children's sense of well-being, behaviour and academic outcomes.

However, some studies note that the physical characteristics of the school and classroom have changed relatively little over the years. Proshansky and Fabian (1987) in the United States argue that:

The school is in general the most predictable and most rigidly structured socio-physical setting in the child's early experience ... the concept of rows of desks and chairs facing the teacher's desk in the front and centre of the room has prevailed. ... It is the school's emphasis on control of the behaviour and experience of the child that establishes the institutional nature of its physical setting. ... The most widely adopted strategy for teaching a large group is to match the uniformity of the physical setting with uniformity in behaviour so

that the children can be dealt with as a manageable unit rather than as a collection of very different individuals (ibid., pp. 33-34).

They thus argue that it is the school's emphasis on control of the behaviour and experience of the child that results in the institutional nature of its physical setting.

2.1.1 SCHOOL SIZE

In recent decades, numerous studies have examined the issue of school size (see, for example, Cotton, 1996). Although there is a vast body of literature on the topic, comparatively few high quality empirical studies exist which systematically compare student outcomes in schools of different sizes (Noden *et al.*, 2006). The studies that exist, however, consistently show that small schools are safer, more personalised, and more equitable than larger schools. In smaller schools, students have been found to make greater academic progress and they have a greater opportunity to participate in a variety of activities in which they can further develop themselves (Cotton, 1996). In an earlier study in the US context, Lindsay (1982) found that schools with 100 pupils or fewer in both urban and rural areas had higher extra-curricular participation rates, student satisfaction and attendance, controlling for socio-economic status and ability.

Researchers have set slightly different thresholds for defining small schools. Existing studies that have looked at student performance and school size have found that school size in small (under 200) and medium-sized (400-600) elementary schools had little impact on student performance; however, performance declined significantly as enrolment increased to 800 students (see Eberts *et al.*, 1984). Wendling and Cohen (1981) found that high-achieving elementary schools had a mean size of 447 students and low-achieving schools had a mean size of 776 students; controlling for social background, school size had a negative effect on achievement. In the US report, *Small School Great Strides: A Study of New Small Schools in Chicago*, it was specified that school settings should support '...a small number of students, [no] more than 100 to 350 in elementary schools and 500 in secondary schools' (Wasley *et al.*, 2000, p.15). Other sources suggest different cut-offs in student numbers as being appropriate: the National Forum to Accelerate Middle Grades Reform (2004) in the US suggested that small schools are constructed to support a maximum of 900 students.

In another US study, Raywid (2000) indicated that successful urban schools enrol between 200 and 400 students. Until relatively recently, the trend in the US has been to create larger schools through consolidation and restructuring (Howley, 1997). Historically, larger schools have claimed to offer a more comprehensive curriculum than smaller ones, while involving proportionally lower costs. As a result, during the past decades the number of school buildings in the US has decreased from almost 250,000 to approximately 95,000 (Kennedy, 2003). However, a growing body of evidence has challenged the view that bigger schools are cheaper to run and offer more opportunities for children. In fact, Cotton (2001) and Raywid (1999) have demonstrated in their studies that smaller schools produce better academic results, provide a better school climate, and allow more opportunities for students as well as more personalisation and individual attention compared to larger schools. In this regard, Howley (1997) argues that larger schools are not necessarily more cost effective considering the

dropout rates from larger schools. In another US study, Andrews and co-authors (2002) found that moderately sized elementary schools (with 300-500 pupils) may be in an optimal position to balance costs and benefits, compared to larger schools. In Canada, Leithwood and Jantzi (2009) examined 57 post-1990 empirical studies of school size effects on a variety of student and organisational outcomes. They found that students who traditionally struggle at school and students from disadvantaged social and economic backgrounds particularly benefit from attending smaller schools. The authors argue that elementary schools with large proportions of such students should be limited in size to not more than about 300 students; while those serving economically and socially heterogeneous or relatively advantaged students should be limited in size to about 500 students.

European countries differ with regard to the size of primary schools. According to the PIRLS 2001 survey, most pupils in their fourth year of primary education across Europe attend schools that cater for between 200 and 400 pupils. However, in some countries (such as the Baltic countries) primary school children were much more likely to attend large schools compared to other countries. For example, in France, primary school pupils attend schools whose average (enrolment) size is 216 pupils, whereas in Lithuania it is 741 pupils, mainly due to the differences in the structure of provision and whether pupils at different levels are taught in separate schools (e.g. in the Baltic countries, most schools offer both primary and secondary education, which accounts for their very considerable size) (Eurydice, 2005).

2.1.2 CLASS SIZE

The impact of class size (that is, the number of children in a class) on student performance has been subject to much debate internationally. Some commentators (such as Hanusek, 1999) have argued that ‘resources do not matter’ since a decline over time in average class size in the United States has not resulted in overall performance gains. This work has been interpreted in the McKinsey Report, a review of the ‘best-performing’ school systems internationally, as meaning that class size is less important than other factors such as teacher quality (McKinsey and Company, 2007). However, looking across schooling systems, it is often difficult to disentangle size from class allocation policies since less academically able students may be allocated to smaller groups.

Insights are available, however, from one study in which students were randomly assigned to smaller or average-sized classes, allowing for a very rigorous test of the impact of class size comparing ‘like with like’. Project STAR in Tennessee was an experimental intervention to explore the impact of reduced class size (13-17 students) in the early years of primary education. Students in small classes significantly outperformed those in larger classes (22-25 students), an advantage that persisted to the age of 15 years; additional benefits were apparent for those who started in small classes at an earlier age and stayed in small classes for a sustained period (Finn *et al.*, 2001). As well as higher attainment levels, students who had been in smaller classes were less likely to drop out of high school than other students. Among the control group, 76 per cent graduated from high school compared with 88 per cent of those who had been in small classes for four or more years (Finn *et al.*, 2005); class size had a greater impact on school retention for more disadvantaged students.

More recent studies have stressed the importance of examining the relationship between class size and other variables such as the age level of students, the subject matter taught and the teaching methods used. For example, Blatchford and co-authors (2006) in the UK, exploring the effects of class size on teaching pupils aged 7 to 11 years, found that there was more individual attention, a more active role for pupils and beneficial effects on the quality of teaching in smaller classes. A further study of pupils aged 4-7 years of age (see Blatchford 2003; Blatchford, Moriarty, Edmonds and Martin, 2002) indicated that whole-class instruction was more prevalent in larger classes. Hunn-Sannito and colleagues in the US (2001) also found that teacher workloads become more manageable and students received more individualised attention in smaller classes. Other studies consider it likely that bigger classes will decrease the amount of time that can be spent on instruction and dealing with individual children (see Bennett, 1996; Molnar *et al.*, 1999).

Meyenn (2005) in Australia explored the Class Size Reduction Program that was introduced in NSW Government (Australia) schools on a state-wide basis in 2004. Under this programme, by 2007, average classes were to be reduced to 20 to 24 pupils, depending on the year group. Teachers and principals reported an increase after programme implementation in the frequency of certain teaching practices, especially behaviour management, literacy and numeracy instruction, and group work. They reported that students spent more time 'on-task' and were generally more attentive in smaller classes.

In sum, there has been considerable debate about the impact of class size on pupil outcomes. The Project STAR findings indicate significant benefits from smaller class sizes, especially in the early years of primary education. However, later studies using 'real life' variation across schools in average class sizes have failed to replicate these findings. It would appear, therefore, that the success of smaller classes depends on broader factors such as the kind of teaching approach taken (Milesi and Gamoran, 2006).

2.1.3 SCHOOL BUILDINGS AND CLASSROOM PRACTICE

Burke and Grosvenor (2003) argue that school buildings reflect processes within the broader society. In Britain, a significant number of schools were erected in the 1960s and 1970s in order to accommodate increasing numbers of students. In order to respond to this need, architects often used prefabricated assembly systems to help reduce costs and most new schools in the UK at the time 'tended to resemble factories in their construction and style' (Burke and Grosvenor, 2003, p.18) whereas design aesthetics and comfort were usually given less priority than costs.

In recent decades, there has been a growing interest in the improvement of school design and its impact on teaching and learning activities. In addition, there has also been marked interest in integrating school buildings with their local setting. A concern with harmony and with integration is apparent in the design of many schools (OECD, 1996). The OECD report notes that the quality of the environment can have a significant effect on children. Building a quality environment for children means that attention should be paid to the colours chosen, effective acoustics, carefully selected materials, well-designed lighting and green surroundings (*ibid.*). In addition, Kirkeby (2002) in Finland argues that the pedagogic changes taking place

throughout the educational sector have increased the requirements for physical space as the framework for education.

Brief Overview of Classroom Practices and Environment Historically

'Traditional' images of the school and classroom environment have been found to guide design. In their influential work on school design, Weinstein and David (1987) in the US note that this reliance on traditional approaches has resulted at times in inappropriate design of childcare centres for preschool children, as the developmental needs of very young children were not taken into account. Lippmann (2007) has argued that in the past school buildings were often perceived as settings '...where information is obtained, rather than where knowledge is acquired'. In addition, schools were often 'teacher-centred' (in terms of the teaching methods used) and were structured to support passive (rather than active) learning. This was also reflected in rigid and 'traditional' classroom layouts. The teacher position was typically at the front of the room, leading the lesson, while students were seated in rows, listening and recording what they were being told (Oliver, 2004).

In the same vein, in the UK Galton (1995) notes that in the past the teacher's desk dominated the class (positioned at the front, or in the centre on a raised platform), symbolising both the authority of the teacher and a particular style of teaching. This positioning afforded an uninterrupted view of the class, so that pupils were aware that they could be observed at all times. These arrangements reflected the prevailing ideology of the time influencing the way the teacher functions in the classroom, their '...system of ideas, beliefs, fundamental commitments or values about social reality' (Apple 1979, p.20). According to Galton *et al.*'s (1980) study, whole-class teaching became the norm in English schools approximately one hundred years ago (when it was known as the 'Prussian' system). According to this system, the class teacher had sole responsibility for organising and controlling the activities of a large number of children within the teaching space (or hall). This system allowed the head to supervise all activities in the school directly, including those of the pupil-teachers and uncertified (and so unqualified) teachers who then formed the bulk of the staff in primary schools (*ibid.*, p. 52). Whole-class teaching involved specific skills relating to classroom management with regard to monitoring time and discipline. Elsewhere, Galton (1995) notes that teachers in the UK in earlier decades continued to emphasise memorisation through rote learning. A large proportion of time was spent on the 'three Rs', the attainment of which, along with the general intelligence test, were the major determinants of successful entry into grammar school.

Galton and Williamson (1992) note that significant changes have taken place over the last fifteen to twenty years in classroom arrangements. In place of the traditional arrangements of the past, many schools have adopted more flexible forms of classroom organisation. In fact, by the 1970s British primary schools had moved on from 'traditional' classrooms where teachers stood in front of the class directing pupils who were arranged before them in rows while all worked on the same subject matter (Galton and Williamson, 1992) as such a system was considered to be inappropriate for the 'open' or 'informal' approaches to classroom organisation and 'active learning' that were advocated by the Plowden Report (issued in 1967). These approaches also suggested the use of other areas in the school such as corridors and foyers for individual work. Teachers in the 1970s moved around the class, going from pupil to pupil,

monitoring their activities. At the time, the carpet area was introduced into primary classrooms for common activities such as sitting and listening to stories (Galton *et al.*, 1999). Children now mostly sat together in groups around desks or tables to form larger working areas (*ibid*). This form of organisation reflected the philosophy of the time which emphasised the child as being at the ‘heart of education’ (Plowden, 1967, paragraph 1) and which ‘...extolled the principle of individualisation, while recognising the educational and social virtues of collaborative learning’ (Galton *et al.*, 1999, p.39). Other changes that had taken place were reflected in the fact that children no longer sat in single-sex groups, but engaged in work in small mixed groups (Galton and Williamson, 1992). Open plan areas were introduced where children are taught in a single general area without dividing walls; in some areas, withdrawal spaces are provided where a class, or part of a class, may be to some extent separated from the rest. Such an arrangement facilitates team teaching, where two, three, or more teachers work together, grouping the children in different ways for different areas for the curriculum. Classes can also be grouped vertically, that is, comprise more than one year group, a pattern which is quite common in infant schools and in small junior schools with insufficient teachers to form one class for each year (Galton *et al.*, 1980). Although this research points to more innovative and flexible classroom layout, the introduction of standardised assessment at the various ‘key stages’ in the UK has been seen as impacting on the nature of teaching and learning. Webb and Vulliamy (2007) indicate that, in the light of such reforms, there has been a dramatic increase in the use of whole-class teaching within primary schools and a move in some schools towards seating pupils in rows rather than groups.

Unfortunately, the historical evolution and implications of school design has not been systematically documented in the Irish context. However, Coolahan’s (1981) historical account of the educational system indicates that concerns about school design and conditions have been evident for a long period. The Powis Report of 1868, for example, commented on the condition of some schoolhouses. It was noted that only two-thirds of the schools were in good physical condition, and less than half had a playground and enclosing walls. Several hundred did not have sufficient number of desks and had poor lighting, ventilation and heating. In many cases, teachers looked after the repairs and provided teaching materials such as maps and wall charts (Coolahan, 1981; INTO, 1980). The 1960s and 1970s saw an increase in the building of new schools. It also saw the emergence of non-cellular classrooms, a consequence of curricular changes, largely influenced by Rousseau, Piaget, and Bruner (INTO, 1984). The 1971 curriculum highlighted more child-centred education and learning and play (INTO, 1995). The new emphasis on the acquisition of knowledge by subjective, activity-based learning also influenced internal classroom layout and design, with the introduction of interest areas, wet areas, display facilities and non-fixed seating. There was also an increase of classroom floor space per pupil, inclusion in the school design of storerooms, and assembly halls, en-suite toilets, improved lighting and several other features (INTO, 1984).

Changed Perceptions of Teaching and Learning and the Role of School Design

Rudd and co-authors (2004) argue that one of the recurring ideas in much of the literature on the future of teaching and learning is the belief that the learner should be at the heart of future developments with the teacher’s role increasingly seen as that of a facilitator. A good deal of the existing literature suggests a strong tendency towards ‘customised’, ‘individualised’

or ‘personalised’ learning. According to the authors, the nature of learning in the future can be conceptualised in terms of three main dimensions of change:

- The characteristics and expectations of future learners;
- The demands that will be placed on future learners;
- New approaches, foci and contexts of learning.

In this regard, the notion of ‘lifelong learning’ is becoming increasingly important. It has also been argued that ‘...education in the future is redesigned to help children develop the problem-solving skills and creative abilities necessary to participate in the knowledge economy and play a full part in society as well as being fun and relevant to the learners’ (Local Government Act, 2000, p.1). It is also envisaged that pupils will have increasing control over what and how they learn (ibid., p. 4). In the same vein, Bentley and co-authors (2001) consider two crucial foci for learning in the future to be ‘creativity’ and ‘community’. The authors argue that possessing knowledge in the information age is not enough. Individuals need to be able to apply their knowledge in new and valued ways in order to be able to respond effectively to the changes taking place in the wider society. Communities become increasingly important as they provide a wider context from which learners can draw guidance, motivation and meaning for what they are trying to learn. In addition, the author notes that the communities surrounding schools can provide resources for learning which are frequently untapped.

Today, teaching and learning is commonly viewed from a constructivist perspective. This perspective refers to new understanding about excellence in teaching and learning as well as the roles of teachers and learners. The latter are seen as active agents and the teacher’s role is that of a facilitator rather than a transmitter of knowledge (Moussiaux and Norman, 1997). In other words, learning is regarded as a self-directed process of constructing meaning, which takes place in interaction and the teacher’s role is to support this learning process by selecting teaching materials and methods that aid the learning process (Baines and Stanley, 2000; Jaworski, 1994). Knowledge is thus constructed by the learner and not passively received from the teacher. In this context, it is also important that teachers understand what constitutes effective teaching for good learning. Constructivist teaching practices are intended to produce much more challenging instruction for students and thus produce improved student learning; teachers’ skills and their commitment can also bring about structural change in schools (Moussiaux and Norman, 1997; Cohen, 1995; Elmore, 1995). In order to change their teaching techniques, teachers need the opportunity for staff development so they might move away from a more ‘traditional’ mode of instruction. They also need the opportunity to develop shared goals, expectations and beliefs about what constitutes good teaching (Elmore, 1995). The ‘traditional’ teaching approach was, in principle, direct instruction, involving imparting of the knowledge about the content or skills to be learned; while effective when students had to reproduce factual knowledge, this approach was seen as neglecting the development of a wider set of skills and competencies (Steffe and Gale, 1995). The move towards integrating constructivist principles into the classroom is likely to have significant implications for classroom layout and design because of the focus on active learning methods.

Two reports by the Department for Education and Skills (DfES) (2002; 2003) in the UK acknowledge the importance of design and architecture as contributors to the learning environment since the physical environment can stimulate and encourage educational activity. A positive environment is seen to contribute to improved student retention and a reduction in discipline problems. Furthermore, the report of the Teaching and Learning in 2020 Review Group (2006) highlights the importance of personalised teaching and learning in the future. Such an approach means focusing in a more structured way on each child's learning in order to enhance progress, achievement and participation. The report states that, while there is no single blueprint for a school designed for personalised learning, previous experiences have shown that schools should be flexible in order to enable a variety of learning and teaching approaches to be used, accompanied by greater diversity in the size and age mix of pupil groupings, as well as improving links with parents and the wider community in order to encourage participation and collaboration. In addition, the schools should be '...open, safe and inviting; support interaction, knowledge sharing and learning amongst teachers and support staff; use technology – both within and outside classrooms – to enhance learning' (ibid., p. 25).

The UK DfES report on Building Schools for the Future (2007) notes that schools today are expected to offer extended services in addition to their traditional role. In fact, by 2010 it is envisaged that primary schools will provide access to high quality year-round childcare and that secondary schools will provide a range of activities, such as homework clubs and study support, sports, music tuition, dance and drama, arts and crafts; parenting support, including family learning; swift and easy referral to specialist support services (such as speech and language therapy) and intensive behaviour support – possibly delivered at school; and wider community access to ICT, sports and arts facilities, including adult learning. It is noted in the report that some British schools already offer access to multi-disciplinary teams from health, social care and youth services, and that many have used their school grounds to provide recreational facilities, play areas, recycling facilities, youth clubs, and local produce areas (ibid., p. 22). These ideas echo sentiments put forward by Brubaker *et al.* (1989) who noted that the key words describing the schools of the future are flexibility and adaptability. They note that: 'When thoughtfully planned, constructed, and managed, schools will be places where individuals and whole families learn basic skills, learn about occupations, business and history, and art and languages' (ibid., p.36). They note that schools need flexible facilities that can, at a minimal cost, be converted from classrooms to seminar rooms, to individual study spaces or into study areas for a few students. Furthermore, they also suggest that '...the school of the future will look more like an office and laboratory environment where small teams study, discuss, and create with the assistance of technology'.

In addition to the flexibility of school buildings, discourse about the sustainability of schools has also taken centre stage in recent years. The UK DfES report (2007) notes that this will have a positive impact on staff morale and better pupil behaviour as well as providing opportunities for food growing and nature conservation. It is also argued in the report that by building sustainable schools, one can access a rich resource for teaching. Sustainability is also seen to result in significant savings on running costs as well as a smaller impact on the environment. Such schools are energy efficient, making use of renewable energy, with low carbon footprints and using wind, solar, rainwater and bio-fuel sources in their communities.

In Ireland, developments in school design are reflected in a number of DES technical reports (1978; 2000; 2007). The recent primary school design guidelines make a number of recommendations for the design of indoor and outdoor areas, acknowledging the revised primary school curriculum that embraces new developments in teaching approaches and methodologies. The guidelines also take note of various environmental factors such as the importance of use of natural daylight, good ventilation in classrooms, and noise reduction. In addition, the Department have an award winning research and development programme in the area of sustainable energy efficiency in school buildings (DART Approach – see www.energyeducation.ie). The programme focuses on four key areas, namely: design, awareness, research and technology (Department of Education and Science, 2009). It is argued that all schools designed and built in line with the above policy and the technical guidance documents can have an energy performance that is more than twice as efficient as international best practice (ibid).

Outdoor Spaces

Relatively few international studies deal with the use of outdoor space in schools. In fact, Blatchford (1989) describes the schoolyard and outside play areas as the ‘forgotten spaces’ of the school (see also Blatchford and Sumpner, 1998). Yet Tanner (2000, p.313) notes that ‘...outdoor learning environments are becoming more popular as curriculum innovation seeks to involve students in the study of ecology and greener environments’. While school grounds are becoming more significant sites for children's environmental learning (Malone and Tranter, 2003), often overlooked considerations for schools include the design and development of green areas, natural quiet areas, and play areas (see also McIntyre, 2006). Historically, play areas have been a part of all schools. Burke and Grosvenor (2003) observe that children's time in the playground is sometimes perceived by adults (including teachers) as a source of anxiety since this space is often associated in their minds with misbehaviour. In the 2001 ‘The School I'd Like’ competition in the UK, younger children wanted more space and more equipment in the playground, including mazes, ponds, swings, gardens and slides. Other research on play shows that children prefer and use playgrounds that are challenging, novel and complex (Fjortoft and Sageie, 2000). The school must include places for indoor and outdoor play, since it is through play that children acquire social, cognitive, and physical skills as well opportunities for fun and a break from school work (Gaunt, 1980; Burke and Grosvenor, 2003).

In Ireland, Carty (2007) observes that school outdoor areas appear to be perceived by children as ‘play’ spaces where they themselves are the main players, as opposed to their perceptions of classrooms as ‘work’ spaces created and controlled to a large extent by teachers. This stronger sense of ownership over their outdoor learning space than over their indoor learning space may be a factor in children expressing more confidence and imagination in their design of outdoor spaces. One possible explanation for this may be that children view indoors as the teacher's territory and the outdoors as children's territory. Alternatively perhaps, the indoor space appears already ‘designed’ to children whilst the outdoor space does not. However, outdoor space seems to receive less consideration – a recent survey of Irish primary school principals (see Fahey *et al.*, 2005) demonstrates their dissatisfaction with school sports facilities, although DES (2007) guidelines have made recommendations with regard to the provision of ball courts and play areas.

Within the Building Schools for the Future (BSF) movement in Britain, attention has also been paid to promoting school sports. The plans focus on developing both outdoor and indoor school sport facilities and creating flexible spaces for sport open not just for pupils but also for others. The DfES (2007) notes that Building Schools for the Future offers an opportunity to provide imaginative PE and sport facilities and attractive playgrounds. It is noted in the report that the existence of good quality PE and sports facilities may help tackle student inactivity, boredom and misbehaviour while boosting their well-being and achievement. It is hoped that providing such facilities will encourage previously resistant pupils to engage in new and different activities, including dance, trampoline, fitness studios, climbing walls and short tennis (*ibid.*, p. 24).

2.2

Classroom Design, Teaching and Learning

2.2.1 CLASSROOM LAYOUT AND SEATING ARRANGEMENTS

The previous section dealt with changes in school design and teaching approaches over time. In this section, we will discuss the implications of these changes for children's learning. In recent years, it has increasingly been recognised that sitting in groups enables children to share facilities as well as ideas. However, some studies in the British context focusing on primary classrooms show that verbal exchanges between pupils are much rarer in this setting than one might have supposed (Galton *et al.*, 1980; Mortimore *et al.*, 1988). In fact, the authors have found that, in many primary classrooms, children, although seated together, work alone. In their study, Galton *et al.* (1980) distinguish between different groups whereby: (a) a group of children work on a similar theme or curricular area at their own space; although children sit in groups, they do not work as a group; and (b) a group of children work on the same task because they are at approximately the same stage of learning but they work as individuals with a minimum of co-operation. The main purpose here is to use the teacher's time more efficiently by allowing him/her to introduce topics, give directions and guide subsequent activity. Galton *et al.*, argue that groups function best when they are of mixed ability. The authors also note that, if children sit in groups, they are likely to achieve more if they are encouraged to co-operate. Such groupings seem to improve pupils' self-esteem and increase motivation.

Moving away from the 'traditional' classroom layout where children sit in rows to open plan areas in classrooms has become increasingly common. Galton *et al.* (1980, p. 98) found that the 'typical' pupil co-operates on his/her task less in the 'open plan' situation than in the 'box' (or discrete) classroom. Teacher and pupils are seen to initiate less interaction together – consequently, there is less pupil-teacher interaction in open plan classes. The authors also found that teachers in open plan areas ask fewer questions (and particularly fewer 'higher cognitive level' questions); and that they make fewer statements (including higher order statements, relating to ideas). They spend more time in checking over and monitoring ('marking') pupils' work but otherwise give less feedback. However, in the open plan situation the pupil has more opportunities to observe and learn from other pupils' work or activities. Conversely, in box classrooms all such interactions comprised nearly 82 per cent of the time (*ibid.*). Other studies, such as that of Wheldall and Lam (1987), showed that, where children were required to be sitting down and engaged in individual work, the level of on-task work was substantially higher when seated in rows than when grouped around tables. Hastings *et al.* (1996) note that, in order to

encourage effective learning, teachers need to use a variety of organisational approaches to ensure that 'seating organisation reflects teaching intentions and task demands'. Kirkeby (2002) in Finland notes that in the Nordic countries there is a common tendency towards an increasingly open school and more places for individual and group work.

Montello (1992) notes that to date there are few studies of classrooms as physically structured interaction settings. Marx *et al.*'s (1999) study on German children investigated the relationship between classroom seating arrangements (the positioning of students relative to teacher in the classroom space) and the question asking of 10-year-old German children. Children were assigned to sit in a semicircle and then in a row-and-column seating arrangement. Student-teacher interaction in the class was systematically observed and it was found that children asked more questions in the semicircle than in the row-and-column arrangement. The authors conclude that social interaction is encouraged when individuals are able to establish face-to-face contact. Furthermore, psychologists have stressed the importance of question-asking as part of children's problem-solving skills (King, 1995). Questions serve many important educational functions, enabling individuals to seek information, obtain clarification, and receive information (Good *et al.*, 1987).

The previous section mentioned vertically grouped or multi-grade classes – that is, classes that comprise more than one year group. Galton (1998) notes that organising children in this way in a class results in certain difficulties for the teacher as he/she needs to 'match' tasks with children's developmental level. Teachers are also seen to spend more time interacting with pupils in vertically grouped rather than in single age classes, perhaps a reflection of the increased demands made on the teacher.

2.2.2 USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) IN SCHOOLS

Information and communications technologies (ICT) are now a part of everyday life in schools. Much has been written about the potential impact of information technology on the organisation of learning and the implications of the increasing use of computer-mediated activities for the role of the teacher (see Somekh and Davis, 1997). Rudd *et al.* (2004) note that a good deal of the work on the future of teaching and learning is written from a technological stance, perhaps because technological developments are often seen as the most obvious and most visible manifestations of change in this context. The authors argue that the use of ICT will bring increased flexibility in teaching and learning in the future. This flexibility applies to multiple sites of learning, access to materials, tutorials and changed assessment practices. Conversely, some concern has been expressed that computers significantly limit the role of teachers, a view rejected by Johnson and colleagues (1994). Mortimore (1998) makes some interesting observations about the use of ICT in schools and its impact upon teachers' skills. The author notes that '...the pace and nature of development in information technology ... makes change more, rather than less, likely' and this emphasises '...the need for teachers of the highest calibre' (*ibid.*, p. 11). Rudd *et al.* (2004) note that overall ICT is one of the most popular topics for discussion in the futures literature. It is clearly an area that is going to continue to impact upon teaching and learning in significant ways. In fact, most writers on the topic agree that, in some shape or form, new technologies will bring flexibility for both teachers and

learners. In the same vein, Heppell *et al.* (2004) note that new pedagogies are emerging globally. They argue that ICT has been both a catalyst for change and a key tool to bring about that change in learning as indeed it has been in the social and economic infrastructure.

In Britain, the Becta report (2001), *Primary Schools of the Future – Achieving Today*, investigates the link between ICT and educational standards using a variety of data sources. In recent years, there has been a significant expansion in the use of ICT in British schools. Statistical data on schools showed that schools with good ICT resources tended to have better achievement at Key Stage 2 than schools with unsatisfactory resources. Schools that use ICT to support a subject tended to have better achievement in that subject than schools that did not make such use. Head-teachers of ‘high ICT’ schools identify ICT as having an impact on factors known to have a direct impact on learning, including: pupil motivation, subject knowledge teaching, pupil effectiveness, school effectiveness, and home-school relations.

Hall and Higgins (2005) in the UK explored primary school students’ perceptions of interactive whiteboards (IWBs) using twelve focus groups. In general, IWBs were viewed very favourably by the children. They liked the fact that they incorporate an assortment of previous educational technologies, that is, chalkboard, plain whiteboard, television, video, overhead computer and personal computer but with the added advantage of being able to interact with various elements of these media. Furthermore, Walker-Tileston (2004) argues that children learn best through their dominant senses, seeing, hearing and touching. As a result, IWBs make learning more enjoyable and fun. The authors warn, however, that a balance must be struck between structured and meaningful uses and unstructured uses purely for the purposes of gratification, such as games. What the students did not like were technical problems that caused disruption, delay and frustration. Other issues that emerged included teachers’ and students’ ICT skills and access to technology. Other studies sound a note of caution in indicating the importance of the use to which new technologies are put. Smith and co-authors (2006) indicate that used uncritically interactive whiteboards may, in fact, result in a move towards a greater use of whole-class teaching with less time being spent on group work.

A recent report by the DfES (2007) in the UK notes that ICT encourages pupils to collaborate with one another and take responsibility for their own learning; it helps to nurture individual talent, independence and a strong sense of self-worth and confidence; it inspires pupils to use their imagination and sparks creativity; and it develops enquiry and communication skills, creating appropriate contexts for critical thinking, decision making and problem-solving activities (*ibid.*, p. 30). However, shortage of computers may mean that not all children have access to these learning opportunities. While technology has radically changed our everyday lives, the potential of computing has yet to be fully realised in school-based learning (Cuban, 2001).

In recent years, Ireland has also provided resources for the promotion and development of ICT in schools. For example, the Schools IT 2000 initiative was introduced by the Department of Education and Science in 1998 to provide capital funding, teacher training and a range of support

services for ICT development and use in schools. According to NCCA (2004), specific aims for ICT use in the primary school include:

- to enable the child to use a range of ICT tools in a relevant curriculum context,
- to enable the child to develop and use ICT skills in the attainment of curriculum learning objectives,
- to foster the child's confidence in his or her use of ICT, through enjoyable learning experiences,
- to develop the child's understanding and practice of the safe use of ICT,
- to enable the child to overcome barriers of access to learning resources caused by geographic location, culture, or language,
- to enable the child to use ICT to support his or her learning effectively and creatively,
- to inform the child's attitudes regarding the role of ICT in society, including the benefits and challenges of ICT use,
- to support the development of the child's social skills through co-operative learning and problem-solving. (ibid p.2).

DES (2004a) Information and Communication Technology (ICT) Infrastructure Guidelines for Primary Schools recommend integration of the infrastructure needs of Information and Communication Technology (ICT) with the building structure. The guidelines reflect recent changes in the educational system in Ireland and changes in ICT technology and standards.

With regard to research in the Irish context, Shiel and O'Flaherty (2006) found that the pupil-computer ratio in primary schools had fallen from 11.6 in 2001 to 11.3 in 2002 to 9.1 in 2005, with designated disadvantaged primary schools faring somewhat better in terms of the pupil-computer ratio. Surveys in 2001 and 2006 have indicated fewer computers in Irish primary schools compared with the European average (Eurydice, 2001; European Commission, 2006). In 2006, there were 9.2 computers per 100 pupils in Ireland compared with an average of 11.3 in the EU 25; similarly, there were fewer computers with internet access in Irish compared with European primary schools (7.0 compared with 9.9 per 100 pupils). Furthermore, teacher dissatisfaction with ICT facilities was greater in Ireland than in other countries. Current DES (2007) guidelines recommend that each primary classroom should have a computer area with five workstations to enable the use of IT in teaching and learning.

The Inspectorate evaluation report on ICT in Schools (2008) provides a useful insight into the provision and use of ICT in primary and second-level schools in Ireland. According to the findings of the study, at primary level the student-computer ratio is 9.1:1. The lack of technical support and maintenance is a significant impediment to the development of ICT in schools. Only 30 per cent of primary teachers rated their ability as either "intermediate" or "advanced" with regard to using teaching and learning methods that are facilitated by ICT. Recently qualified teachers rated their ICT skills more highly than more experienced teachers. The 2009 evaluation of the implementation of the Schools Broadband Programme (involving a representative sample of schools, both primary and post-

primary, and across all technologies) showed that the broadband service was judged by schools to have had a positive impact on schools and has facilitated the introduction of ICT-based delivery of education to pupils. However, the evaluation also identified a number of areas that needed attention, including the quality of the service.

2.3 Individual Environmental Factors, Teaching and Learning

An increasing number of studies have focused on the effect of individual environmental factors on pupils' school experiences and academic outcomes. These studies have discussed the effect of density, air quality, light, colour, noise and other factors. While some researchers find that there is no conclusive evidence that better school design has a positive effect on pupil outcomes (Picus *et al.*, 2005), other studies that investigated possible relationships between individuals and groups in their physical environment indicated a significant link between better educational facilities and improved pupil achievement (see BICE, 2006; Schneider, 2002). This section will give a short overview of international empirical research on environmental factors.

2.3.1 DENSITY (SCHOOLS AND CLASSROOMS)

Maxwell (2003) in the US notes that students' self esteem and identity may be influenced by density, noise and the general physical environment. She explored classroom spatial density effects on elementary school children (second and fourth grades in urban public schools). Her findings indicate that the amount of space per child in the classroom may be just as important in terms of their academic learning and behaviour as the number of children in the classroom. Girls' academic achievement was negatively affected by less space per student while boys' classroom behaviour was negatively affected by spatial density conditions. She notes that previous research shows that chronic exposure to high density for children has generally negative effects, including increased aggression and hostility, poor academic performance, poor family social interaction, and social withdrawal (Evans *et al.*, 2001). Maxwell notes that:

In an elementary school where students spend a large amount of time in one classroom, a child's experience in a large school may be positively affected by being in a classroom that allows ample room per child. Likewise, a child in a smaller school with smaller class group sizes may be in a high spatially dense classroom and not benefit from the positive effects of a smaller school. An individual child's experience is tied directly to a specific classroom. (p. 574)

With regard to boys, Maxwell suggests that boys' response to the crowded classroom may be to try and claim space for themselves by acting out. This finding held for classrooms that had less space per child, not necessarily more students. Overall, both girls and boys are vulnerable to the negative effects of high classroom density, particularly spatial density. Previous studies have noted that decreasing the amount of space per child from 25 to 15 square feet was accompanied by increased aggressive behaviour, more parallel play in large groups and less group play (see Smith and Connolly, 1980 for UK context).

2.3.2 LIGHTING

Jago and Tanner (1999) cite the results of a number of previous studies that find that appropriate lighting improves test scores, reduces off-task

behaviour, and plays a significant role in the achievement of students. Benya (2001) notes recent changes towards introducing energy-efficient windows and skylights and a renewed recognition of the positive psychological and physiological effects of daylight. In the same vein, Lemasters's (1997) synthesis of 53 studies pertaining to school facilities, student achievement, and student behaviour reports that daylight fosters higher student achievement. In addition, the Heschong Mahone Group (1999) indicates that students with the most classroom daylight progressed 20 per cent faster in one year on Mathematics tests and 26 per cent faster on reading tests than those students who learned in environments that received the least amount of natural light.

In the Irish context, the Department's (Primary and Post-Primary) General Design Guidelines for Schools (2007) propagates the use of natural daylight where possible and notes that the amount of light, among other factors, influences how pupils learn. Another DES (2004a) document recommends that all teaching spaces and habitable rooms should have natural daylight as the principal source of light with artificial lighting used only to supplement available daylight. An average daylight factor recommended by the Department is in the range of 4.5 to 5.5 per cent, which means that classrooms achieving this standard will have natural light for 70-80 per cent of teaching hours.

2.3.3 NOISE

The ways in which classroom noise can impact on children's learning and attainment have been relatively neglected in educational research. The existing literature documents the adverse impacts of loud, ambient noise exposure on reading acquisition in children (see Berglund and Lindvall, 1995; Kryter, 1994). A major part of the research has focused on the effects of transportation noise, such as aircraft and road-traffic noise (see Haines *et al.*, 2001). Studies on other types of noise are relatively rare. However, Lundquist *et al.* (2000) found that chatter was rated as the most disturbing noise in school, and their study showed a relationship between perceived annoyance and the estimated negative effect on schoolwork.

The research linking acoustics to learning is consistent and convincing: good acoustics are fundamental to good academic performance. Earthman and Lemasters (1998, p.18) report three key findings: that higher student achievement is evident in schools that have less external noise, that outside noise causes increased student dissatisfaction with their classrooms, and that excessive noise causes stress in students, in line with Evans and Maxwell's (1999) findings. An Austrian study by Lercher *et al.* (2003) focuses on attention and memory among primary school children (grade 4) chronically exposed to ambient noise levels. They found that chronic noise exposure was significantly related to memory. As a result, the authors warn that even modest elevations in noise exposure in typical residential areas could be affecting developing memory systems. Excessive noise can interfere with learning by affecting memory (Hygge, 2003). Children attending schools near an airport were found to have significantly more errors on a standardised reading test and their reading comprehension deteriorated compared to students from quieter communities (Hygge *et al.*, 1996). Boman and Enmarker (2004), environmental psychologists in Sweden, also write about the effect of noise on schoolchildren. They report on two studies (one survey and the other focus groups) intended to develop and assess conceptual models of how different factors mediate and

moderate the annoyance reaction in school environments. They note that studies concerning pupils' annoyance in school are rare, with almost all studies in this area based on adults. Boman and Enmarker (2004) found that students considered chatter as the most disturbing sound in school. Students felt that noise induced a feeling of stress, including irritation, tension, headache, tiredness, energy loss; this affected their behaviour, making it difficult to concentrate and slowing down their work. The researchers also found that the methods used by the teachers and teachers' authority were important for performance during noise or for the prevention of noise. Blondeau *et al.* (2005) in France further highlight the importance of school site location. They argue that schools next door to heavy traffic areas may have higher levels of outdoor pollutants being drawn indoors. Anderson (2004) argues that although the importance of classroom acoustics to educational outcomes is well supported in the research literature, it is frequently ignored by school officials and by those designing schools. In the Irish context, the DES (2007) guidelines note that good acoustic separation is required for all teaching spaces and noise-sensitive rooms.

2.3.4 COLOUR

Read and co-authors (1999) in the US report that empirical studies that examine features of the physical environment, such as colour, wall surfaces, and vertical space, lighting and acoustics, and how they affect development, are sparse. Focusing on pre-school children, the authors found that differentiation in ceiling height or wall colour was related to higher levels of co-operative behaviour among preschool children. They note that:

The process through which children gain knowledge and learn from their environments is perception. Children are inherently active perceivers, motivated to discover, explore, attend, extract information, and differentiate objects within their environments. They are stimulated by the rich source of information present within their environments, which extend over time and space, continually leading them to perceive and learn at still higher levels. Environments, therefore, are characterised by affordances, referring to what environments offer, provide, furnish, or afford children that are perceived and learned (p. 414).

Read *et al.*, found that the physical space that was the least differentiated was the environment in which preschool children displayed the lowest levels of co-operative behaviour; where the ceiling height and wall colours were differentiated, children displayed the highest levels of co-operative behaviour. Other studies on colour in learning environments focus on its physiological (i.e. blood pressure, brain activity, pulse and respiration rates) and psychological (i.e. affect) effects rather than social effects (Norman and Scott, 1952; Olds, 1989). Moore *et al.* (1995) suggested that warm colour tones be used in quiet areas to create a calmer atmosphere. Olds (1989) also suggested the use of warm tones to control activity in highly active areas, and cool tones for quiet and soothing areas.

Woolner *et al.* (2007a) in the UK refer to the paucity of clear, replicable empirical studies, especially research that addresses specific elements of the environment. Their study reports on a literature review which looked at the evidence of the impact of environments on learning in schools. The authors conclude that, although the research often indicates the parameters

of an effective environment, there is an overall lack of empirical evidence about the impact of individual elements of the physical environment which might inform school design at a practical level to support student achievement. The authors find clear links drawn between poor quality school buildings and classrooms and poor outcomes for learners and there is evidence that bringing these environments into the 'normal range' of acceptable provision reverses the detrimental effects. Temperature, heating, air quality, (external and internal) noise and lighting fall into this category. Inadequacies in these areas can have detrimental effects on concentration, mood, well-being, attendance and, ultimately, attainment. The authors are critical of the fact that existing empirical research on the impact of environment on teaching and learning tends to focus much more upon certain elements (such as noise) and fails to synthesise understandings across different dimensions of the environment (such as the fact that the implications of noise and temperature research tend to conflict). They note that '...it is reasonable to suggest that positive changes, selected by the teachers and learners might tend to beget further positive changes in a 'virtuous cycle', whereas negative elements might cause a vicious cycle of decline' (p. 61). One has also to bear in mind that '...schools are systems in which the environment is just one of many interacting factors: including, but not exclusive to, pedagogical, socio-cultural, curricular, motivational and socio-economic' (p. 61).

2.3.5 AIR QUALITY AND TEMPERATURE

Some international studies deal with indoor air quality in schools and its effect on student experiences and well-being. Buckley *et al.* (2005) and Rosen and Richardson (1999) note that poor indoor air quality increases student absenteeism and reduces student performance as students' well-being and health may be affected by air quality. In the same vein, Nedellec (2005) recognises the importance of the topic but finds that very little research exists in this area. Two major studies in the area in the United Kingdom in 2001 found air quality in the classroom was not satisfactory in a notable number of schools. The main reason for poor ventilation in the classrooms was inadequate use of openable windows. In the US, Shendell *et al.* (2004) found that a 1,000 parts per million (ppm) increase above the outdoor concentration of CO₂ was associated with statistically significant 10 to 20 per cent increases in student absences. Reviewing the literature, Mendell and Heath (2004) found that there is a paucity of studies investigating the relationship between room temperatures in schools and occupant comfort or productivity of teachers and students, indicating a clear gap in research.

2.3.6 USING STUDENT ARTWORK TO BOOST BELONGING

Killeen *et al.* (2003) in the US explored whether the physical design of learning environments can foster a sense of student ownership in the learning process and discovered a significant association between school design and students' sense of ownership. Sense of ownership incorporates personalisation, sense of control, territoriality and involvement. Within schools incorporating permanent artwork, the stronger students' perceptions are that their artwork can be permanently displayed, leading to a greater sense of their ownership. The authors argue that student engagement may be significantly influenced by sense of ownership. By allowing students to play a role in the design and aesthetics of their school, they feel a stronger sense of ownership over their learning environment.

Moore and Lackney (1993) explore previous research on the relationship between educational outcomes and the architectural design of educational facilities in the United States. Two physical environmental factors are found that directly impact on academic achievement in elementary schools (school size and classroom size) and another two that impact on 'non-achievement' behaviours (location and secluded study spaces). The authors note that there is a crisis in education in the USA today and in the infrastructure of its school buildings which are frail and ageing. They review research on school size, classroom size and density, location and noise, and the existence of secluded study spaces. Research findings reviewed by the authors demonstrate that a comfortable, attractive physical setting can be supportive in creating enthusiasm for learning and encouraging social relationships. They found compelling evidence (in relation to class size and school size) that the physical setting impacts directly on academic achievement. Other physical variables impact less directly. The authors stress the need to develop a more comprehensive model of the factors contributing to learning achievement outcomes. Such a model would include a range of psychosocial and pedagogical factors as well as physical environmental factors.

2.3.7 CLASSROOM FURNITURE

Relatively few studies have addressed the impact of classroom furniture on pupil comfort and engagement. In a study of 10-14 year old children in India, Savanur and co-authors (2007) found that seat and desk heights were higher, and the depth of seats and desks less, than was appropriate for the physical dimensions of pupils sitting in them. As a result, students reported discomfort in the shoulder, wrist, knee and ankle areas. The authors recommend the use of adjustable seat heights along with footrests in classrooms. Even in Finland, a country commonly regarded as at the cutting-edge of school design, Saami and co-authors (2007) discovered a mismatch between school furniture and the physical dimensions of pupils, with schoolchildren sitting in 'disadvantaged postures' for a substantial part of the school day.

2.3.8 FACILITIES AND TEACHERS

Buckley *et al.* (2005) in the US focus in their study on teacher attrition. They note that there is very little research to date on the effects of school facility quality on teacher retention. The authors suggest that one of the factors in a teacher's decision to stay or leave is the quality of school facilities. Based on a survey of teachers, the authors found that facility quality is an important predictor of the decision of teachers to leave, even after controlling for other contributing factors. The quality of the school can affect the ability of teachers to teach, teacher morale, and the very health and safety of teachers.

Lackney (1999) and Corcoran *et al.* (1988) find that teachers emphasise their ability to control classroom temperature as central to the performance of both teachers and students. The effects of lighting on student school experiences has also been commented upon by Jago and Tanner (1999), who noted that appropriate lighting improves teaching as students are less likely to engage in off-task behaviour, and plays a significant role in the achievement of students. Lucas (1981) found that external noise may cause more discomfort and lowered efficiency for teachers than for students and may affect their ability to teach. Martin (2002) in the UK investigated the impact of the design of classroom environments on the practice of

teachers. The study involved data gathered from primary and secondary schools, using lesson observations and teacher interviews. She found that teacher-centred lessons tended to occur in classrooms with less space and higher density of pupils, whereas child-centred lessons tended to occur in classrooms with a greater amount of space per pupil. Teachers were aware that the setting affects their teaching styles and a large proportion of teachers take into account their classroom spaces when planning their lessons. She notes that when a teacher does not recognise the role of the environment, it is unlikely that change will occur in their practice

2.4 The Future of Primary Schooling

Primary school systems internationally vary in the age-group they cover, the teaching approaches used and the form of assessment employed (Le Metais, 2003). It can therefore be expected that such system-level differences will persist, at least to some extent, into the future. However, educational systems are also subject to influence by social and economic factors at both the national and international level. The OECD has posited six possible future scenarios for schooling in general (OECD, 2001; 2002):

- Little change to the organisational structures of teaching and learning;
- Increased marketisation of education;
- Schools become core social centres, with shared responsibilities between schools and other community bodies;
- Schools become focused and flexible learning organisations;
- De-schooling with a move towards non-formal learner networks;
- De-schooling because of a 'meltdown' of school systems.

Such scenarios tend to be delineated at a very high level of abstraction and so it is difficult to infer the implications for teaching and learning and the spaces within which they occur. An alternative approach is to explore a number of trends or developments which have emerged in discussions of the future of primary schooling across many countries; these include:

- The use of active learning methodologies as opposed to more teacher-centred approaches;
- An emphasis on personalised learning;
- The use of play as a basis for learning;
- The use of ICT as a site for learning;
- An emphasis on the development of skills or competences instead of, or as well as, a focus on subject content;
- An inclusive approach to provision for children with special educational needs;
- A shift in the boundary between the school and community (for example, through the extended services model).

These developments are considered briefly in the remainder of this section.

There has been variation over time and across educational systems in the emphasis on *a child-centred approach to teaching and learning*. In England, for example, the child-centred approach employed in the 1960s and 1970s was

tempered by a new focus on preparation for working life and centralised control of schooling as a response to economic imperatives from the 1980s onwards (Shuayb and O'Donnell, 2007). Analyses of teaching practices across a number of European countries indicate no single prescribed teaching style, with teachers in all countries using a combination of whole class, group and individual learning according to needs. However, the demand for transferable skills and the introduction of ICT are leading to a greater emphasis on group work and independent learning in virtually all countries; such a trend is likely to continue into the future (Le Metais, 2003). In Sweden, for example, there is a general tendency towards less 'teaching from the front' with more individualisation and group work, allied with teaching teams often using a problem-based approach to exploring cross-curricular themes (Le Metais, 2003).

Analyses of best practice indicate that effective group work in primary schools has a positive effect on children's academic progress, higher conceptual learning, behaviour, and personal relations with teachers and peers (James and Pollard, 2008; Brophy, 1999; Alexander, 2010). However, research clearly indicates that pupils should be trained in group work practices and group work be supported by teachers so that pupils are learning as groups rather than merely seated in groups (Blatchford *et al.*, 2008). Using project-based or problem-based learning tasks is found to lead to better understanding and a greater ability to transfer learning to new situations (Codd *et al.*, 2002).

Allied to a focus on more active learning approaches, policy commentators have emphasised the importance of *personalised learning* as a key to future educational provision. While the term personalised learning has been used to cover a variety of different approaches, the central element rests on tailoring provision to the needs of the learner (Sebba *et al.*, 2008). Thus, personalised learning is seen as involving assessment for learning, active teaching and learning strategies, curriculum relevance, flexible learning pathways through the system and a student-centred approach to school organisation (Pollard and James, 2004).

Effective group work and personalised learning opportunities are seen as key to the educational and social development of learners of all ages. The use of *play-based learning* is increasingly seen as crucial to the development of younger learners, and as spanning the period from preschool to primary school. Play is acknowledged as supporting intellectual development alongside social, emotional and physical development (Broadhead, 2006). Play is found to be most effective for learning when carried out with other children and when supported and scaffolded by adults (Goswami and Bryant, 2007; Alexander, 2010).

Discussions of the future of primary schooling invariably focus on *the role of ICT in teaching and learning* (Codd *et al.*, 2002). Across all countries, there has been considerable investment in recent years to equip schools and prepare teachers for the integration of Information and Communication Technologies (ICT) into the classroom (Le Metais, 2003). Some commentators have described the focus on ICT in the classroom of the future as largely uncritical, assuming that teaching and learning should adapt to the technology rather than vice versa; Cuban (2001), for example, famously describes computers as 'oversold and underused' in education. There are emerging examples of the creative use of ICT to support teaching and learning, however. Where ICT use is planned, targeted and a

means to learning rather than an end in itself, it is found to contribute to pupil understanding of a range of knowledge domains, especially mathematics and science (Hogarth *et al.*, 2006; Goulding and Kyriacou, 2008). Once again, effective group work, supported and guided by teachers, emerges as key to the use of ICT to enhance pupil learning (Goulding and Kyriacou, 2008).

Across many countries, there has been a greater emphasis within primary education on the *key skills and competencies* which are seen as necessary for lifelong learning, employment and social participation (Le Metais, 2003). This has resulted in a stronger focus on the development of core transferable skills within and through new curricula (Conroy *et al.*, 2008). Such an emphasis is also apparent in the Irish Primary Curriculum (1999), which advocates the development of concepts and skills through the exploration of curriculum content; a strong emphasis is placed on the ability to question, to analyse, to investigate, to think critically, to solve problems and to interact effectively with others (Le Metais, 2003).

The Salamanca Statement (UNESCO, 1994) represented a turning-point in relation to educational policy regarding children with special educational needs; it argued that ‘...those with special educational needs must have access to regular schools which should accommodate them within a child-centred pedagogy capable of meeting these needs’ (p. viii). Since then, there has been a growing trend across most countries towards the *inclusion* of children and young people with special educational needs in mainstream schools (EADSNE, 2003). Migration patterns have also meant that many schools across Europe are catering for a culturally more diverse population (European Commission, 2008).

Many educational systems have seen a *shift in the boundaries between school and the broader community*. Such changes have incorporated a range of different practices, from the provision of extended services within the school building to looking at how learning occurs beyond the confines of traditional institutions (Wilkin *et al.*, 2003). In the United States, the 21st Century Community Learning Centers (CLC) programme has led to the more extensive use of school buildings by communities for educational activities outside of normal school hours as well as providing students with safe out of school learning environments. Many schools in Australia, Britain, France, the United States and Sweden have extended their functions beyond traditional teaching to provide after-school childcare, access to social (and sometimes health) services and a greater involvement of parents and students in decision making (Clark and Moss, 2001; Wilkin *et al.*, 2003). Moss *et al.*, suggest that in the future schools will cease to be single purpose establishments and widen their role to include childcare and leisure provision and will act as places for social interaction with the rest of the community.

There has been relatively little attention, however, to the implications of developments in primary education for the future of primary school buildings. Educational architecture does not occur in a vacuum but is responsive to changes in demographics, changes in culture and the economy, as well as new social and environmental demands (Brubaker *et al.*, 1998). The design of schools is intermeshed with teacher training, changes in teaching and learning, the school curriculum, assessment and testing systems, the introduction of new technologies as well as parental engagement and expectations (Heppell *et al.*, 2004). This makes building

effective schools for the future a highly complex task, especially since building schools for the future is first and foremost about education and fostering learning relationships, rather than architecture (Rudd *et al.*, 2006).

The developments discussed in this section would appear to have significant implications for the future design of schools; in particular, they suggest that: the design and layout of classrooms should be flexible enough to allow for pupil movement to engage in a range of learning approaches, including group work; that for younger children in particular the design and layout of classrooms and outdoor spaces should foster the use of play-based learning; that the boundaries between the classroom and the rest of the school space should be flexible in order to facilitate personalised learning in 'break-out' spaces etc.; that ICT should be integrated into teaching and learning within the classroom in a planned and targeted way; that school spaces be used to foster a wide range of skills and competencies, including social and affective skills; that non-classroom learning spaces be provided in order to facilitate the development of students with diverse educational and language needs and to allow for personalised learning on the part of all students; and that schools be located at the heart of the community and the boundaries between the school and the community become less fixed through the use of shared social and educational spaces as well as the provision of broader services based within the school. How school design impacts on teaching and learning will be discussed in Chapter 4 of this report.

The extent to which the developments discussed in this section are evident in the Irish primary sector will be explored in the remainder of the report. Before doing so, we discuss one further policy trend, that of involving children and young people in the design of educational programmes and spaces.

2.5 Consulting Pupils

International educational research has increasingly acknowledged the importance of taking account of the views of children and young people in deciding upon school policy and practice. Such research with children has indicated important aspects of their well-being which had not always been taken into account previously: '...given a chance to offer their ideas, views and tell of their experience, children can make adults think differently and see the possibilities of change' (Burke, 2007, p.370). In particular, the importance of access to outdoor space has emerged as a very strong theme from child-centred research (Clark, 2007; Hennessy, 2001). A good deal of this work has focused on older young people, usually those within second-level education. However, a number of studies have extended this approach to incorporate very young children, even those at pre-school level (see Clark, 2007; Cremin and Slatter, 2004; Hewett, 2001), and Tangen (2008) argues for using the same approach to tap into the views of children with special needs.

In the Irish context, the emphasis on children's rights is relatively recent but has become increasingly influential in policy debate (Devine *et al.*, 2004). The National Children's Strategy (2000), implementing the UN Convention on the Rights of the Child (UNCRC), emerged as a cross-government response to improving children's lives, offering a vision of '...an Ireland where children are respected as young citizens with a valued contribution to make and a voice of their own'. The National Children's Office, established to implement the strategy, has put in place a range of

initiatives to bring this about, including a national youth parliament for young people (Dáil na nÓg) as well as measures to encourage schools to establish student councils. From 2004, there has also been an Ombudsman for Children, providing an independent mechanism to vindicate the rights of the child.

The recognition of children's perspectives has also emerged in relation to the built environment. In their everyday lives, children largely stay within and relate to three settings – home, school and recreational institutions, all created by adults and designated by them as 'places for children' (Rausmussen, 2004). A number of pilot studies have sought to engage children and young people in design. In the UK, the 'Making Neighbourhoods' project has sought to involve primary school children in the design and construction of new community facilities (Flutter, 2006). Similarly, in the United States, the 'Our Town' project facilitated urban children to design and build a park in their neighbourhood (Gallagher, 2004).

Historically, consultation over school buildings has tended to centre on school principals and teachers (Woolner *et al.*, 2007b). However, a number of initiatives have focused on young people's perspective on school design and layout as a basis for school improvement (Flutter, 2006; Burke, 2007). As part of the Building Schools for the Future (BSF) initiative in the UK, schools in Kent entered into a partnership with the University of Cambridge to consult with students on school design. Students used photographs and writing to indicate the aspects of school which they would most like to change, a process that was seen not only as contributing to school design itself but as building the capacity of the school to involve students (Frost and Holden, 2008). In one pilot school, the Design Council-initiated School Renaissance project directly involved students in developing prototypes for the ideal classroom, yielding a model of the '360 degree classroom', with flexible integrated desk-chairs, ICT units and whiteboards (Woolner *et al.*, 2007b). Similarly, the Secondary Action Research Programme (SARP) in the UK has sought to involve young people in a number of pilot secondary schools in improving the school grounds. Benefits were seen in terms of the development of collaborative and decision-making skills, student self-confidence and the increasing use of outdoor space in student learning (Rickinson and Sanders, 2005).

2.6 Summary

This literature review aimed to show changes that have taken place in school environments as well as perceptions about teaching and learning. While some authors note that change in the cultural climate in schools over the years has taken place (Carty, 2007), others have argued that much school design is tied to the past and outdated practices (see Tanner, 2000; Weinstein and David, 1987). Tanner (2000) also observes that limited empirical evidence is available concerning the influence of the built learning environment on student outcomes. A review of the literature revealed that most of the empirical research carried out on school design and how individual environmental factors impact on teaching and learning practices is concentrated in the US and the UK. The review was able to identify only a few studies carried out in other countries.

Even less research evidence is available that incorporates students' own voices expressing their perceptions of various aspects of school design and how it affects their experiences at school. Weinstein and David (1987)

argue that, if possible, children should be active participants in the planning and arrangement of the environment where they spend most of their time. According to these authors, even relatively young children are capable of articulating preferences and participating in decisions regarding interior design. The scarcity of research involving the perceptions of students (and teachers) has resulted in a situation where little is known about how children perceive their environments (Wiltz and Klein, 2001) and they have been rendered, in effect, voiceless (Carty, 2007).

Rudd *et al.* (2006) observe that in future schools are likely to face a number of challenges including significant demographic changes, changes in student numbers in schools as well as the need to provide students with the skills and competencies required in the future. They argue that, in order to respond to these challenges, learning spaces need to be flexible and meet the needs of students as well as local communities; ‘...schools need to consider how to build on and interconnect and integrate with informal and formal provision that already exists’.

A number of international studies argue that the planning process for designing schools must involve the various interest groups (educationalists, architects, engineers, builders, pupils, teachers, the community, etc.) in order to achieve a fully satisfactory result. In addition, the use of new technologies (ICT, TV, DVD, internet, mass media, etc.) will be a way of making learning more enjoyable for all learners. It is crucial that educational areas should be designed in accordance with curricula and teaching methodologies and taking into account on-going changes in the learning process (International Workshop on Educational Infrastructure, 2002, p. 18). Wilkinson (2002) in the UK urges planners to also consider the environmental impact of schools focusing on sustainability and efficiency.

To reiterate, international research has indicated that designing schools is a complex and multi-faceted process. Several studies have suggested that school design should take into account curricular changes and developments in teaching and learning in order to respond to the needs of teachers and pupils. In order to facilitate teaching and learning, good school design should take into account both indoor and outdoor areas. Unfortunately, the latter have often been neglected in the planning process. However, the importance of outdoor space for sport and play activities for primary school children should not be underestimated. Overall, school design must consider factors that have an impact on teaching, learning and student academic outcomes. One of the main topics to emerge from international research is space in school in terms of school and classroom density. Space in school (both inside and outside the school building) must be able to respond to the child-centred approach used in teaching primary school children. In addition, in order to ensure the effectiveness of teaching and learning, it is important to ensure that children are comfortable and are not affected by internal or external environmental factors such as poor lighting, poor ventilation and excess noise.

3. DATA AND METHODOLOGY

While international examples of innovative school design can be identified (see Appendix II), basic school design has remained largely unchanged in spite of significant changes in curriculum, teaching methods, and use of ICT in recent decades. Chapter 2 demonstrated a dearth of systematic and comprehensive empirical research in the area of school design that considers interaction between design and environmental factors and teaching and learning practices in primary schools. Much of the existing research is old with newer empirical research emerging only from a small number of countries. The key objective of this study is to identify and chart various perspectives with regard to school design, in order to inform future design practices in Ireland. The study aims to develop a brief for a model “school of the future” with a specific focus on educational needs. In so doing, the study adopts an exploratory approach due to the lack of previous research on this topic in the Irish context. Exploratory research is used when one is seeking insights into the general nature of a problem; the method is highly flexible, unstructured and qualitative, designed to uncover basic viewpoints, perceptions and attitudes (Schutt, 1999; Vogt, 1999). In the context of the present study, exploratory research is useful for providing significant insight into perceptions of existing primary school buildings and establishing priorities for school design.

3.1 Data Sources and Methodology

In order to provide a multifaceted view of school design and its relationship with teaching and learning, the study drew on information from a range of sources. The remainder of this section outlines the data used.

3.1.1 CASE-STUDIES OF PRIMARY SCHOOLS

Data were gathered from six case-study schools that were identified based on information provided by the Department of Education and Science. These schools were selected to vary in terms of the age of the building, the size of the building and location. Two of the schools, Maple Lane and Pear Tree Row, date from the most recent period. The profile of the case-study schools is presented in Table 3.1.

Table 3.1: Profile of the Case-study Schools

School	Size	Location	Age of the building	Layout
Riverbank	Small (5 or less teachers + SNAs)	Small town	1960s	Single storey*
Oak Leaf	Small (5 or less teachers + SNAs)	City	1890s	Two-storey
Maple Lane	Medium (6-8 teachers + SNAs)	City	1990s	Two-storey
Lake View	Medium (6-8 teachers + SNAs)	Small town	1950s	Two-storey
Hillcrest	Large (8 or more teachers + SNAs)	City	1970s	Two-storey
Pear Tree Row	Large (8 or more teachers + SNAs)	Small town	2000s**	Two-storey

Note: *Not a purpose built school (previously a private dwelling and offices).

** School built in accordance with DES current design principles. Pear Tree Row school is one of the Generic Repeat Design (GRD) Schools developed by the DES in recent years (i.e. a standardised design for 8, 12 and 16 classroom schools capable of being used on urban/suburban type sites with different versions to suit varying site orientations). The GRD school is designed to be a benchmark of current best practice and an exemplar of the 2006 Accommodation Schedule and current Technical Guidance Documents. The particular layout and features of the GRD have been designed to facilitate the current pedagogical approach in Irish schools and exemplifies current guidelines with regard to environmental performance (i.e. daylighting, natural ventilation, acoustics, low energy design and technologies, quality appropriate materials and finishes, etc).

Letters with detailed descriptions of the aims of the study and procedures involved were sent to the principals of the selected schools; these letters were later followed up by phone calls. Of the number of schools initially contacted, two refused on the basis of the additional strain the research would put on staff and pupils as they already had agreed to participate in another study and, in one case, feelings of disempowerment. Subsequently, other schools were contacted who agreed to participate. The schools that agreed to participate in the study distributed parental consent forms where the parents were asked to indicate whether or not they would like their child to take part in the study.

In the six case-study schools, in-depth interviews were conducted with key staff members, including the principal, class teachers of junior classes, class teachers of senior classes, learning support teachers and resource teachers. In total, twenty such in-depth interviews were conducted. The interviews centred on the following topics:

- Use of space in the school for different activities, including location of ICT facilities;
- Use of space outside the school (yard, playing fields) for different activities, and the perceived adequacy of facilities for PE and sports;
- Access issues – physical (e.g. for children with disabilities) and social (e.g. access for parents and the wider community);
- Teaching methods used (e.g. group work, whole-class instruction) and perceived adequacy of physical space for these methods;
- Use of ICT resources on the part of teachers and pupils;
- Existence and location of any after-school activities.

Table 3.2: Participants in the Study

School	Principal Interviews	Class Teacher	Learning Support/ Resource Teacher	Pupils	4th Class Pupils	Teacher Questionnaires	Inspectors	Key Informants
Riverbank	1	One 5 th class teacher; One 2 nd and 3 rd class teacher	1	Group of 5 th class pupils	Group of 4 th class pupils	5		
Oak Leaf	Teachers and Principal Interviewed Together			Group of 4 th class pupils; Group of 6 th class pupils	Group of 4 th class pupils	5		
Maple Lane	1	1 teacher of 5 th class; 1 teacher of infant classes	1 resource and 1 st class	Group of 6 th class pupils	Group of 4 th class pupils	5		
Lake View	1	1 teacher 5 th and 6 th class;	1 learning support teacher	Group of 6 th class pupils A; Group of 6 th class pupils B	Group of 4 th class pupils	5		
Hillcrest	1	1 teacher of 6 th class;	2 learning support teachers	Group of 6 th class pupils	Group of 4 th class pupils	2		
Pear Tree Row	1	1 5 th class teacher; 1 teacher of infant classes	1 learning support teacher	Group of 5 th and 6 th class pupils	Group of 4 th class pupils	3		
Number of Interviews Conducted	Total: 6	Total: 8	Total: 6	Total: >50	Total: >40	Total: 25	42*	16

* Survey of all (>90) school inspectors.

In addition, teachers in the school who were not involved in the interviews were asked to fill out a questionnaire that included questions on the importance of school design, teaching and learning in primary school, and how design factors impact on teaching and learning practices. The questionnaires were returned by post in pre-paid envelopes, with a total of twenty-five questionnaires returned.

As a next step, focus groups were conducted with older primary school pupils (mostly from fifth and sixth classes). The pupils were randomly chosen and the groups consisted of an average of six individuals. The pupils were asked to reflect on their school building and to indicate what aspects of the building they liked most (see Appendix I). In addition, a set of questions was asked about learning in the primary school. In total, over 50 pupils participated in the focus group interviews.

Data gathered from older children were complemented by an input from younger (usually fourth class) pupils. Again, groups of six randomly chosen pupils were asked to participate in the study. The pupils were given coloured pencils and paper and were asked to draw their favourite place in the school. While this work was being carried out, the researcher engaged the children in a conversation about the pictures that they were drawing. Pupils who had finished their picture were instructed to draw another one, this time depicting a school they would like. Over forty pupils participated in this part of the study.

3.1.2 INTERVIEWS WITH INTEREST GROUPS AND STAKEHOLDERS

The second phase of the study involved in-depth interviews conducted with interest groups and key stakeholders selected to reflect a range of organisations involved in primary education. The sample was purposive, in that interviewees occupied key positions in educational organisations, but the sample should not be regarded as representative and responses cannot necessarily be taken to reflect the views of the organisation (for this reason it is not appropriate to refer to the percentage of stakeholders when discussing the results in later chapters). The purpose of the interviews was to gain an additional perspective with regard to the issues surrounding primary school design. As well-informed educationalists, their views were important for triangulation with the perspectives of principals, teachers and pupils. A total of sixteen such interviews were conducted. These involved representatives from the following organisations:

- The Inspectorate of the Department of Education and Science;
- The National Council for Curriculum and Assessment (NCCA);
- The Irish National Teachers' Organisation (INTO);
- Educate Together;
- The Irish Primary Principals' Network (IPPN);
- Primary school principals from outside the case-study schools;
- National Centre for Technology in Education (NCTE);
- Teacher educators from teacher education colleges;
- The ICT Policy Unit of the Department of Education and Science;
- The Qualifications, Curriculum and Assessment Policy Unit of the Department of Education and Science;

- The School Planning and Building Unit of the Department of Education and Science;
- Centre for Early Childhood Research and Development.

The interviews (see Appendix I) focused on the following issues from the perspective of both current and future educational needs:

- Use of space in the school for different activities, including location of ICT facilities;
- Use of space outside the school (yard, playing fields) for different activities; perceived adequacy of facilities for PE and sports;
- Access issues – physical (e.g. for children with disabilities) and social (e.g. access for parents and the wider community);
- Trends in teaching methods used (e.g. group work, whole-class instruction) and perceived adequacy of physical space for these methods;
- Trends in the use of ICT resources on the part of teachers and pupils;
- The school's relationship with the wider community.

3.1.3 SURVEY OF SCHOOL INSPECTORS

The third and final set of data was gathered from a survey of all DES primary school inspectors (>90 individuals). They were invited to participate in the survey by email, and the questionnaire focused on the importance of school design, teaching and learning in primary school, and what design factors are likely to impact on teaching and learning practices. A total of 42 questionnaires (see Appendix I) were completed by DES primary school inspectors. The results of inspectors' questionnaires were entered into SPSS and analysed. Descriptive statistics were used to describe the distribution of the data. The results of teachers' and inspectors' questionnaires were used in the triangulation of responses from the case study schools. The survey results are incorporated in the chapter discussing perceptions of key personnel.

3.2 The Importance of Consulting Pupils

As discussed in Chapter 1, international research and practice indicates that, whenever possible, children should be active participants in the planning and arrangement of the physical settings in which they live and learn. Even relatively young children are capable of articulating preferences and participating in decisions regarding interior design. Research involving the perceptions of pupils (and teachers) has remained scarce, however (Wiltz and Klein, 2001; Carty, 2007). Weinstein and David (1987) in the United States argue that public spaces in the United States are rarely designed with children in mind and architects frequently design children's settings without much thought to the developmental characteristics of the users and generally without their input. In the United Kingdom, Burke and Grosvenor (2003) argue that '...children and young people have yet to be convinced that their right to have a say is genuinely respected ...[one can sense a] certain amount of resignation that they might be consulted but never actually permitted to take part in the challenge of changing school' (p. 2). They argue that '...if schools are to be a successful vehicle for learning in the 21st century, it is essential that young people are involved in determining their nature, design, organisation, ethos and use'. Research by

Tiburcio and Finch (2004) in the UK showed that increased sense of belonging was evident in the children who were involved in the design process of their new classroom. In the same vein, in Ireland, Carty (2007) criticised the failure to include children and teachers in producing the brief for designing schools who are left voiceless in the design philosophy of Irish primary schools. International research-based literature on the importance of the student's voice in the context of schooling has grown rapidly in recent years. Overall, there seems to be an emerging consensus among researchers and educationalists that listening to students' voices provides useful insights into the issues that are important for students and can thus potentially contribute to school improvement (see Rudduck and Flutter, 2004; Flutter and Rudduck, 2004; Flutter, 2006). It is argued that capturing the student voice can play an important role in education reform as it enables policymakers to make school life more meaningful to students and informs opinions among school staff with regard to school development (Fletcher, 2003).

Considering these arguments, this study has sought input from primary school children – voices that have rarely been included in the consultation process concerning the planning of school buildings in Ireland.

3.3 Validity and Other Methodological Issues

Due to the nature of qualitative research, and of participatory methods in particular, proving validity can be challenging (Hart and Tyrer, 2006). The basic problem in assessing the validity of qualitative research is how to specify the link between the relations that are studied and the version of them as provided by the researcher (Flick, 2002, p. 222). One way to establish validity is through the method of 'triangulation', 'by combining multiple observers, theories, methods and data sources' (Denzin, 1989, p. 307). According to Quinn Patton, triangulation of data sources can contribute to verification and validation of qualitative analysis (2002, pp. 555-6). This study used triangulation of data gathered from six case-study schools, interest groups/key stakeholders and primary school inspectors in order to identify common issues relating to school design and its intersection with teaching and learning. The results of the analyses are presented in the following chapters.

4. PERCEPTIONS OF PRIMARY SCHOOL DESIGN AMONG EDUCATION STAKEHOLDERS AND INTEREST GROUPS

As part of the study, in-depth interviews were conducted with representatives of different interest groups and stakeholders in the field of education. These included different sections of the Department of Education and Science; the National Council for Curriculum and Assessment (NCCA); the Irish National Teachers' Organisation (INTO); Educate Together; the Irish Primary Principals' Network (IPPN); a number of primary school principals; the National Centre for Technology in Education (NCTE); teacher educators from the colleges of education and the Centre for Early Childhood Research and Development (see Chapter 3). These interviews focused on topics such as recent changes in the architectural design of Irish primary schools and the impact of these changes on teaching and learning as well as the main factors (architectural as well as environmental) to be considered when building a primary school. The first section of this chapter will focus on the perceived importance of primary school design and recent changes in this area. Section 2 focuses on issues to be considered when designing indoor spaces in primary schools, while Section 3 discusses the design of outdoor space. Section 4 explores stakeholders' views on teaching and learning in primary schools while Section 5 provides further information on the factors to consider when designing a new school. The final section six concludes the chapter and provides a summary of the findings. While the chapter draws mainly on interview data, it also incorporates findings from a postal survey of Inspectors of the Department of Education and Science.

4.1 Developments in School Design

4.1.1 THE PERCEIVED IMPORTANCE OF SCHOOL DESIGN

All of the individuals interviewed for the study emphasised the critical importance of school design. A school building is seen as giving ...*a material form to how we view education and what we think children should be doing in school.* First, more attractive surroundings were seen as enhancing pupil engagement, making school a more enjoyable experience for children:

It can influence a child's attitude to school and how they enjoy their time.

Second, the design and layout of the building was seen as shaping the kind of teaching and learning which can take place. In particular, the amount of space available within classrooms was considered crucial, as it can either facilitate or hinder the use of specific teaching methodologies:

You might not literally have the space to have children sitting around creatively in groups facing each other and if you can't do that, it's difficult.

Thus, the physical structure of the school determines ...*what you can and cannot do.*

4.1.2 TRENDS IN SCHOOL DESIGN

Over the years, the Department of Education and Science has produced several documents with technical guidelines for building schools. However, the interviewees felt that general school design was not considered to have changed very much in recent years.

In terms of architectural design, not an awful lot has changed ... Effectively the classroom is still a classroom. It is very confined, very restricted; it's obviously not large enough.

However, what changes had taken place were generally viewed positively. These improvements were reflected in the overall quality and standards of new school buildings, with some stakeholders contrasting these with the poor quality of school buildings (in terms of building materials) prevalent in the 1980s. In addition, schools today are considered much more ...*aesthetically pleasing*. It was thought that using a variety of materials, such as timber, and natural lighting create a more positive atmosphere in the class. New classrooms are considered to be larger, with enough space for a teacher to move about and allowing for greater use of group work. In addition, toilets for pupils are now located inside the classroom, an arrangement largely preferred by teachers.

Some stakeholders indicated the prevalence of designated rooms for specific subjects (for example, IT rooms, science rooms and art rooms) in many older schools. However, this was not necessarily seen as a positive feature:

One concern I would have about that ... is the principle of integrated learning because I think in that situation you could find yourself as a teacher with a very restricted approach to time-tabling in that you have to get access to those rooms at particular times for subjects.

It didn't make for a very integrated curriculum when you were conscious you had an hour in the art room on Thursday afternoon, whether you wanted it or not.

It is important to note current Irish policy highlights the importance of integrating a range of activities by using different spaces or activity areas within the classroom rather than separate specialist rooms and this perspective is reflected in the current technical guidelines (see DES, 2007).

Many stakeholders argued for further improvements in school design, issues which are discussed in the remainder of this chapter. Interviews with stakeholders and analyses of the Inspectorate survey showed that some considered current school design to be ...*quite restrictive in certain areas* in delivering the primary curriculum. PE was taken as an example of one of these areas: *There are many schools that don't have access to a space other than the outdoor environment.* Swimming, now part of the curriculum, also poses problems for schools that have no public pool in the vicinity. In addition, in some schools teaching Art and Science needs careful logistical planning as the classrooms lack facilities for these subjects.

The cost of land in recent years was seen as posing difficulties for school design with schools now located on smaller sites, which has implications for play, sports and the potential use of the outdoor environment for teaching and learning.

While acknowledging some improvements in school design, one respondent emphasised the fact that most primary school children are attending classes in older buildings:

[The new schools are] pretty good, but there's so few of them, 95 per cent of the kids in the country are still in schools which are many from the 19th century, the majority from the early 20th century and the ones from the latter part of the 20th century are so poor in quality that many of them are having to be refurbished already.

Many of the respondents were critical of the top-down nature of the current approach to designing schools (...*they are not principals, they are not teachers and they're not kids*) and the ...*one size fits all* approach. They argued instead for the need to consult with the school community, including teachers, pupils and parents.

Bringing staff in and keeping them involved throughout the design process is really important.

It was argued that it was particularly important to consult children in relation to school design ...*because it is so easy in our smugness as adults to forget that kids also have views.*

I think they [children] can make a very important contribution because at the end of the day if they don't enjoy the school space that they're in, and yet we expect them to be highly motivated and attentive and involved, I think there's kind of a mismatch between what they actually experience and what in their own minds they want to be experiencing.

Overall, it was argued that partnership between designers, teachers, children and parents was advisable when designing a school building in order to ensure an effective school environment. Genuine involvement of children and teachers in the design process of a school has also been highlighted by Dudek (2000) and Clark (2002), who argued that as lay and expert perceptions and opinions about architecture vary, it is necessary to involve ordinary users. In the Irish context, the speed of delivery in recent years was seen as having restricted the opportunities for consultation:

There is tremendous haste in the process and there isn't enough time for the creative element of design.

The importance of consultation while designing schools has been highlighted by architect John Mitchell (2008), who argues that ...*whole school involvement* in developing a shared vision is crucial to the success of such projects as it can help produce a strong sense of ownership.

4.2

Indoor Space in Primary Schools

4.2.1 SCHOOL SIZE AND LAYOUT

Stakeholders were asked about the importance of school size in teaching and learning at primary level. In general, there were divergent views on the optimal school size. The majority of respondents favoured small to medium sized schools, generally in the region of 200 to 300 pupils. This size was seen as allowing for more personal interaction between teachers and pupils and among pupils themselves, yielding a sense of community and greater mixing across age-groups. In contrast, they argued that larger schools (that is, those with more than 400 pupils) were 'impersonal' and more regimented, being less reflective of the home and community, in line with international research (see the international research on school size discussed in Chapter 1). A number of other respondents, however, argued that school size per se is not the most important factor but rather issues of potential overcrowding and the nature of the school climate:

Size of school is not the key ingredient to the quality of teaching and learning that is going on in the school. I think it is much more to do with the people who work in the school and the facilities the school has.

In the same vein, international literature on school improvement notes the importance of school leadership and teachers on students' learning, over and above the effects of school size. It was also recognised by some stakeholders that very small schools may also have some challenges, in terms of the viability of providing certain facilities.

The stakeholders felt that big buildings with long corridors are not suitable for primary school children. Other criticisms centred on unsatisfactory break-out spaces and general purpose rooms. Small schools sometimes lack general purpose rooms with implications for the activities available to children; for example, space for PE is often restricted in such schools. Where general purposes rooms/halls do exist, they are often seen as too small.

Several stakeholders argued that school design must reflect the different ages of the children:

The design for the 4, 5, 6-year olds needs to be entirely different from the 10-year olds at the other end of the school.

Just as in the home environment, primary school classrooms should have different spaces for different functions and not be devoted entirely to an open floor space, or to a series of rigid, static zones. Rather, teaching spaces for small children should have spaces devoted to "flow" or movement, and smaller spaces that are for quiet activities for small groups or a single child (see Illinois Facilities Fund, 2004). Other criticisms

concerned lack of lunch areas for children; at present most children eat at their desk or in the yard. It was argued that the design of primary school buildings should provide for an area where children can have their lunch.

Another area where improvements are needed concern the design of multi-grade schools. In smaller schools, often in older buildings, it is necessary to cater for different class grouping in a classroom. In these schools, accessibility for smaller children is an issue. It is necessary to have different sizes of furniture in one room and it also has to be at different levels. At the moment, standardised furniture is used and there is no recognition that there are different ages in the class. It is important to note that it is up to individual schools to order and place appropriate sized furniture in the classrooms. Perhaps guidelines would be useful in this respect.

School design should also address issues such as light (especially daylight), ventilation (the location of windows and the ability to open them) and environmental noise. One stakeholder observed that *...we should never underestimate the importance of light and colour in primary schools, children respond to this in a big, big way.*

The increasing integration of children with physical and learning disabilities into mainstream schools was seen as having significant consequences for school design and layout. Many older primary schools were not seen as suitable for children with physical disabilities. Older schools often had steps at entrances or lacked lifts in multi-storey buildings. Respondents were critical of much of the available provision for learning support, with teaching taking place in *...old cloak rooms, old cupboards*. According to the survey of school inspectors, teaching in primary school also took place in staffrooms, the principal's office, the school kitchen, hallways and corridors in some schools that experienced problems with space. Designated space for learning support and resource teaching was considered to be necessary in all schools. The provision of a stimulating environment was seen as particularly important for pupils with special needs, with a need for a setting *...that's not soul-destroying for the children and the teachers to sit in:*

Those are the children that need the bright, motivating atmosphere and environment.

The need for special education units (especially for autism) is seen as having significant consequences for school design; these units need to be apart for some purposes but near other classrooms for integration purposes:

They need sensory gardens, multi-sensory rooms, cooking facilities, washing facilities, lots of areas which can be used for developing social skills and life skills for children with autism.

Catering for pupils with special needs means having to integrate a wide range of services and therapies (such as light therapy) into the school, with space necessary for such provision. Special education tuition rooms (see DES, 2007) are included in design guidelines to provide a suitable environment for the supplementary teaching of children with special educational needs. Such tuition rooms are also to be used to cater for the

increasing numbers of newcomer pupils who require English language support. However, many older buildings are seen as having inadequate or unsuitable space for such supplementary teaching.

Stakeholders were generally in favour of schools operating as a resource for the wider community. Reference to opening up school buildings in this way was also made in the recent DES (2007) guidelines. However, this was seen by stakeholders as potentially creating some practical difficulties in terms of management and security; there must, therefore, be a way of physically restricting access to the rest of the school building(s) and staffing is required to open and close the hall or other facility. These factors have to be built into the design if a school is to have a wider function in the community. The OECD paper (2003) “Review of Security in School Design in Ireland” lists factors influencing building security (such as building access, structural elements and materials, roof design, monitoring and lighting) and site security (such as location and surroundings, site layout and landscaping), and offers useful recommendations for tackling the issues. The security problems can be solved by limiting community use to certain areas without access to the main part of the school (see DES, 2007). In the same vein, in the UK, *Building Bulletin 99* (2006) suggests that in creating greater community access, particular attention should be paid to:

- access control, for instance to ensure visitors can be shown to an interview room from reception, but cannot enter the school without permission;
- securing the building ‘envelope’ – walls and roofs but particularly windows and doors;
- having clearly defined site boundaries, using appropriate fencing and/or planting;
- electronic measures, such as intruder alarms or internal alarms for teachers in classrooms;
- a health and safety audit of the design to ensure it is appropriate for adults and pupils with SEN or disabilities (p. 23).

Some stakeholders noted that schools today are seen as increasingly rooted in their community, especially in the case of DEIS (designated disadvantaged) schools. Such a role points to the need *...to have a space for parents to come and feel that they’re welcome*. This makes it important that the school be actually located *...in the centre of the community rather than on the periphery* and would facilitate co-operation with the local community to support children’s learning.

4.2.2 CLASSROOM SIZE AND LAYOUT

Physical classroom size was considered to be an important issue in primary schools. According to Maxwell (2003), primary school pupils spend a large amount of their time in one classroom; hence, their experience depends on the conditions and space in the classroom. In the UK, *Building Bulletin 99* refers to standard classroom size in primary schools as being 56m²-63m² and refers to classrooms measuring 63m² to 70m² (each with designated space for practical work) as large; this size is also used in the primary exemplar designs (see www.teachernet.gov.uk/exemplars). According to the Primary School Design Guidelines (DES, 2007), classroom size in Irish primary schools incorporating toilet and storage is 80m². In 2-3 classroom schools the suggested area is 60m². However, many older schools had

much smaller classrooms (see Chapter 4 on variation in classroom size across the case-study schools).

Many stakeholders in Ireland were critical of the amount of space available per child, especially for younger children, in many existing primary schools. Infant classes, in particular, need to have sufficiently large classrooms with areas designated for different activities and creating a home-like environment (see Illinois Facilities Fund, 2004). It was considered that the limited space available in the classroom makes it difficult to provide adequate early childhood education. Some respondents argued that in the context of classroom size, *...school design has some way to go in order to keep pace with teaching and pedagogy*. Where space is limited, respondents argued that teachers are less likely to use more active, discovery learning-based methods and it is more difficult to celebrate children's work due to the lack of sufficient space for display areas.

According to all stakeholders, the ideal class layout was seen as comprised of small groups rather than rows, but the opportunity to do this was often constrained by lack of space in the many primary schools built before the current DES guidelines. Currently, classrooms tend to be 'box-shape' or 'rectangular' but it was seen as potentially useful to be able to create sub-areas within classrooms for different activities and in this way encourage independent learning and higher order thinking rather than having the teacher at the top of the classroom directing proceedings.

I was in a school in Finland a few months ago and it was full of these nooks and crannies, little areas. I don't think I saw one straight linear corridor in the whole building because they had put these little areas. And they were all full – two, three, four pupils working on laptops and on paper. This is the education of the future.

Hastings *et al.* (1996) note that, in order to encourage effective learning, teachers need to use a variety of organisational approaches to ensure that '...seating organisation reflects teaching intentions and task demands'. A 'horse-shoe' arrangement is commended by Galton *et al.* (1999) and Alexander (2000), while open plan classrooms have been reported to facilitate teacher-to-teacher interactions and 'social support' (Ahrentzen and Evans, 1984, p. 449). In the UK, *Building Bulletin 99* suggests that the furniture layout of a classroom should assist supervision and allow for sufficient space for moving around the room as well as allowing for space for teachers, teaching assistants, teachers' work stations, different furniture arrangements and storage.

In this study, having enough space for pupils' bags and coats was highlighted as an important issue. In addition, the size of furniture and resources within classrooms was seen as a matter for concern, particularly at infant level. One respondent cited the Reggio Emilia project in Italy where schools were designed with young children in mind and stressed the importance of having facilities specially geared towards this group:

Everything is small sized for children [in Reggio Emilia], and I'm talking about the actual cupboards as well. This has a tendency to instil more independence in children because they can actually do more things for themselves. And I think that's something we haven't really taken on board in school design here. We have the small desks and the small chairs and that's it.

That also shows through in the public areas in schools in that everything on display is at adult eye level. It's very rarely that you would go into a school where the things are down at the children's eye level. ... The design isn't very child-orientated, it's very adult.

Historically, experts on early childhood education have emphasised the importance of a carefully designed physical environment in fostering learning.

4.3 Outdoor Space in Primary Schools

International studies have indicated the importance of outdoor areas for play and sport (see Chapter 2). Outdoor areas are an ideal vehicle for learning and socialisation across abilities and ages, providing a valuable environment for the study of ecology as well as being important for play and relaxation between lessons (Hayhow, 1995; Tanner, 2000). Current primary school design guidelines (DES, 2007) make a number of recommendations for designing external ball courts and play areas. This study found that, in general, education stakeholders are dissatisfied with existing outdoor areas in primary schools. The main criticism concerned the limited space available for outdoor activities and the *uninspiring* nature of these spaces:

I don't think it's appropriate to plonk a school and have a small bit of tarmac and a fence around it, that's like a prison not a school. ... They [children] need to get out and run around.

We send children out to them [yards] two or three times a day, to a patch of tarmac, there's nothing stimulating about a patch of tarmac. ... If you compare it to schools in other countries, where they have superb outdoor play equipment and different surfaces and little sort of games that the children can all play together.

Outdoor equipment was also considered to be very limited. While basketball hoops are available for children in some schools, there are generally no swings, play mats or other equipment. It was argued that outdoor areas should be designed with the different ages and needs of primary school children in mind, with a variety of surfaces, including soft play areas for infants and children with special needs that is not solely grass as grass areas quickly become unsuitable in wet weather. Some stakeholders recommended incorporating different areas into the design of outdoor areas, ranging from sand pits and child-friendly surfaces for running and jumping for younger children, playground equipment for older children, to basketball and volleyball courts. It was also recommended by some stakeholders that shelter should be incorporated into the design of outdoor spaces so that children can still enjoy fresh air during breaks even if it is raining.

Generally, it was felt that outdoor space is currently rarely used for teaching and learning:

The outdoor environment isn't being used so I'd wonder again whether that is to some extent influenced by school design. ... [In some buildings] access to the outdoors is limited.

Stakeholders argued for the potential value of increased use of outdoor spaces in teaching and learning:

The idea of being in the classroom all day is not conducive to the kind of active learning that you want to engender.

In some cases, school sites were considered to be very limited, thus not providing scope for teaching outdoors: ...no mature trees, no nature trails, no field games as you don't get a field. Some stakeholders suggested that there should be incentives for schools to collaborate with local community centres to provide sports facilities. Sports facilities were seen as a particular necessity in schools serving disadvantaged areas where children have less access to such facilities outside school.

4.4 Teaching and Learning in Primary Schools

Stakeholders participating in the study commented on changes in teaching approaches following on from the introduction of the new primary curriculum in 1999. In general, it was noted that teaching approaches are closely associated with the design of the school building and the amount of space available in classrooms. In addition, the pupil-teacher ratio in primary schools was seen to have implications for teaching and learning processes.

4.4.1 CLASS SIZE

Both average primary class size (number of pupils in the class) and the ratio of pupils to teaching staff are higher in Ireland than in other OECD countries: the ratio of pupils to teaching staff in Irish primary schools is 19.4, the OECD average being 16.2, while average class size in 2005 in Ireland was 24.5 compared to an OECD average of 21.5 (OECD, 2008). Existing research evidence suggests that reduced class size (approximately 15 students) in primary schools has a positive impact on academic attainment and attendance (Finn *et al.*, 2001), particularly for disadvantaged students (Finn *et al.*, 2005) and has an impact on the teacher's approach in the classroom (Blatchford *et al.*, 2006). Blatchford and co-author's (2003) study in the UK found a clear effect of class size differences on children's academic attainment over the (first) Reception year in primary schools. In the case of literacy, the lowest attainers on entry to school benefited most from small classes, particularly those below 25.

In general, stakeholders were critical of the large size of many existing classes in Irish primary schools. One stakeholder thought that ...*[in Ireland] we should be leaders in this area instead of trying to reach European averages.* Smaller classes were seen as allowing for more individual attention, getting to know the children better and the more creative use of different methodologies. In contrast, larger classes were seen as requiring a greater emphasis on 'control'. However, stakeholders differed in what they considered the optimal class size, with suggestions ranging from 16 to 'the early twenties'. Furthermore, a number of respondents indicated that the mix of pupils in the class was as important as total class size, since having more pupils with special needs meant needing even smaller classes. Reducing class size was also seen as insufficient without an accompanying change in methodology:

You can reduce numbers but if teaching doesn't change, it won't make a difference. ... Class size is not going to improve learning unless teaching changes.

In smaller schools, additional difficulties are seen for teachers in handling multi-grade classrooms (for example, the coverage of age-appropriate topics).

4.4.2 TEACHING APPROACHES AND METHODOLOGIES

The Primary Curriculum (1999) has a strong emphasis on the child as an active learner and incorporates much international thinking on discovery learning methods. Stakeholders consider that the introduction of the curriculum has resulted in some changes away from the ...*expert, all-embracing teacher model* towards a greater use of group work and pair work. However, many stakeholders argued that in terms of teaching and learning, more 'traditional' whole-class teaching still dominates in primary classrooms, which echoes existing research findings (Dunphy, 2008; Murphy, 2004; OECD, 2004b; DES, 2005; NCCA, 2005; NCCA, 2008).

Traditional whole-class teaching would still be the mainstay of teaching in the classroom. There might be some group work going on, some very good group work at times, but a lot of it is not co-operative learning and a lot of it is not problem solving. Children are physically in groups ... but there isn't actually the real co-operative learning where they have to solve a problem or learn something from their peers.

Lack of space was seen as a constraint on the full implementation of the primary curriculum:

The type of curriculum we have – this is a very active learning curriculum ... is confined to the classroom ... [there is a contradiction in] what you are teaching in and what you are trying to teach.

You can see very good work, co-operative learning, going on in a small classroom depending on how the practitioner organises the classroom and organises the activities. But obviously the bigger classroom ... lends itself to co-operative learning and it lends itself to getting around the classroom and getting to work with children.

Class size, that is, having too many pupils in the class, was also seen as a constraint:

The classroom size should not be reduced just because the class size is being reduced. That space is needed if the methodologies are to be used. It is much easier in a confined space when you have lots of children, to have them all sitting down. And this is what will happen.

However, there was also the view that, while more space and smaller classes will facilitate more active methodologies, they will not guarantee their use unless teachers are supported through professional development. Some stakeholders, for example, stressed the importance of distinguishing between children 'sitting in a group' and 'actually doing group work'.

The methodologies used by primary teachers were seen as varying somewhat across subject areas, with a somewhat greater use of active methodologies in teaching science, for example. A number of respondents considered play and drama to be two key methodologies, particularly for

younger children. However, restricted space was considered an issue when utilising these teaching approaches:

You can create drama in the classroom but it is great to get out of the classroom, an appropriate hall, tease out what you want to do, to have a performing area. ... Space is a huge issue.

The potential for the development of play-based learning among infant groups and its implications for school design also emerged as an issue:

One of the gaps in the primary curriculum at the moment is the gap in specific methodologies at the infant level. The methodologies do tend to be geared more toward older children. Play will be addressed in the next year ... but unless school design changes to a large extent, you might find play is something that's talked about and we feel should be used rather than seeing it being used in infant settings. ... Space is a big thing for infant classrooms, also various practical issues such as different surfaces to support different types of play – water play, sand play as opposed to more literacy-based play – literally different types of coverings would add greatly to the experience for children.

The use of play-based learning was also seen as having implications for personnel needs, requiring 'an extra pair of hands' in the classroom. Stakeholders hoped that in future there would be a greater use of interactive methodologies – group work, pair work, more use of the outdoor environment and improved integration of ICT across the curriculum. They would like to see more collaboration among teachers in developing practice, which would require resources, particularly time and physical space for teachers to meet outside their own classrooms.

Collaborative teaching was not seen as being practiced widely in primary schools, with many respondents pointing to the 'failed experiment' of providing shared teaching spaces in the 1970s. However, the presence of Special Needs Assistants within classrooms was seen as enhancing collaboration along with a tendency for greater co-operation between mainstream class teachers and learning support staff.

In general, stakeholders felt that pre-service and in-service teacher education presumes the existence of adequate space and facilities but such facilities are not available in all schools.

4.4.3 USING TECHNOLOGY IN PRIMARY CLASSROOMS

Several stakeholders highlighted the importance of including facilities for digital learning in primary schools. It was suggested that classrooms should be wired for computers and interactive whiteboards and there should be a sufficient number of modern computers (preferably laptops) with good Internet access available for everybody. Increasingly, computers were seen as a requirement in primary classrooms to enable their use in teaching different subjects. However, physical space in classrooms was often seen as limiting the use of ICT:

We could get two to three more computers in but would have to throw two to three children out. Again, space is an issue.

With an increasing use of computers in schools, adequate technical support is seen as crucial:

So when the computer breaks down or there is something wrong with it, you are not relying on teachers' knowledge to address it.

Several stakeholders were critical of the quality of ICT equipment currently used in primary schools. They argued that it is difficult to use the technology effectively if the computers are nearly ten years old, have no USB ports and Internet speeds are slow. Stakeholders were critical of the fact that there has been no large-scale investment in information technology since the IT 2000 project.

In addition, one stakeholder highlighted the need for ...*software which is curriculum-specific and actually proven to enhance learning* rather than relying on standard Office-type software. They also believed that touch screen technology supporting the primary curriculum should be available in schools. Other requirements included fibre optic cabling of the highest standard.

Generally, it was felt that ICT was not currently integrated into day-to-day teaching and learning in the primary classroom (see also DES, 2008a):

You will now see a computer in some corner of the classroom... but very, very rarely would you see it in use.

In order to facilitate such integration, stakeholders favoured the provision of computers in the classroom rather than in a dedicated computer room:

I would not have a computer room in primary schools at all, it defeats the purpose ... IT should be integrated not separate.

There was also a perceived need to support teachers by providing training in the use of technology as a teaching tool:

Training in the use of ICT in lessons is a problem as well. There's a bit of fear of the computer and how to ... integrate it well into a lesson. A lot of teachers might use it as a source of individual extension work ... but there's not a huge amount of knowledge there around software that's available.

In addition to computers, stakeholders mentioned that the use of interactive whiteboards is becoming more common in schools and suggested that these (along with projectors) should be automatically built into new classrooms. However, one respondent indicated the importance of how technology is actually used since the interactive whiteboard has the potential to become ...*just a modern blackboard ... with directive teaching*. Indeed, research in the British context indicates that the use of interactive whiteboards has been accompanied by an increased use of whole-class teaching (Smith *et al.*, 2006).

4.5 Factors to Consider when Building a New Primary School

The majority of stakeholders interviewed argued that school buildings should be well designed to have a positive impact on pupils, parents and teachers:

When you enter a school that is really well designed, there is something positive about it.

Others noted that a school building should have ...*an immediate inviting atmosphere*. In such a school, hallways and corridors should not be *dark alleys* but should be wide and bright, allowing physical access for all children. The school building should be inviting for pupils and parents alike: ...*not just outside the building where people come and collect their children*.

Many stakeholders were critical of current school design and argued that due to changes in the nature of schooling, ...*design [in Ireland] is playing catch-up, rather than maybe having a leadership role*. In addition, some argued that school buildings should blend more naturally with the ...*richness of the natural environment* and become more environmentally sustainable by being integrated with, and contribute to, the local setting. A design formula that 'embraces' indoor and outdoor design as well as location was considered to be crucial in designing school buildings.

It was thought that general primary school design has not kept pace with the developments in pedagogy as ...*most classrooms are still conceptualised as squares*. The shape of a classroom has to be suitable for the full range of activities taking place. Rectangular shapes allow the easiest supervision and flexibility of furniture layouts (DES, 2007). However, there may be a trade-off between square sized rooms and flexibility of the space. In addition, spatial density within those classrooms was not considered to be favourable to movement within the classroom. One stakeholder commented on his experiences in schools in the USA and Scandinavia where the schools ...*have a natural movement of kids simply because they have the space*; in these schools it was considered very 'natural' for children to move around in the classroom.

Stakeholders were asked to indicate which aspects they considered 'very important' when designing a new primary school. The vast majority considered space (both indoor and outdoor) as the most important factor to consider. It was suggested that the following elements are crucial:

- Spaces within schools should be flexible (different rooms/areas can be used for a number of activities) to allow for a variety of methodologies as well as changes in teaching practices in the future;
- There should be sufficient room to allow for a range of methods in day-to-day teaching and learning, including group work, pair work, individual work, play-based learning and use of ICT;
- There should also be sufficient space for different 'zones' within the classroom;
- Space for display areas within the classroom and in communal areas of the school;
- Design and layout should be appropriate for the different age-groups within the primary schools, taking account of young children's sightlines, for example;

- There should be sufficient space (either within the classroom or in a separate area) for children's coats, bags, and shoes;
- A large general purpose room for PE, play and drama;
- Storage for teachers within the classroom and in common areas (for example, for PE or sports equipment);
- The provision of smaller rooms for learning support and English language teaching, which are well-designed and stimulating environments for children;
- Space for a school library 'so that kids can be empowered to learn for themselves';
- Bright corridors with work spaces and display areas so that corridors are ...*sites for learning rather than simply thoroughfares for passing through*;
- A place for pupils to eat their lunch;

Eating at the desk in the classroom is unhygienic ...there is opportunity to learn many social skills in a proper dining facility.

- Space for a meeting room or other dedicated space for parents, which is seen as particularly important in schools located in disadvantaged areas;
- Communal spaces within the school building (other than the general purpose room/hall) where pupils can gather for their own recreation and which can also be used for collaborative work;
- Large playgrounds with a variety of surfaces and playground equipment;
- Designs should allow for a school garden and extensive outdoor area for play and sport; the external environment should always allow for the provision of various habitats to be used in the learning of Science;
- Space for teachers to meet professionally outside the classroom (for example, a staff resource room with materials and textbooks).

Stakeholders also argued for the 'future proofing' of schools in terms of both anticipated trends in technology and teaching, and projected pupil enrolments. The necessity of adopting a long-term planning perspective was emphasised since many newly built schools required further extensions within a short space of time. Being able to walk safely to school and/or access to local public transport were seen as important considerations in deciding on school location.

While space was seen as the most important issue to address, stakeholders also indicated a number of other factors which would enhance teaching and learning in primary schools:

- Classroom furniture should be ergonomically designed to cater for the different age-groups of pupils and for the fact that ...*kids are much larger now in primary schools than they would have been in the past*;
- Access to a range of teaching resources (which impact on the methodologies used and children's experiences);
- Building and classroom layout should be suitable for pupils with special needs, with access to adaptive technology;

- Shelter for pupils in the yard to allow children to go outdoors even in wet weather;
- Toilets within the classrooms;

As an infant teacher, having toilets away, very far away from your classroom can cause major anxiety, where children are out of sight you don't know what's going on.

- Classrooms that are acoustically *friendly to the ear*, allowing for group work and differentiated learning, and sound-proofing between classrooms and common areas;
- Use of natural light;
- Appropriate temperature and ventilation with consistency over the school year;
- ICT integrated into the classroom (for example, through pupil laptops), access to interactive whiteboards, and technical support and maintenance;
- Environmental sustainability.

Some stakeholders highlighted the importance of close links between schools and local communities, especially in more disadvantaged areas. It was suggested that some of the 'schools of the future' should adopt the 'full service' or extended school model: they should be at the centre of the community and be resourced to allow for meaningful community usage of the buildings. It was also suggested that there should be close liaison with the HSE to ensure that primary healthcare teams are located within the school building; for example, these schools should have psychologists, speech and language therapists and other professionals, working out of the same building in which the school is located. In addition, sports and after-school facilities should be available.

4.6 Conclusions

This chapter explored stakeholders' perceptions of the design of primary schools. The topic was considered crucial because of its significant consequences for the engagement and learning experiences of children. Changes in school design in recent years were generally seen as positive; however, most stakeholders noted that there is still a lot of scope for improvement, especially with regard to the space available in classrooms as well as to the size and nature of outdoor areas. Lack of space along with large class sizes were seen as hindering the full implementation of the primary school curriculum and restricting the use of more innovative teaching approaches involving play, small group work and pair work. In addition, out-dated and insufficient ICT resources were seen to hinder the use of technology in day-to-day teaching and learning. Stakeholders argued that primary school design should be responsive to the different needs of children, in terms of age, physical and learning needs. It was recommended that in designing primary schools the best results could be gained by consultation with the teachers and pupils that use school buildings on a day-to-day basis.

5. TEACHER PERCEPTIONS OF SCHOOL DESIGN AND TEACHING AND LEARNING IN PRIMARY SCHOOLS

Chapter 4 drew on interviews conducted with the main education stakeholders and interest groups to focus on their perceptions of the implications of school design for teaching and learning processes. This chapter builds upon these findings by exploring the perceptions and experiences of key staff members in six case-study primary schools. These schools were selected to capture crucial dimensions of variation in school design and layout, including age of the building, size of the school and location. The profile of these case-study schools, including details on the size of the classrooms, is presented in Table 5.1. Chapter 5 presents the views of pupils attending the case-study schools. The analysis presented in this chapter is based on in-depth interviews with staff members, but is further complemented by questionnaires completed by other teachers in the school who were not interviewed. In order to ensure confidentiality, the term ‘teacher’ is used throughout the chapter to encompass school principals, classroom teachers, and specialist teachers (for example, learning support teachers). The first section of the chapter focuses on issues relating to space in the school. The second section describes the facilities available in primary schools for pupils, teachers and the wider community. While these sections of the chapter focus on indoor areas, Section 3 explores the use of outdoor spaces in primary schools. Current approaches to teaching and learning in the case-study schools are investigated in Section 4 while Section 5 discusses the environmental factors that are seen to influence teaching and learning. Section 6 highlights the factors that teachers consider important in designing primary schools while Section 7 explores the extent to which issues such as the use of space are addressed in teacher training. Section 8 concludes the chapter.

Table 5.1: Profile of the Case-study Schools

School	Size	Location	Age of the Building	Layout	Multi-grade Classes	No. of Pupils in Classes Studied	Classroom Measurements	Spatial Density in Classrooms Per Pupil
Riverbank	Small (5 or less teachers+SNAs)	Small town	1960s	Single storey*	Yes	2 nd and 3rd Class - 25 4,5,6 th Class - 21	6.50m by 9.30m (60.45m ²) 4m by 6.20m (24.8 m ²)	2 nd and 3rd Class (2.4m ²) 4,5,6 th Class (1.2m ²)
Oak Leaf	Small (5 or less teachers+SNAs)	City	1890s	Two-storey	No	4 th Class - 24 6 th Class - 24	9m by 6m (54m ²) 9m by 6m (54m ²)	4 th Class (2.3m ²) 6 th Class (2.3m ²)
Maple Lane	Medium (6-8 teachers+SNAs)	City	1990s	Two-storey	No	4 th Class - 31 6 th Class - 26	All classrooms 81m ²	4 th Class (2.6m ²) 6 th Class (2.6m ²)
Lake View	Medium (6-8 teachers+SNAs)	Small town	1950s	Two-storey	No	4 th class (A) - 22 4 th Class (B) - 24 6 th Class (A) - 33 6 th Class (B) - 31	6.4m by 7.5m (48m ²) 6.3m by 8.4m (53m ²) 6.4m by 7.5m (48m ²) 6.4 by 7.5m (48m ²)	4 th class (2.2m ²) 4 th Class (2.2m ²) 6 th Class (1.5m ²) 6 th Class (1.5m ²)
Hillcrest	Large (8 or more teachers+SNAs)	City	1970s	Two-storey	No	4 th Class (A) - 30 4 th Class (B) - 30 6 th Class (A) - 30 6 th Class (B) - 30	All classrooms 7m by 7.3m (51.1m ²)	Density (1.7m ²)
Pear Tree Row	Large (8 or more teachers+SNAs)	Small town	2000s**	Two-storey	No	4 th Class - 30 6 th Class - 30	10.52m by 7.72m (81.2m ²) 7.8m by 10.52m (82m ²)	4 th Class (2.7m ²) 6 th Class (2.7m ²)

Note: Age of the building refers to the main school building where different parts of the building were built at separate stages.

* Not a purpose built school (previously a private dwelling and offices)

** School built in accordance with DES current design principles.

5.1 Space in Primary Schools

Table 5.1 indicates significant variation across the case-study schools in available classroom space. This applies both to the actual size of the rooms and to the amount of space available per pupil within each classroom. In two of the newer schools, Maple Lane and Pear Tree Row (the latter a school built to current DES design guidelines) the space available per pupil was 2.6-2.7 metres squared compared with considerably less space available in some of the older schools (1.2-2.4m² per pupil). Within two of the older schools, Riverbank and Lake View, pupils in the senior classes had considerably less room than those in the younger classes (see Table 5.1).

Across the case-study schools, space was singled out as the central feature of school design. Adequate space was considered to have significant implications for the comfort and safety of the children: *...school size is important for all kinds of reasons [it is important to] give a child enough space to move around freely ... also for safety reasons* (Teacher, Maple Lane school). The safety element, especially with regard to lack of space in the schoolyard, was also highlighted by a teacher in Lake View school. Teachers in Maple Lane school acknowledged that, while they were restricted in terms of their outdoor space due to their urban setting, it is important for children to have sufficient space both outdoors and indoors.

The topic of space and safety was closely linked with school layout. Several teachers commented on specific aspects of the layout in their school. In one school, a teacher was critical of the corridors for safety reasons:

There are a lot of corners to turn, I think, in this school ... straight corridors are much better from a practical point of view ... If a corridor is wide, this is good for lots of reasons: we had a fire practice recently, and even from that point of view it is so much easier to get all the children together, and get them out in one go. ... If space is cramped, children moving around in a hurry, as children do, you often get collisions, [having] one long corridor ... is much easier to manage. (Teacher, River Bank school, small, older building)

River Bank school, based in a building originally designed for other purposes, had a computer room with doors leading off it, one leading to the staffroom. This layout was considered to be highly disruptive for pupils working in the computer room.

In general, there is a dearth of research on the impact of single storey versus multi-storey primary schools on children's schooling experience. In our study, five of the six case-study schools had classrooms on two floors. While teachers did not generally comment on the single storey as opposed to multi-storey layout, one teacher considered a multi-storey layout to be a disadvantage from the point of view of communication and information: *...[this] creates communication problems. You don't see other people* (Teacher, Maple Lane school, medium size, newer building)

In the two newer buildings, Pear Tree Row and Maple Lane, staff were more satisfied with the indoor space available than those working in older school buildings. Here teachers noted that the buildings have had a very

positive impact on teaching and learning as a brighter and more comfortable school enhanced pupil engagement:

Everybody enjoys coming to school far more because of the physical building we are in; everybody is really proud of the school and wants to have it as nice as possible.
(Teacher, Pear Tree Row school, large, newer building)

In this school, teachers felt that the atmosphere in the school had changed significantly and the presence of more space enhanced the opportunities for teachers and pupils to engage in a diverse array of activities. In one of the two newer schools (Maple Lane), extensive consultation had taken place regarding the design of the school, a process which had involved both teachers and parents. Such consultation was seen as key to a successful school:

I think it is very important for the client to work with the architectural team, the design team, so that they understand what the needs, in this case of primary schools, are. (Teacher, Maple Lane school, medium, newer building)

When asked about the optimum size for primary schools, the opinions of teachers in the six schools varied somewhat, with some favouring a single class per year group while others favoured having a maximum of two groups per year. The opportunity to have more personal interaction between all members of the school community was seen as the main advantage of smaller schools:

A smaller school is good because you get to know the children over the years; you get to know the families. (Teacher, Maple Lane school, medium, newer building)

I really like the idea of one class per stream, which we have here ... it is nice to provide kids with an opportunity to have an interaction [with different year groups]. [In bigger schools] there may not be so much integration between the older and younger classes, which is really nice. (Teacher, Maple Lane school, medium, newer building)

Several international studies have found positive relations between smaller primary school size and student academic and social outcomes, especially for more disadvantaged students (see Fowler, 1992 and Chapter 1). Although smaller schools were seen as having advantages, the necessity to have multi-grade classes in very small schools was seen as posing particular concerns for teachers and pupils alike:

It would be nice for each school not to have mixed [multi-grade] classes, so you'd have, say, in the first class, all the children in that class are first class. ... I think it makes the curriculum much clearer that way because you don't have to differentiate so much. We have one class where there are fourth, fifth and sixth year [pupils], I know this is a reality for lots of schools but it does put an extra pressure on the teacher and on the children in a sense that a lot of them try to do the work which they are not expected to do. So you've got a competitive element. I think it would be nice to have one class per year group. (Teacher, River Bank school, small, older building)

Class size (that is, the number of children in the class or social density) emerged as a significant topic in the teacher interviews, and was seen as being more important than school size. Chapter 1 has indicated international research findings which point to the academic benefits of smaller class sizes (see, for example Ehrenberg *et al.*, 2001), although there is some variation in the appropriate threshold identified (Glass *et al.*, 1982; Achilles, 1999). Teachers in the case-study schools argued that the pupil-teacher ratio has significant implications for the nature of teaching and learning processes within the classroom:

[Class size is really important so that you] can teach all of them really well ...especially children who don't speak English, children with special needs – your time and your attention is just dragged everywhere. Sometimes you feel that you are not teaching any of those children properly because your time is so divided. Whereas if you had fifteen [it would be different]. (Teacher, Maple Lane school, medium, newer building)

In the same vein, a teacher in River Bank school noted that the *...teacher's influence is diluted*⁷ in larger classes. Teachers generally specified a class of twenty to twenty-five pupils as being preferable. However, it was also noted that infant classes in particular should be smaller in order to pick up problems that could be *nipped in the bud* so that pupils *do not slip through the net*.

Teachers, especially in the older schools, were also critical of the physical size of primary classrooms, that is, the space available for each pupil in the class. In some cases, teachers expressed the fear that if pupil numbers in primary classrooms should fall, the classroom size is also going to be reduced. In a number of the case-study schools, teachers considered the classrooms to be too small for fully delivering the primary curriculum. In particular, restricted space is seen as constraining the range of teaching methodologies, particularly group work, which can be used, an issue discussed in greater detail in the section on teaching and learning below. The use of a greater variety of resources and equipment in primary teaching, ICT, science equipment, displays and flipcharts, has implications for available space within the classroom which *...would make the space in the classroom awkward to use* (Teacher, Lake View school). Some subject areas, such as drama, are seen as having additional space requirements. Available space not only shapes the nature of teaching and learning but the quality of interaction between pupils themselves:

Particularly when the children are with the same children all the time in a little room where they have to constantly move bags and things, you know, they begin to get fed up with each other. So you need the space. (Teacher, Maple Lane school, medium, newer building)

In order to solve the issue of lack of space in the school, one of the case-study schools (Hillcrest) utilised a prefab building as the learning support room. Pupils who were attending learning support, therefore, have to leave the main school building to access the prefab. Teachers in this school commented that this was not ideal as younger pupils need to be accompanied to and from the prefab (as it is separate to the school). Some of the other

schools had had prefabs previously but were no longer using them at the time of the interview.

Teachers in the case-study schools were asked to comment on the nature of classroom layout. This topic has been quite well researched and debated by educationalists. Overall, different seating arrangements are seen as appropriate to different tasks (Galton *et al.*, 1999), although children sitting in rows is seen as contributing to a more teacher-dominated and less interactive classroom (Marx *et al.*, 2002). Not surprisingly, classroom layout was closely associated with the physical space available in the classroom. However, even in similarly sized classrooms, there was some variation in the layout with furniture arranged into clusters in some classes and in rows in others. Teachers mentioned that while the ideal layout in the primary school classroom would involve pupils sitting in groups, it is necessary to have enough space available for this arrangement. Having tables in clusters was considered to facilitate more active and varied learning:

It is important to give children an opportunity to work one-to-one, or in pairs, or in small groups depending on what objective you'd like to meet that day. And from a social point of view as well, they begin to make friends more easily when they have other children around them. If they all sit in rows, that is kind of missing. (Teacher, River Bank school, small, older building)

In contrast, a more fixed classroom layout with children sitting in rows was seen as constraining the amount of contact possible:

The row just does not work in terms of getting around to the kids, you know, you're climbing over them all the time. (Teacher, Maple Lane school, medium, newer building)

Similarly, a teacher in Pear Tree Row school indicated that a class layout based on clusters of tables enables different pupils to work together and consequently the class 'gels better together'. Rotating the pupils around the classroom on a regular basis was also seen as enhancing educational and social development:

We would constantly change the pupil groups as well, for example pupils sitting in one group in September would not be sitting in the same group now. We change quite a lot. [We do it for] just the variety; even in the fifth class a lot of the pupils hang around the same people all the time, to give them a chance to speak to other pupils. It is really encouraging them to develop new relationships with other kids in the class; and also it might be a discipline factor if somebody is too chatty with somebody else. Somebody who works well with somebody else, somebody who would be helpful to somebody, they can help them along and encourage them. (Teacher, Maple Lane school, medium, newer building)

Classrooms in the newer schools had different zones for various educational activities in the classrooms, including a wet area, a library corner and so on. However, in some of the older buildings, children had to go to other classrooms for subjects such as Art because of the lack of space and/or

access to facilities such as a sink in their own classroom. More restricted space was seen as having particular implications for certain subject areas and required very careful teacher planning (an issue which is discussed further below):

The teachers make the most of what they've got. So no matter what kind of room you are in, those are your objectives and you work to meet those objectives. The school is restricted when it comes to PE. ... But you still make sure that the children don't miss out in any way. In terms of other subjects, such as Science, it can be restrictive but it does not mean it is not done; you don't want children to miss out in any way. ... I think it is careful planning on teachers' part in terms of who is going to be where and when to make sure that everything is covered. (Teacher, Riverbank school, small, older building)

International studies indicate that display of children's work is beneficial, making the school more welcoming (Maxwell, 2000) and increasing feelings of ownership and involvement, thereby leading to improved motivation (Killeen *et al.*, 2003). In all of the case-study schools visited, pupil work was exhibited both inside the classrooms and in common areas such as corridors. All teachers considered exhibiting pupil artwork important:

It is hugely important to display pupil artwork because a lot of work goes on in the classroom that I mightn't be aware of; other pupils are not aware of; other teachers aren't aware of and maybe somebody has a talent for Art that maybe is not celebrated as the talent for sport – we can see that. But other teachers learn from each other as well. ... People are getting ideas. (Teacher, Lake View school, medium, older building)

In sum, teachers in the case-study schools favoured having fewer pupils per class and more space available per pupil in order to facilitate teaching and learning. Organising pupils into groups or clusters within the classroom represented the favoured approach, but this was not always possible in some of the older schools because of space constraints.

5.2

Facilities in the Schools

5.2.1 FACILITIES FOR PUPILS

The study also explored staff perceptions of facilities available for pupils in the school (see Table 5.2). A number of the older schools were seen as unsuitable in catering for the needs of children with physical disabilities. While toilets suitable for children with physical disabilities were in place in a number of schools, only a few of the older schools had ramps or lifts throughout the school. Even in the newer schools, classrooms may not be sufficiently spacious to enable wheelchair use if pupil numbers are large. It is worth mentioning, however, that only a few of the schools currently had children with a physical disability. In one school, teachers were critical of the lack of such facilities: *...If someone had motor difficulties, that would pose a problem (Teacher, Oak Leaf school); The toilets aren't disabled-friendly either (Teacher, Oak Leaf school)*. Hillcrest school has an accessible toilet and a ramp at the entrance. However, the absence of a lift means that relevant classes would have to be positioned on the ground floor. In Pear Tree Row, a school built to current DES design guidelines,

Table 5.2: Facilities in the Case-study Schools

School	ICT		Other Audio- Visual Equipment	Library		Learning Support		Community Use	
	In (some) Classrooms	Separate Room		In Classrooms	Separate Room	Dedicated	Shared	None	Limited
Riverbank	✓	✓	✓	✓		✓			✓
Oak Leaf	✓		✓	✓			✓	✓	
Maple Lane	✓		✓	✓	✓	✓			✓
Lake View	✓	✓	✓	✓	✓	✓			✓
Hillcrest	✓	✓	✓	✓	✓	✓		✓	
Pear Tree Row	✓		✓	✓	✓	✓			✓

which has one child with a physical disability, existing provision, including changing facilities for pupils, was generally seen as adequate.

The position of toilets for pupils varied across the case-study schools. Where the toilets were installed inside the classrooms, teachers were generally satisfied with them. Having toilets as part of the classroom was preferred by a number of teachers as it reduced the need for supervision: *...children don't have to leave the classroom* (Teacher, Maple Lane school). This was seen as a particularly important issue for infant classes because *...if you let an infant out you don't know if they are ever going to come back, they can get lost on the way back* (Teacher, Pear Tree Row school). In some cases, senior classes had separate toilets for girls and boys.

In all of the case-study schools, pupils eat their lunch in the classroom, at their desks. In some cases, the pupils were allowed to take their food outside. One teacher commented on the difficulties involved in providing pupils with a designated lunch area:

[Eating at the desks is] not ideal, as they work there all day. It is a hygiene and cleanliness issue. I wouldn't be in favour of a canteen, unless you change the school day, it is not practical to provide hot meals. [Providing hot meals] would be a sea change for Ireland. You would need to provide very much enhanced facilities, [there would also be a] staffing issue, space, it has to be thought through. (Teacher, Maple Lane school, medium, newer building)

Teachers were also asked to describe the facilities available for pupils for specific activities, including Physical Education, Drama, ICT and learning support/resource teaching. Generally, PE lessons took place in the hall or general purpose area, the quality and size of which varied. The exception to this pattern was Oak Leaf school, where PE classes had to take place in the schoolyard due to the lack of indoor facilities:

Obviously with no facility for wet weather for PE, we wouldn't be completely satisfied. ... And the yard is not a huge amount of space either. (Teacher, Oak Leaf school, small, older building)

In some schools, including Maple Lane, one of the newer schools, the facility was seen as satisfactory for dancing and gymnastics but not suitable for PE lessons for the whole class. As a result, the teacher had to take half a class at a time, while the other half were working in their classroom. Where possible, schools utilised indoor facilities in the community (such as the local tennis club or swimming pool). River Bank school had serious issues with the space available for PE and Drama as the general purpose area was also used as a classroom. The situation was considered to be:

Obviously very disruptive because we have to put our Drama, assemblies and PE on one day for the reason that we have to take the furniture out of the room and that room has to be used by all classes that day to make use of that PE area. So that is quite disruptive to the class who are in there because their furniture needs to come out and they are 'homeless' for the day. And then, obviously, it's got to go back at the end of the day. (Teacher, River Bank school, small, older building)

Computers in the classroom are a powerful educational tool and their use is becoming more widely available in schools. International best practice suggests the need to embed ICT within existing pedagogy (Higgins and Hall, 2002; Scottish Executive, 2005), and the appropriate use of ICT has been found to promote active learning and student engagement (Becta, 2003; Hakkarainen *et al.*, 2001). However, the shortage of modern, up-to-date computers in the classroom may be an obstacle in this respect, with pupils reporting superior equipment at home than at school (Scottish Executive 2005). Docrell *et al.* (2005) conducted a study on the use of computers by Irish primary school children and found that almost all schools (99.7 per cent) had computers for children's use. The majority (89.6 per cent) of teachers had received computer training but few (17.6 per cent) had received ergonomic information. An IPPN report (2007) argues that Ireland lags behind other OECD countries with regard to the level of teaching of and through technology. According to the survey carried out by IPPN, 91 per cent of school principals felt that ICT has the potential to significantly improve educational outcomes at primary level. In particular, they believe that properly integrated technology strategies and methodologies substantially improve pupil motivation, engagement and attainment levels, and boost literacy and numeracy levels at all levels of the system.

In three of the case-study schools, Riverbank, Lake View and Hillcrest, all older schools, there was a separate computer room while (a small number of) computers were located in classrooms in the other schools (Table 5.2). In general, teachers in the case-study schools were critical of the number and age of computers along with lack of support in relation to maintenance (see below). Library facilities usually involved a 'corner' or zone within the classroom, although separate library rooms were also available in four of the schools. Learning support and resource teaching usually took place in dedicated rooms, although in many cases such spaces had been adapted from other uses (such as a storeroom) with implications for the suitability of the layout and comfort.

Several teachers commented on the furniture available in classrooms. Several international studies suggest the use of the ergonomically designed furniture in schools (Troussier, 1999; Panagiotopoulou *et al.*, 2004) as such furniture was perceived to be more comfortable and less likely to cause back pain. It has been suggested that the design of classroom furniture should be based on students' height in order to avoid a mismatch between students' body dimensions and the furniture they use (Molenbroek *et al.*, 2003; Parcels *et al.*, 1999). In general, the perceptions of teachers participating in this study of the furniture used varied. In one school where 'standard' desks and chairs were being used, desks and chairs were seen as *...uncomfortable for the children, poorly designed, heavy to move around, [with] poor storage* (Teacher, Maple Lane school). In another school, old timber desks in rows had been used until relatively recently. However, new furniture posed some difficulties since it did not fit the classroom size and took up far more space than the older furniture. In addition, a teacher commented that *...room size constitutes how the furniture is laid out as well* (Teacher, Lake View school). In Pear Tree Row school, staff attempted to overcome the issues with furniture by fund-raising to purchase furniture more suitable for children:

Chairs have a very good back support and the children cannot swing very easily on the chairs. There are baskets under the desks which hold books and books on the sides which hold schoolbags. This furniture is easy to maintain and the quality is better. (Teacher, Pear Tree Row school, large, newer building)

Loughlin and Suina (1982) discuss how the importance of storage and arrangement of materials can be underestimated and argue that accessible, well thought out storage leads to more time spent learning. The necessity of having adequate storage areas was highlighted by teachers across all of the schools. The storage area behind sliding doors within the classroom was considered by those in Pear Tree Row to be particularly suitable:

The space is important, you don't have to stand back to open them, ... there is also a less chance of somebody walking into an open door, fingers caught or anything like that. (large, newer building).

Inadequate storage emerged as a significant issue in Hillcrest school, an older school. The school has collected supermarket vouchers for sports equipment but they cannot buy any sizeable sports equipment as they have nowhere to store it. Items such as televisions and videos are stored on the corridor, which is seen as a potential health and safety issue.

5.2.2 FACILITIES FOR SCHOOL STAFF

As well as sites for teaching and learning, schools are workplaces for teachers. International studies have indicated the importance of having satisfactory facilities in place for teachers (see Chapter 1). The quality of the staffroom and toilet facilities for teachers differed across the six case-study schools. Staff in the two newly built schools (Maple Lane and Pear Tree Row) were generally satisfied with the facilities, although in one of these schools, the standard size of the staffroom provided was seen as too small for the number of staff. In older schools, teachers were critical of the facilities:

As far the staffroom is concerned, there is no space to get away from your class and go and have your lunch for, let's say, ten to fifteen minutes. It gets to the point where people will have their lunches in their rooms, which is very isolating. ... In terms of toilets, with [the number of] staff, the facilities are quite strained. You find that you are nipping in quickly at any opportunity you get, really. (Teacher, River Bank school, small, older building)

5.2.3 FACILITIES FOR PARENTS AND THE WIDER COMMUNITY

Most of the schools participating in the study did not have a designated area for meeting parents, which was generally seen as a drawback:

For parents there is no designated area. If staff want to talk to the parent privately, they use a learning support room. We will be often turfed out of the room to give them time alone with the parents. (Teacher, River Bank school, small, older building)

In Oak Leaf school, lack of facilities for parents was seen as posing problems:

The parents' association would have their meetings in the local pub, they would use a room there. ... But there's nothing on during the day for parents, because there's really no space for them to meet. (Teacher, small, older building)

Where such a facility existed (such as in Maple Lane school), staff were very pleased with it.

Several schools opened the building in the evenings for after-school activities, such as dance classes or sports for pupils. Some of the schools also opened up their building or school grounds for the wider community. One of the schools had made their yard area available for a local market at weekends. One of the issues that concerned staff in terms of opening schools for community use was management and security:

Who is going to caretake it? Who is going to insure it? Who is going to manage it – if schools are to be opened up for a wider community? (Teacher, Lake View school, medium, older building)

In Lake View school, this meant that the school principal was responsible for organising access to the school building after hours. However, the benefits of having wider access to the school buildings were acknowledged:

But then again sometimes you can have these buildings with modern equipment while the local community may be starved of this equipment. (Teacher, Lake View school, medium, older building)

In the same vein, a teacher in Maple Lane school noted that management and security is important:

As long as things are not disturbed. ... It is really important that you don't come in and your classroom is moved about or is tampered with. (medium, newer building).

In Hillcrest school, the school layout militated against making it available for the wider community: as the hall is directly connected to classrooms, this prevents it being used by the local community as anyone in the hall would have access to the entire school. Teachers would like the hall to be used by the outside community rather than *sit idle* at the weekend. These teachers suggested that all school halls should be stand-alone rooms, which would address the issues of security if the room is used by a wider community. However, there is a potential trade-off between facilitating community access in this way and having to supervise pupils moving between buildings as well as requiring pupils to go outside in bad weather conditions. This issue may be resolved by current DES guidelines which suggest that general purpose rooms should be designed so that the main part of the building remains inaccessible to the public and thus facilitate community use.

5.3 Outdoor Space

Several international studies have highlighted the importance of outdoor space in teaching and learning (see Chapter 2). The six case-study schools differed in the availability and size of indoor and outdoor facilities for PE, play and other activities (see Table 5.3). The need to improve outdoor facilities emerged as a significant theme across most of the case-study schools. In particular, teachers were critical of the small size of schoolyards as well as the kinds of surfaces used:

There is no grassy area, the yard is covered with concrete and a large chunk is taken up by a staff car park. ... This sets certain limitations to what the children can do in terms of football etc. and obviously there is a safety element to it. ... Grass area widens the opportunity for games that they can play. As the school site is limited, there is not much scope for nature study etc. (Teacher, Riverbank school, small, older building)

Table 5.3: The Use of Indoor and Outdoor Facilities for Teaching and Learning

School	Inside the School	Outside	Other Areas Outside School that are Used for Teaching Purposes
Riverbank	Use classroom for PE, drama etc.	Small yard area, covered with tarmac and concrete	Do not use areas outside school for educational activities
Oak Leaf	Use schoolyard for PE	Small tarmac playground	Occasional use of nearby park; local swimming pool
Maple Lane	Small hall for PE (divide class into groups)	Small yard area with different surfaces including tarmac and artificial grass	Use the facilities of nearby sports club for PE
Lake View	Hall for PE and drama	Tarmac yard area, school garden, fields	Use of school garden; history trails in the local area
Hillcrest	Hall for PE and drama	Basketball courts, medium size yard, vegetable patch	Occasional field trips to a local park
Pear Tree Row	Hall for PE and drama	Yard with basketball court, fields, school garden	Use of the local park for sports; use of school garden; occasional nature walk

Limited outside space in the yard was also commented on by teachers in Lake View school (medium, older building):

The older children like to run and play games in groups ...they would like to play football or things like that but the yard is not big enough.

The space problem was seen as easier to solve in spring and summer when the fields nearby belonging to the school could be used for sport and play:

This time when the weather is good they are up in the fields and the fields are much larger. (Teacher, Lake View school)

Outdoor space also emerged as a significant issue among pupils. Internationally, outdoor space for children has been relatively neglected in school design but a number of studies have highlighted the potential use of outdoor spaces for enhancing children's learning and well-being (see for example, McIntyre, 2006).

5.4 Teaching and Learning

5.4.1 TRENDS IN TEACHING METHODS

Several studies have explored changes that have occurred in teaching and learning in recent decades, with a trend in many countries toward viewing pupils as agents of their own learning, a pattern which has implications for school design (Wall *et al.*, 2008). Staff in the six case-study schools were asked to reflect on changes that have occurred in teaching and learning in the last decade and on their own teaching approaches and methods. Overall, there was a consensus among teachers that, in recent years, teaching and learning has become more child centred in nature:

There is much more awareness now that children learn in different ways. I think that teaching has responded to that awareness. (Teacher, Maple Lane school, medium, newer building)

The focus is seen as more ‘hands on’, involving more active learning on the part of children.

I suppose the teachers no longer see themselves as the fountain of knowledge at the top of the room. (Teacher, Lake View school, medium, older building)

Similarly, in Pear Tree Row school a teacher noted that: ‘...children respond best to the approaches they feel they are part of’ (such as active learning). Children learn from experience, ‘...if you do this and this happens ... this way the child would always remember the process’. Teachers perceived the necessity of using a variety of methodologies in order to enhance pupil engagement:

The hallmark of a teacher is to be able to engage the whole class at one time. That’s the key – the successful teacher has to be able to engage all the children in the group at one time. What flows from that is pair-work and small group work. Children respond best when they feel engaged. I think that a variety of approaches is really important, the classes have to be interesting and stimulating. (Teacher, Maple Lane school medium, newer building)

Changes in teaching approaches were seen as directly following on from the introduction of the Primary Curriculum (1999):

In the last decade with the revised curriculum, there’s a lot more interactive learning. The children are not seated as much as they’d been, they’d be more engaged in their lessons, say in Science, standing up group work, active learning, discovery learning. So there’s a lot more movement involved. (Teacher, Oak Leaf school, small, older building)

[Teachers] are not as tied to the textbooks and it [the new curriculum] will give teachers a fantastic scope ... It is also much more now about discovery learning: to learn for themselves, which is a skill for life. (Teacher, Pear Tree Row school, large, newer building)

Changes in teaching and learning were also seen in relation to broader societal changes:

The kids you’re teaching are different now. It’s more of an interactive society. They wouldn’t sit the way maybe my generation would have, and taking

instruction – they now ask the question ‘why?’. (Teacher, Oak Leaf school, small, older building)

5.4.2 APPROACHES TO TEACHING IN THE CASE-STUDY SCHOOLS

While teaching approaches were seen as having changed over time, teachers in the case-study schools varied in the kinds of approaches they reported taking with their own classes, although all reported a combination of whole-class teaching, group work and pair work. The design of school buildings is seen to have a direct impact on teaching and learning processes among teachers in the case-study schools. Teachers in the newer schools, Maple Lane and Pear Tree Row, reported greater use of a variety of methodologies. Children are seen as responding best to group work:

[Older pupils] in particular, they are well able to discuss things together, challenge each other, question each other on what they are doing and that works very well. (Teacher, Maple Lane school, medium, newer building)

More active approaches were also used in History, Geography and Science, where children can be involved in doing experiments and conducting research. The use of a variety of methodologies, reflecting the needs of children and different subject areas, was stressed:

The key is variety – try and use as many different approaches as you can to meet their needs. (Teacher, Maple Lane school)

In the four older schools, however, teachers emphasised the difficulties in delivering the primary curriculum to its full potential due to constraints on space within the classroom. One teacher commented that changes in the curriculum had profound implications for the layout and functioning of schools:

One of the challenges and the tensions with the revised curriculum is that it is ...very practical, very much group work-orientated, excellent in its approach. However, the very design of many buildings is the reason why that doesn’t happen to the extent that’s desirable in certain places, people just can’t if they’ve got a class of over thirty in an over-crowded classroom, no matter how good the theory is, it’s very, very difficult to do some of the things. So I think that’s a huge issue is the tension between the design that we have in schools and the aspirations towards the very much constructive based learning. In some schools, for instance, you still have to have the old-fashioned desks because the rooms are simply not big enough to cater for the modern furniture. So clearly that’s going to affect entry and exits, it’s going to affect group work, it’s going to affect partner work. It means that almost certainly the desks are going to be the traditional style desks facing the teacher and the teacher is always going to be the fount of knowledge because of the way the classes actually are. ... I think that curriculum should very much influence design; it’s a matter of form following function. (Teacher, Oak Leaf school, small, older building)

While teachers did use group and pair work even within these constrained spaces, they felt that such work could not be as effective as they might like:

I do some group work with my class, but with the size of the seniors and the space, you already have the desks taking up a huge amount of the room, so when they're over in a group trying to keep one group separate from another group... There's nowhere for the groups to go. (Teacher, Oak Leaf school)

I can't do drama really with my class unless I bring them outside. (Teacher, Riverbank school, small, older building)

The classrooms that we have at the moment really aren't suitable for those kinds of activities. (Teacher, Hillcrest school, large, older building)

The opportunity to display pupil work was also seen as constrained by space in the older schools. Several teachers highlighted the importance of play for younger classes. Attempting to have separate learning zones for different activities was, however, seen as difficult in smaller and/or overcrowded classrooms:

Ideally, you're meant to have different areas like a library corner, a play corner, a painting corner, a writing corner but there's isn't room in the room for all those corner spaces. ... It would be lovely to have a space specifically for wet and messy stuff, especially for infants. (Teacher, Hillcrest school, large, older building)

I can't move the kids around my room so I can't really have zones. ... I can't even have a nature table in my room. (Teacher, Riverbank school, small, older building)

Peer learning was seen as occurring within the context of group work. In Pear Tree Row school, teachers specifically mentioned using a structured approach to co-operative learning among pupils themselves:

We do pair reading where you have got an older group helping a younger group with their reading. We pair them very carefully from the ability point of view so that the older child is ahead of the younger one and their personalities suit so that they work well together. The system is very structured so that they are trained in how to do it. But they absolutely adore it. (Teacher, Pear Tree Row school, large, newer building)

This kind of pair work occurred on a more informal basis in some of the other schools. In terms of working with other teachers, the most common forms of collaboration mentioned included co-operation and collaboration with Special Needs Assistants and resource and learning support teachers. Collaboration with another class teacher was rarely mentioned. Only in one school did teachers mention swapping classes for certain subject areas such as Music, Science or PE.

5.4.3 THE USE OF ICT AND AUDIO-VISUAL EQUIPMENT IN PRIMARY SCHOOLS

Teachers were also asked about the use of ICT in their schools. Teachers across all of the case-study schools expressed a good deal of dissatisfaction with available computer facilities in their school. Such criticisms centred on the small number of computers available, lack of data projectors, the outdated nature of the equipment, and the lack of suitable software:

I don't have a computer in my class, it's not for the want of trying ... you do need it. (Teacher, Lake View school, medium, older building)

The absence of technical support and maintenance services was also raised as an issue. In one school (Hillcrest), they paid an external company to maintain the computers, while in other cases it was dependent on the expertise of existing staff. A number of broken computers were evident during our visits to the schools.

All of the schools had a small number of computers in some, but by no means all, classrooms. In two older schools, Hillcrest and Lake View, there was a separate computer room. Teachers varied in their views on integrating computer provision into the classroom as opposed to having a separate computer room. In Maple Lane school, one teacher argued against locating computers in a separate room:

In primary schools you have to use computer as a tool for teaching rather than an end of themselves. So I don't see it particularly useful to bring a group of primary school children to a computer room for an hour. I think it is much better to have an access to a couple of computers and laptops in the classroom, so that they could be used more in an incidental way, groups of children at a time or ones or twos work on a computer when others are working on different things. (Teacher, Maple Lane school, medium, newer building)

However, another teacher in the same school had a different opinion: *I think if we had a room that was designated, it might be great.* Teachers in the case-study schools were generally positive about the potential for greater use of IT:

[Use of the Internet] could make teaching and learning a lot more interesting and a lot more interactive. (Teacher, Lake View school, medium, older building)

The benefit of having access to ICT facilities for children who may not have these resources available at home was also noted:

Especially if some kids don't have a computer at home are not so comfortable using computer, for kids like that, it would be fantastic to do the work at school. (Teacher, Maple Lane school, medium, newer building)

However, lack of facilities was seen as constraining this potential. Furthermore, lack of confidence among teachers in relation to technology was seen as a potential issue. Younger teachers were seen as more confident ... *because they have grown up with computers* (Pear Tree Row school, large, newer building).

The extent to which computers in the case-study schools were regularly used in the teaching process varied. In Oak Leaf school, computers were used *very little* in day-to-day teaching and learning. In other cases, ICT was used as a source of information or for research purposes:

We use computers for looking up something, go on the Internet, we don't do classes based on computer work, it is very much like getting out an encyclopaedia

and looking up something. (Teacher, Maple Lane school, medium, newer building)

ICT was seen as more suitable for some activities than others:

It is not something that you would use all the time but it has its uses in reinforcing, making it more interesting and probably lending itself to certain subjects more than others. (Teacher, Lake View school, medium, older building)

Only two of the case-study schools had an interactive whiteboard. However, in one of the schools, its introduction had led to more rigidity in classroom layout; only one computer point was available for it so pupils had to sit in rows facing the screen. Other teachers were generally positive about obtaining interactive whiteboards for their classrooms.

In addition to ICT, the case-study schools also made use of other audio-video equipment: TV, DVD-players, CDs and tapes. Television sets and similar equipment was often shared between classes and moved on a trolley from one classroom to the other. Overall, the use of audio-video equipment for educational purposes was limited.

5.5

Environmental Factors that Influence Teaching and Learning

5.5.1 NOISE

A number of international studies relate to children learning in noisy environments. According to this research, chronic noise exposure impairs cognitive functioning and is associated with reading problems (Haines *et al.*, 2001b; Evans and Maxwell, 1997) and deficiencies in pre-reading skills (Maxwell and Evans, 2000). In this study, noise, either internal or external, was considered to be a problem in some schools, especially if the school was located on a busy main road. Teachers in these schools complained about not being able to open the windows and having to open the door to the corridor instead. Interestingly, one teacher in such a school noted that: *...one gets used to noises in the environment very quickly so we don't have complaints in terms of traffic noise or environmental noise* (Maple Lane school). However, not all teachers in that school agreed with this viewpoint and expressed their concern about the impact of noise on teaching and learning processes:

I find it very frustrating having background noise. If it is a situation where the kids are working in groups, doing group-work, chatting among themselves, it is different, but if it is the situation where you are explaining something new or launching a new topic or whatever ... the noise of the buses going up and down, you also hear people's voices down there ... The kids that are easily distracted anyway find it distracting, you constantly have to pull them back. (Teacher, Maple Lane school, medium, newer building)

In Hillcrest school, the school entrance opens onto the hall so there are a large number of people going through it. Also, there are classrooms located directly onto the hall; consequently any amount of noise in the hall disrupts these classes. Not surprisingly, external noise was seen as more of an issue in schools located in urban areas. However, in a number of the schools, noise was seen as travelling between classrooms and/or between the classrooms and common areas. In contrast, teachers in Pear Tree Row

school, were more positive about the acoustics within and between classrooms.

5.5.2 TEMPERATURE

Another important factor seen as having an impact on pupil comfort in the classroom was temperature. Some international studies show that indoor air quality and temperature in schools have an effect on student experiences and well-being, with poor indoor air quality and temperature problems linked to student absenteeism, well-being, health and academic attainment (Buckley *et al.*, 2005). In this study, unsatisfactory temperature was seen as a particular problem in prefabs:

I often find, you work in a prefab and it will be freezing cold in wintertime. And you want the children to be focused and you want them to take their coats off and come and sit down, and they really don't want to. And in summer time it is boiling. And this school gets very stuffy in summer. So the temperature, you know, plays a bigger part than you realise, at times ... It would be nice to have a nice light room. You want the classroom to be so light and airy as you can to capture imagination. I think the factors have a big impact, particularly in a room that is hot and stuffy you begin to want to get out, you are not interested in what is going on in the classroom. (Teacher, River Bank school, small, older building)

In contrast, in Pear Tree Row, one of the newer schools built to current DES design guidelines, staff were more satisfied because of the flexibility in adjusting and regulating the temperature with the thermostat being located within the classroom:

If it gets too hot you can reduce it by a button on the wall. (Teacher, Pear Tree Row school, large, newer building)

5.5.3 LIGHT

There is a considerable amount of literature relating to lighting in the classroom. In relation to student achievement it is argued that daylight offers the most positive effect (Earthman, 2004; Heschong Mahone Group, 2003) as it produces biological effects on the human body (Wurtman, 1975). However, other researchers recommend combining natural light with artificial lighting for maximum benefit for the students: 'lighting to be effective, daylight must be supplemented by automatically controlled electric lighting that dims in response to daylight levels' (Benya, 2001, p.1). Elsewhere, Barnitt (2003) suggests that good lighting can only be achieved by a combination of direct and indirect lighting. In this study, teachers in the case-study schools were generally satisfied with light in their classrooms, although in some cases natural light was insufficient to light the whole room. In Pear Tree Row school, one teacher commented that:

The natural light is fantastic, we have a huge amount of natural light in the school, and it is incredible how this makes the place more cheerful.

While teachers generally preferred to have a lot of (natural) light in the classrooms, one teacher in Pear Tree Row noted that ...*big windows are great but it takes up a lot of wall space* which can limit display and storage area in the class. Another issue arose where other rooms were adapted for teaching

purposes (for example, for learning support). Such rooms often did not have direct access to natural light or were reliant on a skylight being inserted, which had implications for ventilation:

It [the room] has skylights for windows so it does get warm in the summer.
(Teacher, Oak Leaf school, small, older building)

5.5.4 AIR QUALITY

As discussed in Chapter 1, the importance of ventilation in educational establishments continues to be emphasised in international literature (Kimmel *et al.*, 2000; Khattar *et al.*, 2003). Studies in school design refer to the inadequacies of indoor air in schools (Lee and Chang, 2000; Kimmel *et al.*, 2000; Khattar *et al.*, 2003) and link this to ill-health (Ahman *et al.*, 2000). Clearly this has implications for learning and academic achievement. Air quality also emerged as an important factor in this study, with teachers considering adequate ventilation in the classroom as important. In Oak Leaf school, teachers considered that:

Ventilation and oxygen does have a huge impact on the ability of children to learn.

In the same vein, a teacher in Pear Tree Row noted that: *...the rooms can get quite stuffy in warm weather and we are not allowed to leave the doors open because of fire regulations.* According to her, even opening the windows does not improve things very much, especially when senior children return to classrooms having been playing outside.

5.6 Significant Factors in Designing Primary Schools

Teachers in the six case-study schools were asked to list the main factors that they consider important when designing a new primary school. A number of teachers stressed the importance of having a consultation process so that teachers would have direct input into the design process:

[There] has to be a consultation between school users and the design team, we really need to understand each other, I think this is absolutely crucial, because I think a lot of the design teams do not understand the needs of the primary schools, they think they do, but they don't actually. (Teacher, Maple Lane school, medium, newer building)

This is in line with many international studies which highlight the importance of including 'end users' (that is, the school community) in the design process (Higgins *et al.*, 2005; Dudek, 2000; Clark, 2002).

One teacher in Hillcrest school highlighted a model of good practice from their experiences in another school. They indicated that in the Galway Educate Together school, consultation with teachers had meant that some classroom features (such as sockets and coat hooks) were more appropriately positioned and it resulted in *a clever use of space*, by integrating space for children to work into the corridors.

Across the case-study schools, teachers highlighted a number of features which need to be taken into account in school design in order to enhance teaching and learning and teacher and pupil comfort:

- Large classrooms which allow for the flexible use of space and reorganisation of furniture for group work and active learning methods;

It is so much better for them [pupils] to learn in groups because they learn so much from each other, a huge amount from each other. And you have a social aspect as well – that they are part of a little group. It is very isolating to be sitting on your own in a line, somebody on your right, somebody on your left, no eye contact all day except with somebody at the top of the room, that's very limited. It is so much more natural the other way. (Teacher, Pear Tree Row school, large, newer building)

- Adequate storage within the classroom and space for displaying pupil work;
- Natural light and suitable ventilation/temperature;
- Adequate ICT provision, including computers in every classroom, appropriate software, interactive whiteboards, laptops for children, maintenance and technical support services;
- Improved facilities for sport and play, both indoors and outdoors, with greater amount of space and access to equipment;

You need to have as much space outside as inside, you know so that they can learn and grow and play safely. That would be important for the location of the school. (Teacher, Oak Leaf school, small, older building)

- Adequate space (dedicated rooms) for learning support, resource and English language teaching; these spaces should be specifically designed to be stimulating for these groups;
- Adequate staffroom facilities;
- En suite toilet facilities for pupils;

It would be very handy to have toilets in your own classroom, especially down at the junior end. People could go out and come back in without having to walk down and you could keep an eye on them. That would be a handy thing. (Teacher, Oak Leaf school, small, older building)

- Space to meet with parents.

5.7 Teacher Education and Training

In general, there was consensus among teachers that pre-service and in-service education and training does not adequately address the issue of use of space in primary classrooms. Some teachers were of the opinion that it is difficult to introduce the topic at the pre-service level as the young would-be teachers might find it difficult to visualise the classroom. However, having issues such as the use of space discussed during in-service courses was seen as potentially useful. Some teachers were more critical of the approach in existing in-service provision:

Teacher education does not address the use of space in the classroom. What is being said or shown is far removed from reality, often done in huge spaces with a small number of children. (Teacher, Maple Lane school, medium, newer building)

In the same vein, a teacher in Hillcrest school noted that teacher training does not reflect space issues in the average classroom and is based on an *ideal world*.

5.8 Conclusions

The main issue to emerge from the in-depth interviews with staff was class size in terms of both the number of children per class and the amount of space available for each pupil in the class. Approaches to teaching and learning were seen as having become more child-centred in recent years, thanks to the revised primary curriculum. However, lack of space was seen as having significant implications for teaching and learning within the classroom. In particular, it was seen as difficult to fully utilise active learning methodologies within cramped classroom conditions. Staff in older school buildings were more critical of space constraints but even the newer schools had contrasting experiences, with greater satisfaction with indoor (and outdoor) space in Pear Tree Row, while needs had already outstripped capacity in the newly built Maple Lane school. Overall, in the school based on the current DES guidelines, pupils and teachers were more satisfied with the space available for teaching and learning and outside areas. However, it should be noted that the school is situated in a rural area and has a generous site.

Lack of space was also raised as an issue in relation to Physical Education, sports and play. In a number of cases, indoor and outdoor sports facilities were seen as too small. Closely linked with the issue of space was inadequate storage in or next to the classroom. While space emerged as the most important issue, several environmental factors such as adequate light (especially natural light), good ventilation, adequate temperature and lack of internal and/or external noise were also considered to have a significant effect on teaching and learning.

In general, teachers across all schools were dissatisfied with ICT provision and the use of ICT was rarely integrated into day-to-day teaching and learning (consistent with some of the findings of the DES, 2008a study). There were too few computers and sharing sometimes posed problems; the computers were also quite old (sometimes donated by other institutions when they had *finished with them*), and technical support was limited, relying on existing staff or having to pay for external support. Several teachers noted that they would use computers more if they were more freely available. However, not all teachers felt comfortable using computers in teaching with newly qualified teachers being more likely to use these facilities, in line with existing research. In addition to ICT, teachers also make use of TVs, DVD players, CDs and tapes. As these facilities are shared between several teachers, careful planning is vital.

In general, teacher training was not considered adequate in covering issues such as the use of space and environmental factors that can affect teaching and learning. Furthermore, recommendations and useful tips provided during these courses related to an 'ideal' classroom, and not what happens in real life situations in schools needing renovation, where classroom size is small and some of the facilities (such as wet areas) are absent.

6. SCHOOL DESIGN – THE PUPIL PERSPECTIVE

6.1 Introduction

In recent years, the importance of recognising and valuing children's own perspectives has come increasingly to the fore in policy debate and academic research internationally (Clark *et al.*, 2003). A number of studies have focused on the 'pupil voice' as a way of determining more effective ways of engaging children in school and enhancing their learning (McIntyre *et al.*, 2005). Rudduck and Flutter (2004) argue for the need to '...take seriously what students can tell us about their experience of being a learner in school' and '...find ways of involving students more closely in decisions that affect their lives at school' (p. 2).

In this chapter, we draw on the perspectives of pupils in the six case-study schools to capture the 'child's voice'. In doing so, we acknowledge that children have a valuable contribution to make to discussions of the impact of the school environment on their own educational and social development. This chapter draws on two sets of information: first, group interviews conducted with older primary children in the case-study schools (usually sixth class pupils but a combination of fourth to sixth class pupils in multi-grade and/or very small schools); and second, drawings of 'my favourite place' and 'the school I would like' by younger pupils (usually at fourth class level) (see Chapter 3). Drawings have been used in previous research as a way of tapping into children's individual perspectives (Veale, 2005; Guerin and Merriman, 2006). Photography has also been used as a tool for exploring children's perceptions (see, for example, Clark, 2007); however, the use of photography makes it more difficult to maintain confidentiality. In the remainder of the chapter, we draw on children's accounts and drawings to highlight their views on school design and space.

6.2 General Perceptions of School Space

6.2.1 THE SCHOOL DAY

In order to understand how pupils use school space, it is useful to look at the structure of the school day. The six case-study schools vary slightly in the starting-time of the school day. Generally, if pupils arrive before the school is formally open, they wait in the yard. This is described by pupils as *not so bad except when it is raining* (Maple Lane school). In Hillcrest school, pupils wait in the hall until their teacher collects them. Most pupils did not enjoy this experience as the hall is small and they find it particularly *claustrophobic* in the mornings. Pupils expressed a preference to wait in the yard as they felt there was more to do in the yard.

The schools varied in the kind of space available to pupils to store their coats and other possessions. In the two newer schools, Maple Lane and

Pear Tree Row, coats were kept on hooks outside the classroom. In Hillcrest school, pupils hung their coats on pegs on a wall near the classroom entrance, making the entrance to the classroom quite cluttered. Furthermore, the pegs were above a sink and pupils commented that sometimes their coats fell from the pegs into the sink and got wet. In the other schools, children were required to leave their coats on the back of their chairs. Pupils generally kept their school bags under their desk. In Oak Leaf school, each pupil used a plastic crate under their desk to store their books. Some pupils criticised this approach as they could not store their belongings properly:

We've boxes instead of lockers.

But they're terrible.

They don't work. (Oak Leaf school, small, older building)

Similarly, pupils in Lake View school voiced some concerns over space available in the class: *If you bring in your [sports] gear bag, it's a bit messy down there.* Pupils in Hillcrest school felt they should have a shelf for their books, as it would give them more room at their desks. Generally, pupils across the case-study schools expressed a preference for separate cloakrooms and for lockers or other designated spaces for storing their personal belongings.

Pupils generally have two breaks during the school day. For the 'little break', the case-study schools vary in whether pupils are allowed to go outside to play. For the 'big break', pupils generally take lunch at their desks and then are given some time to play in the yard; pupil perceptions of outdoor space in the school are discussed in greater detail in Section 6.4 below. If it rains, pupils tend to stay in their classrooms for their breaks. A number of pupils across the case-study schools suggested they would prefer to have a separate cafeteria rather than having to eat their lunch in their classroom.

6.2.2 THE CLASSROOM

Pupil perceptions of school space and design varied somewhat across the case-study schools. In four of the schools (Oak Leaf, Hillcrest, Maple Lane and Lake View), pupils were critical of the lack of space within their classroom, describing the space as *squashed* (Oak Leaf school).

We have a lot of people [in the class] and sometimes it gets really overcrowded.

(Lake View school, medium, older building)

If we didn't get along, it would be really bad because we are all really squashed.

(Hillcrest school, large, older building)

Lack of space was even apparent in one of the newly built schools, with pupils reporting variation between classrooms in the size available:

The sixth class classroom is quite small, the junior infants' classroom is quite big. Fifth is big too but sixth is tiny. (Maple Lane school, medium, newer building)

Furthermore, the pupils commented that the library space within their classroom was particularly constrained and felt it would be better to have a separate library. Interestingly, pupil perceptions of the adequacy of space

within the classroom were not directly related to the age of the building since pupils in Riverbank (an older rural school) and Pear Tree Row (a newer rural school) were more satisfied with the space available. In the latter school, pupils described their classroom as having ...*a load of space ... and some spare chairs.*

Classrooms were generally described as *bright*, although in two cases all areas of the classroom did not receive the same level of natural light. Most classrooms displayed pupil artwork and other posters on the wall. In Maple Lane school, the pupils liked their artwork being shown as the classroom is *then nice and colourful, it would be quite bland otherwise:*

If there weren't any pictures it would look quite dark. (Maple Lane school, medium, newer building)

Similarly, in Lake View school, the pupils like to have their work exhibited, *to show the other teachers what we are doing.* In contrast, the pupils in Oak Leaf school were critical of the lack of display of their work in their classroom:

How would you describe this classroom?

Small.

Dull.

Not that colourful.

It's not that small.

...

Well, it's bright but it's dull because there's not really that much posters. (Oak Leaf school, small, older building)

In three of the schools, all older buildings, pupils commented on the variation in temperature over the school week and year. In Hillcrest school, pupils felt their classroom was too stuffy during the winter and too warm during the summer and particularly after sports pupils find it very hot. Pupils also commented that the school was always cold on a Monday morning (as the heat was turned off for the weekend). Similarly, in Lake View school (medium, older building), pupils reported that:

Even on a warm day in March the room gets really stuffy ... kinda hard to concentrate if it is really stuffy.

Having access to natural ventilation, that is, being able to open windows, was a possible solution to this issue. However, this meant that external noise could become an issue instead.

And it gets really, really warm here so you sort of have to leave the windows open because there's so many people so then it was really, really loud yesterday so no-one could hear anything. (Oak Leaf school, small, older building)

In the newer schools, Maple Lane and Pear Tree Row, the classrooms were seen as more comfortable in terms of temperature, with more pupils describing the room as 'just right'.

Within the classroom, some pupils reported their classrooms as noisy because of *chatter* from other pupils (Lake View school); however, it was

difficult to discern whether this was due to the acoustics of the room itself or to the level of noise among the pupils. In four of the schools, noise appeared to travel within the school. In Riverbank school, an older school, pupils report being able to hear children *roaring* in other classrooms. Similarly, in Oak Leaf school, pupils reported noise travelling from the classroom upstairs. In Hillcrest school, pupils did comment that if they were doing physical activity (such as music or dance) in their classroom, pupils in the classroom beneath could hear them. Consequently, they do not do this type of activity very often. Although Maple Lane is a relatively new school, pupils report being able to hear noise coming from the corridor outside their classroom. In contrast, in the other newer school, Pear Tree Row (a school built to current DES design guidelines), pupils reported that no noise travelled between classrooms or from outside.

In three of the schools (two of them urban), pupils reported that noise coming from traffic or construction work could impinge on their class work. In Maple Lane, when building work was going on within the school, *...it was really, really loud, drills and everything; You can also hear road-works going on, and traffic.* While the noise was not seen as creating a significant problem for pupil learning, some admitted that *...the people sitting next to the window can get distracted by what is going outside and sometimes you don't hear.* In Lake View school, *...sometimes when people are working on the roads we can hear everything, there is a busy street outside.* Even closing the windows did not help since *...it [the noise] distracts you.* In Hillcrest school, when the windows are open, pupils can hear noise from outside (e.g., grass being cut, other pupils playing sports).

Pupils generally tended to comment on the general appearance and layout of classrooms rather than specifically on furniture. Two contrasting cases were evident, however. In Pear Tree Row school, pupils were particularly positive about their newer furniture (paid for by additional fund-raising), which they saw as more suitable for their needs: *...the chairs are shaped for your back, because the old chairs were like, your back was like ache, ache, but the new chairs are better.* In contrast, pupils in the other newly built school, Maple Lane, criticised their furniture as uncomfortable. Similarly, in Hillcrest school, pupils overwhelmingly felt their chairs were uncomfortable and also felt their tables were very old. Given the difference in size between school children, adjustable furniture might seem an option to consider (Zandvliet and Straker, 2001; see also the European Standard on School Furniture, 2004).

A further issue in Hillcrest school related to classroom and corridor doors being too heavy for pupils to manage and the difficulty in coping with very hard surfaces within the school (for example, the stairs are concrete with metal edges so that pupils are *very sore* if they fall on them).

6.2.3 COMMON AREAS IN THE SCHOOL

Pupils were also more likely to comment on their classrooms rather than the common areas within the school (with the notable exceptions of the PE hall and outside spaces, discussed below). In Riverbank school, the children thought that corridors and common areas in the school were *tiny*: *People often get squashed to get to the classrooms ... the school is really small.* Toilet facilities attracted more attention and more pupil criticism than other common areas. In three of the schools, all older buildings, pupil toilets were separate from their classrooms. Pupils generally favoured this

arrangement for reasons of privacy - *then you don't hear people when they go to the toilet* (Lake View school). Keeping toilet facilities clean was voiced by a number of the pupils as really important. In contrast, pupils in Oak Leaf school criticised the toilet facilities and said they would prefer having their own toilet off the classroom:

The bathrooms are tiny. ...

The girls' are way smaller than the boys' and there's a really bad smell. ...

And the roof in the girls' bathroom is really disgusting.

And they put air freshener in, but it's not working. (Oak Leaf school, small, older building)

In the other three schools (two of them newer schools), en suite facilities were available within the classroom. In the latter cases, pupils held divergent views on these arrangements. Some pupils stressed the fact that this *would be kind of convenient if you need to go* (Maple Lane school) while others felt that having to go to a separate area of the school would give them 'time out'. More serious criticisms centred on lack of privacy and hygiene. In Maple Lane school, pupils commented on smells when the toilet doors are left open and that *it is not very private*. In addition, they noted that the toilets have dark colours and are *quite dirty*, 'and the fact that there is no separate girl and boy toilet is a bit *uncomfortable*'. In Pear Tree Row, there were separate toilets for girls and boys, a system which pupils reported preferring. In Hillcrest school, the main complaint by pupils was the condition of the toilet facilities in each classroom. They felt the toilets were dirty and they *smelled* with the water from the taps being like *ice*. When the classroom is quiet, other pupils can hear what is happening in the toilets, which they found invasive. Pupils in this school commented that they generally avoided using the toilet if they could and waited until they got home.

6.2.4 SCHOOL AND CLASS SIZE

Pupils were asked about their views on school size (that is, the number of pupils in the school). A number of pupils commented favourably on being in a smaller or medium-sized school.

It's small, but it's good.

It's better because it is not like one of these big huge schools with 400 children ... you get lost in there. (Lake View school, medium, older building)

Pupils in Oak Leaf school stressed the advantage of being in a small school was that they knew everyone.

What do you like best about this school?

It's quite small, like the teachers talk with us individually, even if it's only like once a week. (Oak Leaf school, small, older building)

However, some pupils felt that they would have much better facilities in a larger school.

Considering the space we have, we can't really do much. (Oak Leaf school, small, older building)

Smaller classes were also seen as better from the pupil's perspective:

If there's too much people in the class, it's hard for the teacher to get around everyone. (Pear Tree Row school, large, newer building)

6.2.5 PUPILS' FAVOURITE PLACES

When asked to draw their 'favourite place' in the school, the vast majority of pupils drew pictures of outdoor spaces, mainly the schoolyard, sports pitch or school grounds (see section 6.4 below). Pupils in Pear Tree Row school, a large newly built school, were somewhat more likely than those in other schools to depict their classroom as their favourite place (Figure 6.1). This occurred only among a small number of pupils in the other schools, and these children's drawings focused on light and colour within the classrooms (Figure 6.2). The hall or indoor sports facilities were depicted by a small number of pupils (Figure 6.3) with two pupils citing the computer room as their favourite place (Figure 6.4).

Figure 6.1: 'I Drew This Picture Because I Love School and I Love Doing Work in My Classroom' (Pear Tree Row School, large, newer building).



Figure 6.2: My Favourite Place (Oak Leaf School, small, older building).



Figure 6.3: My Favourite Place (Lake View School, medium, older building).

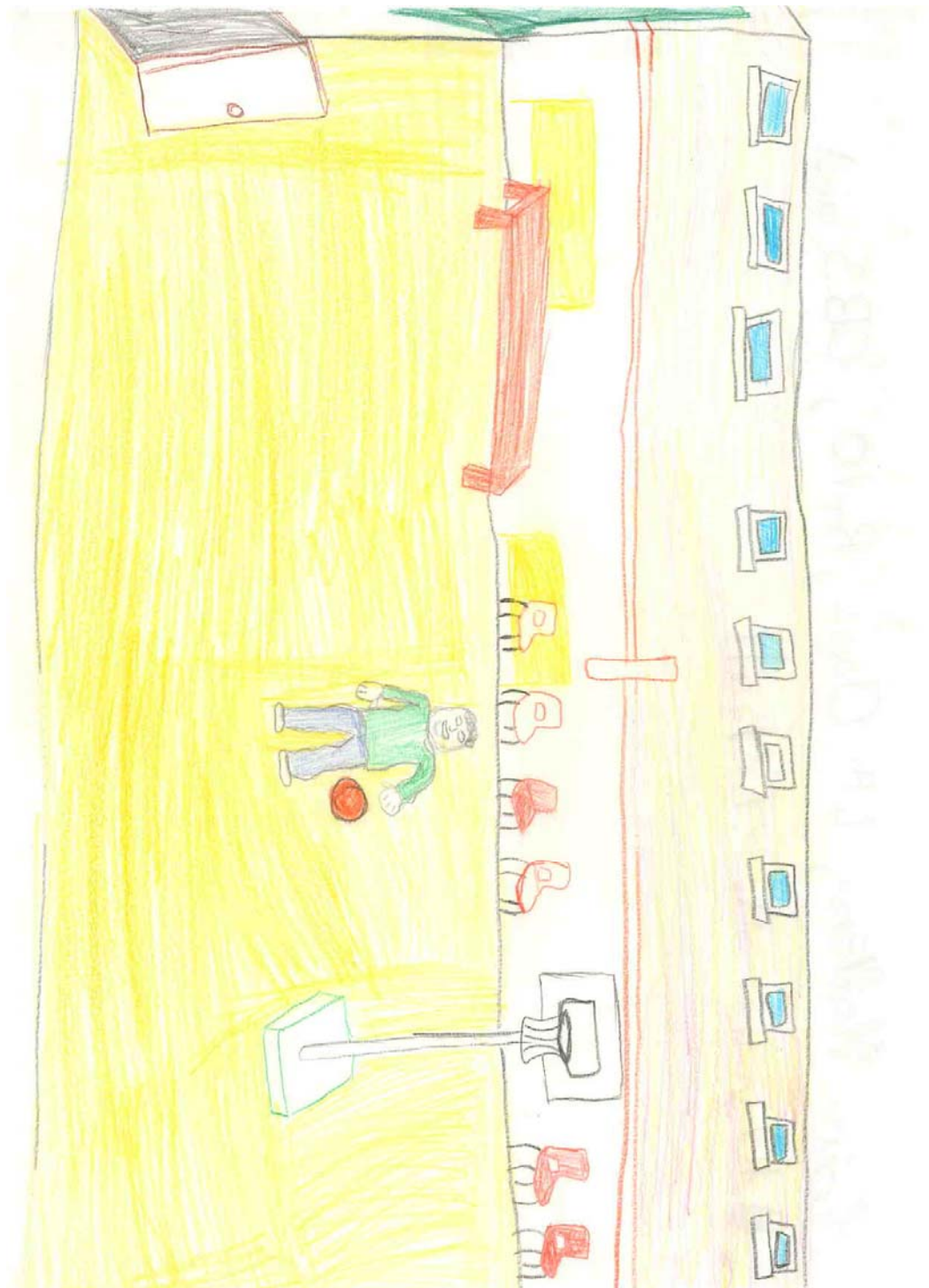
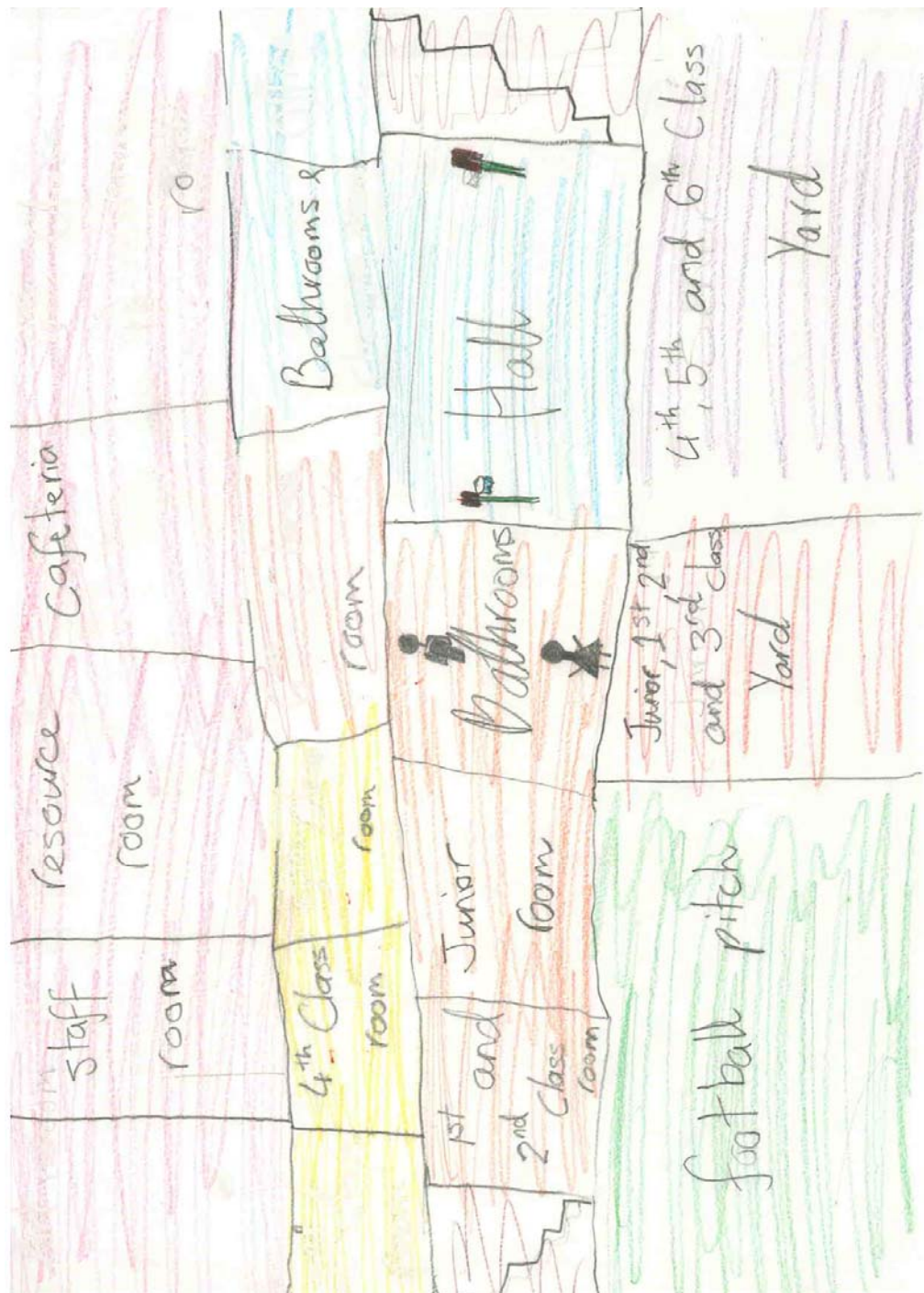


Figure 6.4: My Favourite Place (Riverbank School, small, older building).



Figure 6.5: The School I Would Like (Oak Leaf school, small, older building).



A number of pupils took the time to depict what they would like their school to look like. A number of pupils again focused on the outdoor space, indicating games, sports and play equipment, a basketball court or football pitch, and benches or seats. Other pupils showed the layout of an ideal school, indicating a cafeteria, PE/sports hall and facilities for computers, cookery, languages and so on, with some indicating a swimming pool (see, for example, Figure 6.5).

6.3 Learning in the Classroom

Pupils are generally most positive about activity-based learning and subjects in which more active approaches are used. Physical Education was singled out as a subject enjoyed by the vast majority of pupils (see below), with a number of pupils also mentioning Science and Art. Pupils across the case-study schools differed in the extent to which they reported using more active methodologies and group work. In the two newer schools, pupils reported some use of pair work and group work. In Pear Tree Row school, pair work was used for some subjects more than others, more usually in Irish, Science, *'and in Art we are all in pairs'*. Pupils also occasionally work in small groups: *'Sometimes we work in a group of four or five'*. Similarly, in Maple Lane school, pair and group work tend to be used, at least in some subjects. In Lake View school, pupils again reported a differential pattern across subject areas: *'In Science you sometimes work in groups, doing experiments, while in Maths and Irish you work on your own from a book'* but individual work was seen to dominate: *'we learn on our own most of the time'*. Individual work was also the dominant pattern in Riverbank and Hillcrest schools. In Oak Leaf School, pupils tended to report staying in their desks most of the time with little apparent movement around the room. When asked whether they worked in groups or pairs, they reported:

We're not really allowed.

Very rarely.

Just with the people you sit beside. (Oak Leaf school, small, older building)

Pupils differed in their views on teaching methods. In general, they tended to favour pair and group work as enhancing their learning.

I like working in pairs because you can pick up ideas and you can make your work better. (Pear Tree Row school, large, newer building)

I think it's better to learn in a group because you get other people to help you. (Riverbank school, small, older building)

I'd prefer if we had like square tables so that we could all talk among ourselves. (Oak Leaf school, small, older building)

However, the use of group work had to be carefully managed by the teacher as it *...depends who is in the group, because some people are way overly competitive and take over the group* (Maple Lane school). Pupils were also especially positive about project work which was seen as *'fun'* (Maple Lane school):

You get to make a book to remember and you get to learn at the same time. (Pear Tree Row school, large, newer building)

Games were seen as a way of helping pupils learn. One group reported that the play element seems to be reduced in sixth class compared with earlier years:

Last year we used to play a ball in Irish and that was fun ... you had to count to twenty. (Riverbank school, small, older building)

Generally, pupils in the case-study schools reported a fairly limited use of computers in day-to-day learning.

[In creative writing] we type things up on the computer sometimes and she would show us things on the Internet. (Maple Lane school, medium, newer building)

Well, we are allowed [to use the computers] but we hardly ever get to use them.

...

We used to be allowed to go on them in the mornings but that stopped when we got the interactive whiteboard. (Oak Leaf school, small, older building)

In Lake View school (medium, older building), the pupils go to the computer room infrequently:

Like if we were doing a project, you come down here. A few weeks ago we were doing an international project and we came down here to have a look at Wikipedia.

A number of pupils commented on the outdated nature of their ICT equipment and on the number of computers in their class or school that were broken.

It's not that good because the internet is real slow ... sometimes we wait for forty-five minutes and we still can't get on ... there are a lot of people on at the same time as well. (Lake View school, medium, older building)

Pupils generally favoured a greater use of computers in class as computers were seen to assist their learning and *fun* (Lake View school).

There should be more computers.

Because you kind of need computers in your life. (Maple Lane school, medium, newer building)

You can play mathematical games. (Pear Tree Row school, large, newer building)

The computers really ‘...help you learn because there is so much information’ (Lake View school).

The use of other technology, such as DVDs, in the classroom was relatively rare, although DVDs were used for history teaching in Lake View and Pear Tree Row schools: *So we will be learning while watching* (Pear Tree Row school). Using CDs or tapes was also seen positively by pupils: *it is somebody else rather than the teacher just reading from a book and you can hear it on a tape and you can hear the expressions and everything* (Pear Tree Row school).

In sum, the pupils' accounts echo those of stakeholders and teachers in indicating a lack of integration of ICT into day-to-day teaching and learning. Group work and pair work are used in some classrooms and for some subject areas but the use of these methodologies is seen as less frequent among pupils in older school buildings.

6.4 Learning and Playing Outdoors

Across the case-study schools, pupils' main comments and suggestions for change tended to centre on outdoor space. Pupils in Lake View and Pear Tree Row schools, both rural schools, appeared particularly positive about their outdoor space, especially the garden and fields available to them.

As indicated above, pupils were generally very positive about Physical Education and sports activities because they '*get fit*' and they can '*have fun*' (Riverbank school):

It's a break from writing all day, you get a break. (Pear Tree Row school, large, newer building)

Going to another area within the school was also viewed positively, with pupils liking sport ...*because you can go outside or in the hall, it's fun like* (Pear Tree Row school). However, the schools differed in the facilities available to them for PE and sport. In Oak Leaf school, one of the older schools, there were no indoor PE facilities and pupils were critical of the fact that they could not have PE class when it rained. They also criticised the fact that they only had PE once a week.

And it's really weird because everyone is saying that children are so obese these days but yet we only get PE once a week. (Oak Leaf school, small, older building)

In two other older schools, Lake View and Hillcrest, pupils were critical of the small size of the PE hall:

The PE hall could be bigger, when you are in fourth year it is probably fine but when you get to fifth or sixth year it gets a bit cramped and if you have a big enough class like ours you don't get enough time – teams of four get about four to five minutes and that's all. (Lake View school, medium, older building)

The surfacing used within the PE hall and lack of equipment were also criticised: *if you fall, you'll get crippled* (Lake View school). Pupil accounts are consistent with the dissatisfaction with school sports facilities found among a national sample of primary school principals (see Fahey *et al.*, 2005).

Chapters 4 and 5 have indicated that, with the exception of Physical Education and sports, non-classroom spaces are rarely used for teaching and learning. This perception was echoed by pupils in the case-study schools, who indicated that outdoor spaces were generally only used on a very occasional or 'once-off' basis. Pupils in Oak Leaf school reported engaging in team-building exercises outdoors on two occasions while pupils in Maple Lane school sometimes sketched or drew outdoors. In contrast, in two of the schools, both located in rural areas, outdoor spaces were specifically used as a focus for pupil learning. In Lake View school,

pupils reported enjoying having access to the green space around the school and to the school garden:

We put in flowers last year. We designed the garden ourselves like. We had a competition and this lad got a €100 prize. There is a boy in our class and he came third.

This green space was also used for environmental studies, with their teacher showing them how to monitor average rainfall over a time-period, for example. Pupils were sometimes taken on history trails in the local area. In Pear Tree Row school, the pupils also enjoy the school garden:

We grow vegetables and trees and you can take them home or something like that.

They like the garden because ...it looks nice and you learn how to grow things so you know how to do it in your own garden when you are older.

Outdoor spaces, particularly the schoolyard, occupied a central place in pupil accounts of their school life. The vast majority of pupils drew the schoolyard or other outdoor space as ‘their favourite place’, with many pictures showing pupils playing ball and skipping (Figure 6.6). Outdoors was presented as the location for ‘fun’ activities and for relaxing, even sunbathing (Figure 6.7). Many pupils singled out ‘the green area in the yard’ as their favourite place and depicted trees and flowers as central to their enjoyment of this space (Figure 6.8).

Criticisms of the outdoor space tended to centre on the size of the yard, the surfacing used and the lack of equipment. In a number of the schools, pupils complained that the yard was too small.

The yard is not that great ...the yard is tiny because of the extension. (Maple Lane school, medium, newer building)

The small size of the yard was seen as constraining play activities:

We are not allowed to run in the yard ... because of injuries ... there are too many people. (Lake View school, medium, older building)

Having older and younger pupils sharing the schoolyard was seen as causing particular difficulties, when available space was limited:

There's a certain amount of people who play football and the juniors and the middle room are always getting in the way and we always end up hitting them in the face and they always go to the teacher. ...

It's really annoying ... the football people get into trouble ... and the juniors get in the way and say 'oh, you're hurting us so much'. ...

So it would be better if we had a bit more room. (Oak Leaf school, small, older building)

The fifth class and sixth class can't go on the grass. ... Because they try to keep the little ones safe and we could trip them up by an accident and people may be hurt. (Pear Tree Row school, large, newer building)

In the six case-study schools, tarmac was the most common surface on the schoolyard. In four of the schools, a grass area was also available, although the schools differed in whether pupils were allowed to play on this area. Pupils overwhelmingly favoured access to grass areas, which they found more relaxing and easier to play on:

Because it [the grass area] is ok to sit down on. You can talk to your friends. That area is really nice, you can sit around and talk, it is a quiet area. (Maple Lane school, medium, newer building)

They contrasted the grassy space against the tarmac surface ...*because when you fall, it really, really hurts* (Maple Lane school).

You can hurt yourself on the tarmac, and on the grass you just fall and get up. (Riverbank school, small, older building)

Across the case-study schools, pupils reported the need for more playground equipment, including slides and swings, a soccer pitch and basketball facilities (Figure 6.9).

Figure 6.6: My Favourite Place (Lake View School, medium, older building).



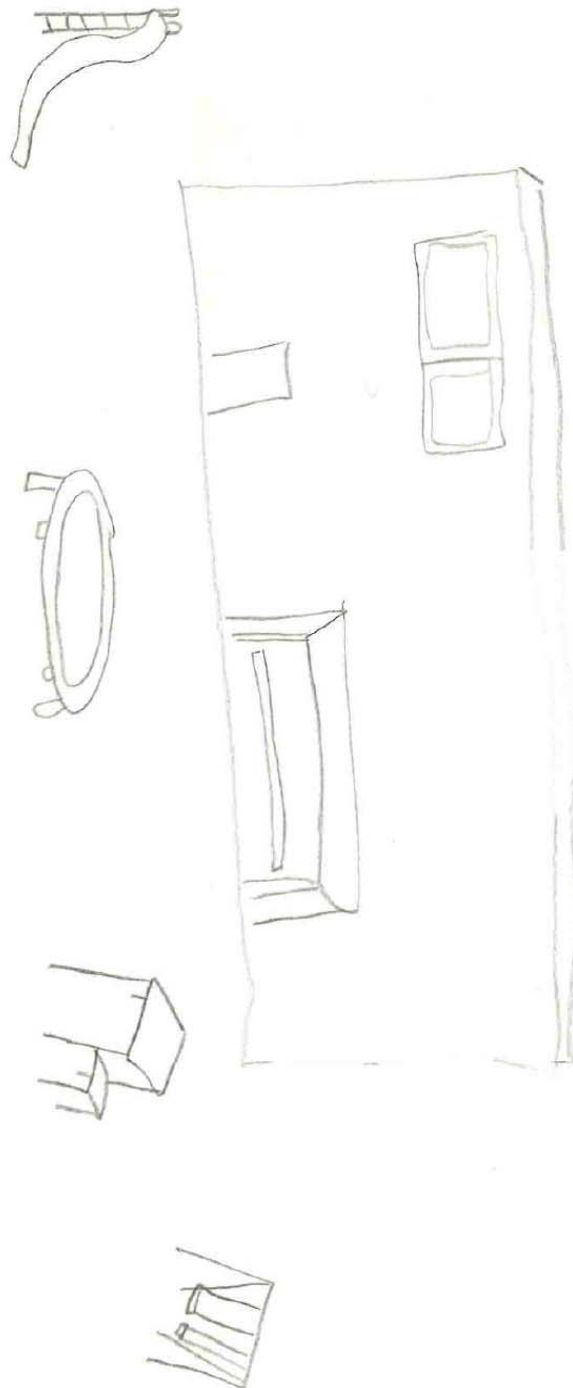
Figure 6.7: My Favourite Place ('My favourite place in the school is the basketball net and beside the blue door so you can sunbathe'), Oak Leaf school, small, older building.



Figure 6.8: My Favourite Place (Hillcrest School, large, older building).



Figure 6.9: The School I Would Like – ('I would like if the school was the same but the yard was bigger and there were things to play on') Maple Lane school, medium, newer building.



6.5 Conclusions

In keeping with international research, the findings of our study indicate that primary school children have definite views about, and preferences concerning, their learning environment. Pupils are most positive about more active learning methods and would prefer a greater use of ICT in everyday lessons. These preferences have the potential to increase pupil engagement but have implications for school and classroom design. Outdoor space emerges as a very important theme in pupil accounts of school life and there would appear to be the potential to enhance pupil engagement through using the school grounds (and other outdoor spaces) for teaching and learning. However, in many cases, pupils are critical of existing spaces.

- On the basis of pupil accounts, the following dimensions of the ‘ideal school’ can be distinguished:
- Large, bright classrooms, with more physical space for each pupil in the class;
- Greater access to computers and other equipment within the classroom;
- Consistent and comfortable temperature and ventilation in the classroom and school buildings;
- Absence of external noise or noise travelling between different parts of the school;
- Display of pupil work in the classroom and common areas of the school;
- Storage space for pupil coats, books and other belongings;
- Clean and well-maintained toilet facilities which guarantee pupil privacy;
- A cafeteria or separate space to eat lunch;
- Having a large indoor space for PE and other activities;
- Access to PE equipment;
- Having a larger schoolyard with different surfaces (other than tarmac);
- Access to green space/gardens within the school grounds;
- Playground equipment.

7. ISSUES IN SCHOOL DESIGN – A SYNTHESIS OF RESEARCH FINDINGS

It is now generally recognised that school environments have an impact on students' school experiences and educational outcomes. Growing research evidence indicates that the built environment for primary school children and their teachers has the potential to enhance wellbeing and student attainment (Wall *et al.*, 2008). Various research studies on the impact of school design have focussed on social and spatial density in schools (see Cotton 2001; Wasley *et al.*, 2000; Blatchford *et al.*, 2006; Anderson, 2000; Maxwell, 2003). Others have explored classroom environment. These studies have looked at seating arrangements (Marx *et al.*, 2000), air quality (Rosen and Richardson, 1999), lighting (Benya, 2001), noise (Haines *et al.*, 2001), and colour (Read *et al.*, 1999). While Weinstein and David (1987) argue that these elements have an impact on children's sense of well-being, behaviour and academic outcomes, other studies (see Proshansky and Fabian, 1987; Galton *et al.*, 1999) note that the physical characteristics of the school and classroom have changed relatively little over the years. In Ireland a growing population means that the number of primary school pupils will increase by an estimated 100,000 pupils between 2008 and 2013 (DES, 2008b). This necessitates building new schools, with almost €4.5 billion to be invested in primary and second-level school infrastructure under the National Development Plan 2007-2013 (DES, 2008b). It is vital, therefore, that the design of these new schools takes account of the needs of the pupils and staff.

This chapter presents a synthesis of our study's research findings, placing them in the context of international research in the area and the current *Design Guidelines for Primary Schools* (2007). This exploratory study involved consultations with a number of main stakeholders in education, and detailed research in six primary schools across the country. In addition to in-depth interviews with principals and teachers, focus group interviews were conducted with older primary school pupils while the younger pupils provided invaluable input into the project by drawing and discussing their favourite places in the school.

7.1 The Importance of Space – Social and Spatial Density in Schools

Chapter 2 demonstrated that there is now a sizeable literature considering the implications of school and class size. While views of what constitutes a ‘small’ school differ across research studies and different countries, it is generally acknowledged that smaller schools tend to be safer, more personalised, more equitable and have better attendance rates than larger schools as well as having a positive impact on the academic progress of students (see for example, Cotton, 1996; Lindsay, 1982; Wasley *et al.*, 2000). Similarly, our study indicated divergent views on the optimal primary school size among the main stakeholders in Irish education. Schools in the region of 200 to 300 pupils were seen as allowing for more personal interaction between teachers and pupils and among pupils themselves, yielding a sense of community and greater mixing across age-groups. In contrast, it was argued that larger schools (that is, those with more than 400 pupils) were seen as ‘impersonal’ and more regimented, being less reflective of the home and community. However, it was noted that school size *per se* was not the most important factor. Instead, issues of potential overcrowding and the nature of the school climate were considered more important.

The topic of school size was further explored in the six case-study schools where interviews were conducted with teachers and primary school pupils. The opinions of teachers regarding an optimum size of primary school varied somewhat, with some favouring a single class per year group while others favoured having two groups per year. The opportunity to have more personal interaction between all members of the school community was seen as the main advantage of smaller schools. However, the necessity to have multi-grade classes in very small schools was seen as posing particular concerns for teachers and pupils alike.

In recent years, the importance of recognising and valuing children’s own perspectives has come increasingly to the fore in policy debate and academic research internationally (Clark *et al.*, 2003). A number of initiatives have focused on young people’s perspectives on school design and layout as a basis for school improvement (Flutter, 2006; Burke, 2007). In our study, we explored the perceptions of primary school children through focus group interviews. Pupils in smaller or medium-sized schools were somewhat more positive about their experiences at school. They seemed to enjoy the more personal atmosphere in smaller schools while suggesting that one can get ‘lost’ in a bigger school. Overall, in line with international research, smaller school size was favoured by teachers and pupils alike.

As with school size, the topic of class size (that is, the number of students in the class) is hotly debated internationally. Overall, there seems to be a dearth of good quality empirical studies on class size effects on pupil well-being and academic outcomes (see Finn *et al.* 2003). However, a number of studies have highlighted the positive academic and social benefits accruing to smaller class sizes; the effectiveness of these smaller classes is, of course, dependent on the kind and quality of teaching methods employed (Finn *et al.* 2001, 2005; Blatchford *et al.* 2006). In the current study, education stakeholders were critical of the large size of most classes in Irish primary schools. As with smaller schools, smaller classes were seen as allowing for more individual attention, getting to know the children better and the more creative use of different methodologies. However, stakeholders differed in what they considered the optimal class size, with suggestions ranging from 16 to ‘the early twenties’. Furthermore,

a number of respondents indicated that the mix of pupils in the class was important in deciding upon the appropriate class size. Class size also emerged as a significant topic in the teacher interviews, and was generally seen as being more important than school size. Teachers felt that smaller pupil-teacher ratio (preferably 20-25 pupils per class) would enable them to use more pupil-centred teaching approaches. Pupils did not specifically comment on the number of children in the class; instead, they focused on the implications of spatial density (the space available to them in the classroom), which is closely associated with class size.

As well as social density (in schools and classrooms), spatial density is seen to affect student outcomes in schools. Cramped conditions may adversely affect children's behaviour and academic performance (Maxwell, 2003; Evans *et al.*, 2001). However, no 'gold standard' has emerged in terms of the optimal physical size of a classroom. Our study indicated significant variation across the case-study schools in the amount of space available to each pupil. Staff and pupils in newer schools, built according to the Primary School Design Guidelines (DES, 2007), were more satisfied with classroom size and space. Teachers in the older schools, which generally had more constrained space, were generally critical of spatial density in their classrooms. In particular, restricted space was seen as constraining the range of teaching methodologies, particularly group work. Pupil perceptions of space varied somewhat across the case-study schools. In four of the schools (Oak Leaf, Hillcrest, Maple Lane and Lake View), pupils were critical of the lack of space within their classroom, describing the space as *squashed* (Oak Leaf school). In Pear Tree Row (a newer rural school), pupils were more satisfied with the space available. Overall, our research found that social and spatial density in primary schools have important implications for the teaching approaches used and pupil experiences in the school. The topic merits further research, especially in terms of the impact on student academic outcomes.

7.2

Classroom Layout and Arrangement – Implications for Teaching Approaches

7.2.1 SEATING ARRANGEMENT

Lippmann (2007) has argued that in the past the prevailing teaching approach was whole-class instruction and the focus was on passive (rather than active) learning. This was reflected in rigid and 'traditional' classroom layouts with the teacher's desk typically positioned at the front of the room, leading the lesson, while students were seated in rows, listening and recording what they were being told (Oliver, 2004; Galton, 1995). Studies in the UK and elsewhere have indicated a change in these practices over the last fifteen to twenty years. Children in primary schools now mostly sit together in groups around desks or tables to form larger working areas (Galton *et al.*, 1999). More open seating arrangements are seen as encouraging more questioning by pupils as well as more social interaction overall (Marx *et al.*, 1999; Galton *et al.*, 1999; Alexander, 2000; Ahrentzen and Evans, 1984). However, Hastings *et al.* (1996) note that, in order to encourage effective learning, teachers need to use a variety of organisational approaches to ensure that '...seating organisation reflects teaching intentions and task demands'. Typical classroom layouts, as well as school buildings vary across countries, reflecting the prevalent educational philosophies as well as available resources (Alexander, 2000; Horne, 1999).

The issue of classroom layout was explored with stakeholders and teachers in the current study. According to all stakeholders, the ideal

seating arrangement in primary schools was seen as comprised of small groups rather than rows (in line with DES Guidelines and Galton *et al.*, 1999), but the opportunity to do this was often constrained by lack of available space in the classroom. Currently, classrooms tend to be ‘box-shape’ or ‘rectangular’ but it would be useful to be able to create sub-areas within classrooms for different activities and in this way encourage independent learning and higher order thinking. In general, teachers participating in this study noted the importance of all pupils being able to hear and see what is going on in the classroom. Not surprisingly, classroom layout was closely associated with the physical space available in the classroom. Teachers mentioned that while the ideal layout in primary school classrooms involves pupils sitting in groups, it is necessary to have enough space available for this arrangement. Having tables in clusters was considered to facilitate more active and varied learning. In contrast, a more fixed classroom layout with children sitting in rows was seen as constraining the amount of contact possible. However, some teachers commented that the appropriateness of seating arrangements depends on the task at hand. Nevertheless, a teacher in Pear Tree Row school, a school with somewhat larger classrooms, indicated that a layout based on clusters of tables enables different pupils to work together and consequently the class ‘gels better together’, especially when rotating the pupils around the classroom on a regular basis in order to enhance their educational and social development. Classrooms in the newer schools had different zones for various educational activities in the classrooms, including a wet area, a library corner and so on. The wet area can be used for teaching a number of subjects, including nature, science, arts and crafts with a designated floor area not less than 6m² with built in secure storage, a built-in worktop, a built-in double sink and using a suitable non-slip easily cleaned floor finish (DES, 2007).

The DES Primary School Design Guidelines (2007) note that careful consideration should be given to the activity zones within classrooms and the position of teaching equipment (such as white boards and pin boards). Many of the stakeholders, including the inspectors, noted that schools should be equipped with suitable, attractive furniture that can be arranged to suit the learning needs of pupils. Size of the classrooms in primary schools should also permit setting up different zones within the classroom, with the use of different surfaces, textures and materials to enhance pupil engagement. Wall *et al.* (2008) also recommend that room use parameters need to be flexibly designed to accommodate their different uses.

7.2.2 TOILETS

In primary schools, classroom layout increasingly accommodates en-suite toilets (see DES Guidelines 2007 on Ireland). Some studies suggest that poorly managed toilets can be a concern for children and may have a direct impact on pupil health if pupils refrain from using them for long periods during the day (Vernon *et al.*, 2003). The current guidelines for primary schools state that each classroom should be provided with en-suite WCs which must be adequately and naturally ventilated (see DES, 2007 for details). Having toilets as part of the classroom was preferred by a number of teachers in our study as it reduced the need for supervision, especially in the case of younger children. In three of the case-study schools, all older buildings, pupil toilets were separate from their classrooms. In these schools, pupils generally favoured this arrangement for reasons of privacy. However, in Oak Leaf school, pupils criticised the toilet facilities and said

they would prefer having their own toilet off the classroom (as is the case in some other primary schools). In schools with en-suite facilities, pupils held divergent views on these arrangements; concerns centred mostly around privacy, maintenance and hygiene issues. Acoustics/insulation was also a matter of concern; when the classroom is quiet, other pupils can hear what is happening in the toilets, which they found invasive. In Pear Tree Row school, there were separate toilets for girls and boys, a system which pupils preferred. In one of the schools where pupils were most dissatisfied with the toilets, some noted that they generally avoided using the toilet if they could and waited until they got home; this may have an adverse effect on children's health, as argued in Vernon *et al.* (2003).

7.2.3 DISPLAY AND STORAGE

Display of Pupil Work

Existing research demonstrates the positive impact of displaying pupil work. In the US, Killeen *et al.* (2003) discovered a significant association between school design and students' sense of ownership. Within schools incorporating permanent artwork, the stronger students' perceptions are that their artwork can be permanently displayed, the greater their sense of ownership. The authors argue that student engagement may be significantly influenced by their sense of ownership. By allowing students to play a role in the design and aesthetics of their school, they feel a stronger sense of ownership over their learning environment. In this study, some of the stakeholders noted that the limited space available in some classrooms can make it more difficult to celebrate children's work due to the lack of sufficient space for display areas. It was argued that bright corridors with work spaces and display areas could become sites for learning. In the six case-study schools, all classrooms and communal areas displayed pupil artwork and other posters on the wall to some degree. In general, teachers considered it important to have pupils' work on display as it celebrates pupils' work and facilitates sharing ideas. Similarly, in Lake View school, the pupils liked to have their work exhibited, '...to show the other teachers what we are doing'. Display of students' work is seen to make the school more welcoming, increasing feelings of ownership and involvement and leading to improved motivation (Maxwell, 2000; Killeen *et al.*, 2003).

Storage

It is argued that accessible, well thought out storage leads to more time spent on learning (Gump, 1987; Loughlin and Suina, 1982). In general, teachers in the case-study schools argued for having adequate storage space in the classroom for teaching materials and equipment. The storage area within the classroom with sliding doors was considered by those in Pear Tree Row (the school built to current DES design guidelines) to be particularly suitable. Storage was also needed for sports equipment, pupils' coats and bags. One of the schools solved the problem of inadequate storage areas within the classroom by keeping items such as televisions and videos in the corridor, which may be a potential health and safety issue. DES (2007) guidelines note that classrooms should have storage areas in the form of presses within the classrooms, while a separate classroom storage room is not recommended. The Guidelines also suggest that each classroom should be provided with a minimum of 9.5m³ of shelved storage space (with a provision for height adjustment between shelves). No part of the shelving should be greater than 2.2m above floor level. The storage area shall be designed so that it can be screened off from the classroom

area by means of sliding doors or other similar arrangement. The layout should allow for some lockable doors. The door surfaces should be suitable for hanging posters, artwork, teaching materials, etc. In the UK, Building Bulletin 99 suggests that arrangements for storage depend on the size of the school. It notes that school resources such as books and paper may be deliberately centralised, with the advantages of easy access for support staff and more efficient stock management. Alternatively, particularly in larger schools, they may be spread around, for example creating curriculum-based storerooms which enable quick and easy access by teachers and pupils. These stores would be in addition to the ones associated with each classroom. Some small schools, however, may prefer larger classroom stores to incorporate resources for the specific subject each teacher has a responsibility for. This does, however, make organisation more difficult and may cause disruption if others need to access resources during lessons (p. 17).

7.3 Environmental Factors

Schools form one of the principal social spaces for children and provide an infrastructure that supports learning and development (Dudek, 2000). An increasing number of studies have focused on the effect of individual environmental factors on pupils' school experiences and academic outcomes. These studies have discussed the effect of density, air quality, light, colour, noise and other factors.

7.3.1 LIGHTING

While explicit links between lighting and pupil performance has not been clearly demonstrated (Wall *et al.*, 2008), Jago and Tanner (1999) cite the results of a number of previous studies that find that appropriate lighting improves test scores, reduces off-task behaviour, and plays a significant role in the achievement of students. Benya (2001) notes recent changes towards introducing energy-efficient windows and skylights and a renewed recognition of the positive psychological and physiological effects of daylight. In the same vein, Lemasters's (1997) synthesis of 53 studies pertaining to school facilities, student achievement, and student behaviour reports that daylight fosters higher student achievement. In addition, students make more progress in reading and mathematics in classrooms with more daylight (Heschong Mahone Group, 1999). What constitutes adequate lighting depends on the task being undertaken (Wall *et al.*, 2008). They note that, according to building regulations in the UK, priority should be given to the use of natural lighting, with overall lighting levels for teaching spaces being 300 lux, and for tasks that are visually more demanding (such as reading), minimum of 500 lux. In addition, lamps with warm to intermediate colour temperature should be used (2,800K-4,000K).

Lighting in classrooms and corridors was also considered an important factor by respondents in this study. Stakeholders commented on the positive impact of the use of natural light, in line with Jago and Tanner (1999) who noted that appropriate lighting improves teaching as students are less likely to engage in off-task behaviour, and plays a significant role in the achievement of students. In this study, teachers in the case-study schools were generally satisfied with light in their classrooms, although in some cases natural light was insufficient to light the whole room. Another issue arose where other rooms were adapted for teaching purposes (for example, for learning support). Such rooms often did not have direct access to natural light (see, for example, Oak Leaf School). In general,

pupils described their classrooms as 'bright', although in two cases they reported that all areas of the classroom did not receive the same level of natural light. International research relates lighting to health issues. The most common complaints of inappropriate lighting are headaches, eyestrain and fatigue (Karpen, 1993). Hence, appropriate lighting should be installed in all schools. *The Primary School Design Guidelines* (2007) suggest that natural daylight should be used when designing rooms, to minimise the dependence on artificial lighting. In addition, glare must be avoided and windows should have an horizontal vista (p. 12).

7.3.2 NOISE

The ways in which classroom noise can impact on children's learning and attainment have been relatively neglected in educational research. The existing literature documents the adverse impacts of loud, ambient noise exposure on reading acquisition in children (see Berglund and Lindvall, 1995; Kryter, 1994). Other studies have focused on the effects of transportation noise, such as aircraft and road-traffic noise (see Haines *et al.*, 2001). Studies on other types of noise are relatively rare. However, Lundquist *et al.* (2000) found that chatter was rated as the most disturbing noise in school, and their study showed a relationship between perceived annoyance and the estimated negative effect on schoolwork. The research linking acoustics to learning show that good acoustics are fundamental to good academic performance, dissatisfaction with classrooms, causing stress to students and impacting on memory (Earthman and Lemasters, 1998; Evans and Maxwell, 1999; Lercher *et al.*, 2003). Boman and Enmarker (2004) in Sweden found that students considered chatter as the most disturbing sound in school, with students experiencing noise stated it induced feelings of stress, irritation, tension, headache, tiredness, energy loss; this affected their behaviour making it difficult to concentrate and slowing down their work. In addition, poor classroom acoustics may especially impact on children with hearing impairments (Nelson and Soli, 2000), learning difficulties (Bradlow *et al.*, 2003) and children who have English as an additional language (Mayo *et al.*, 1997). Research on primary school children in England revealed that children were likely to get annoyed by environmental noise (Dockrell and Shield, 2004). Some authors have suggested ways to reduce reverberation and potential noise in the classroom by utilising acoustic ceiling tiles, wall coverings and carpets to absorb sound (see Maxwell and Evans, 2000; Tanner and Langford, 2003).

In this study, stakeholders felt that schools should be located on sites large enough to help to reduce external noise (such as traffic) impinging on classroom work. Noise, either internal or external, was considered to be a problem in some case-study schools, especially if the school was located on a busy main road and/or in an urban setting. Teachers in these schools complained about not being able to open the windows because of the noise. Several teachers expressed their concern about the impact of noise on teaching and learning processes as it distracts the pupils from school work. Internal noise was also a problem in classes adjacent to halls. Teachers in Pear Tree Row school, the school built according to current guidelines, were more positive about the acoustics within the classroom. The topic was also discussed in focus groups with pupils. Some pupils reported their classrooms as noisy because of *chatter* from other pupils (Lake View school). Although Maple Lane is a relatively new school, pupils report being able to hear noise coming from the corridor outside their classroom. In contrast, in the other newer school, Pear Tree Row, pupils

reported that no noise travelled between classrooms or from outside. In older schools, pupils reported being able to hear children in other classrooms. In three of the schools (two of them urban), pupils reported that external noise could impinge on their class work. In order to avoid an adverse impact of internal and external noise, it is important that school design addresses this issue. Primary School Design Guidelines (2007) note that in all teaching spaces good acoustic separation is required and appropriate surface materials used in order to minimise noise.

7.3.3 COLOUR

Only a few international studies focus on the impact of colour on learning environments in schools. Read *et al.* (1999) in the US report that features of the physical environment, including colour, were related to higher levels of co-operative behaviour among preschool children. They found that where the ceiling height and wall colours were differentiated, children displayed the highest levels of cooperative behaviour. Moore *et al.* (1995) suggest that warm colour tones be used in quiet areas to create a calmer atmosphere. Olds (1989) also suggests the use of warm tones to control activity in highly active areas, and cool tones for quiet and soothing areas. In this study, the stakeholders noted that the importance of light and colour in primary schools should not be underestimated as children respond to this *in a big way*. Students participating in the study noted the dark colours used in the toilets and that without colourful posters, some classrooms would look dull. A teacher in Pear Tree Row school observed that while the colour on the classroom walls was neutral, the rooms were brightened up by the display of pupil artwork.

7.3.4 AIR QUALITY, TEMPERATURE AND HEATING

Research on temperature, air quality and heating in primary schools is limited. Some international studies deal with indoor air quality and temperature in schools and its effect on student experiences and well-being. Poor indoor air quality is seen to be linked to student absenteeism and reduction of student performance, well-being and health (Buckley *et al.*, 2005; Rosen and Richardson, 1999; Nedellec, 2005). Current classroom heating guidelines for England suggest that 18 degrees Celsius is acceptable when teaching, engaging in private study or undertaking examinations. The same document also suggests that excessive variation in heating should be avoided (quoted in Wall *et al.*, 2008). Good ventilation is necessary in order to avoid high levels of carbon dioxide in classrooms. According to Myhrvoid *et al.* (1996), carbon dioxide levels above 1000ppm are associated with decreased student performance in class. Small size of teaching rooms is likely to exacerbate this.

In this study, stakeholders commented on the need to provide appropriate temperature and ventilation with consistency over the school year. Teachers noted that ventilation can be an issue in adapted learning spaces (such as resource rooms) that did not have windows that could be opened. Furthermore, they considered temperature as an important influence on pupil comfort in the classroom. This was seen as a particular problem in prefabs. In Pear Tree Row, one of the newer schools built to current DES design guidelines, staff were more satisfied because of the flexibility in adjusting and regulating the temperature using a thermostat located within the classroom. In contrast, in three of the schools, all older buildings, pupils commented on the variation in temperature over the school week and year. In these schools, pupils felt their classroom was too

stuffy during the winter and too warm during the summer and particularly after sports pupils find it very hot. Classrooms could also be cold on Monday mornings (as the heat was turned off for the weekend). The Primary School Design Guidelines (2007) note that teaching and learning spaces should be given priority in terms of ventilation. Where possible, natural ventilation should be used by means of permanent wall vents and windows with opening sections.

7.4 Outdoor Spaces

Relatively few international studies deal with the use of outdoor space in schools. Yet, outdoor areas are an ideal vehicle for learning and socialisation across abilities and ages, providing a valuable environment for the study of ecology (Hayhow, 1995; Tanner, 2000). Outdoor space is also important for play and relaxation between lessons. Burke and Grosvenor (2003) report that younger children prefer to have more space and more equipment in the playground, including mazes, ponds, swings, gardens and slides. It is important to note that children acquire social, cognitive, and physical skills through play as well as providing them with opportunities for fun and a break from school work (Gaunt, 1980). In Ireland, Carty (2007) observes that school outdoor areas appear to be perceived by children as *play* spaces where they themselves are the main players, as opposed to their perceptions of classrooms as ‘work’ spaces created and controlled to a large extent by teachers.

Within the Building Schools for the Future (BSF) movement in Britain, attention has also been paid to promoting school sports. The movement offers an opportunity to provide imaginative PE and sport facilities and attractive playgrounds. The DfES (2007) report in the UK notes that the existence of good quality PE and sports facilities may help tackle student inactivity, boredom and misbehaviour while boosting their well-being and achievement.

This study found that, in general, education stakeholders are dissatisfied with existing outdoor areas in primary schools. The main criticism concerned the limited space available for outdoor activities and the *uninspiring* nature of these spaces. Outdoor equipment was also considered to be very limited. While basketball hoops are available for children in some schools, there are generally no swings, play mats or other equipment. It was argued that outdoor areas should be designed with the different ages and needs of primary school children in mind, with a variety of surfaces, including soft play areas for infants and children with special needs that is not solely grass as grass areas quickly become unsuitable in wet weather. Some stakeholders recommended incorporating different areas into the design of outdoor areas, ranging from sand pits and child-friendly surfaces for running and jumping for younger children, playground equipment for older children, and basketball and volleyball courts. It was also recommended by some stakeholders that shelter should be incorporated into the design of outdoor spaces so that children can still enjoy fresh air during breaks even if it is raining.

Generally, it was felt that outdoor space is currently rarely used for teaching and learning. In this study, the six case-study schools differed in the availability and size of indoor and outdoor facilities for PE, play and other activities. The need to improve outdoor facilities emerged as a significant theme across most of the case-study schools. In particular, teachers were critical of the small size of schoolyards as well as the kinds of

surfaces used. The space problem was seen easier to solve in spring and summer when some schools could use nearby fields for sport and play. Outdoor spaces, particularly the schoolyard, occupied a central place in pupil accounts of their school life. The vast majority of pupils drew the schoolyard or other outdoor space as ‘their favourite place’. Pupils in Lake View and Pear Tree Row schools, both rural schools, appeared particularly positive about their outdoor space – especially the garden and fields available to them. All pupils liked being outdoors during PE and break times. However, bad weather often meant that halls were used for PE. This had particular implications for one of the older schools with no indoor PE facilities. In addition, pupils were dissatisfied with the hard surface in the yard. Pupil accounts are consistent with the dissatisfaction with school sports facilities found among a national sample of primary school principals (see Fahey *et al.*, 2005). It emerged from the interviews that apart from PE, outdoor space was rarely used for teaching purposes. The exception occurred in two of the schools, both located in rural areas, where pupils seemed to engage in learning outdoors (in a school garden and green areas) more frequently. McIntyre (2006) argues that school design needs to include provision for green spaces adjacent to, and as extensions of, buildings. In addition to providing a variety of environmentally positive effects, such spaces also offer social and psychological benefits for children’s moods and sense of well-being.

7.5 Teaching and Learning

Changes in pedagogy over the decades have influenced changes in school buildings. Today, teaching and learning is commonly viewed from a constructivist perspective, with the concept of the pupil as the agent of their own learning increasingly gaining ground internationally (Wall *et al.*, 2008; Moussiaux and Norman, 1997). One of the recurring ideas in much of the literature on the future of teaching and learning is the belief that the learner should be at the heart of future developments and the teacher’s role is increasingly seen to be that of a facilitator (Rudd *et al.*, 2004). Learning is thus regarded as a self-directed process of constructing meaning, which takes place in interaction with others and the teacher’s role is to the pupil by selecting teaching materials and methods that aid the learning process (Baines and Stanley, 2000; Jaworski, 1994). This contrasts markedly with the ‘traditional’ teaching approach which focused on direct instruction, involving the imparting of knowledge about the content or skills to be learned, thus neglecting the development of a wider set of skills and competencies (Steffe and Gale, 1995). The move towards integrating constructivist principles into the classroom is likely to have significant implications for classroom layout and design because of the focus on active learning methods. In Ireland the new primary school curriculum, implemented from 1999, takes account of constructivist thinking and incorporates new approaches to teaching young children at various stages of their development.

The Primary School Design Guidelines (2007) acknowledge that the implementation of the Primary School Curriculum (1999) represents an exciting opportunity for change and renewal in primary schools. Stakeholders participating in the study noted that the revised primary curriculum in Ireland has a strong emphasis on the child as an active learner and incorporates much international thinking on discovery learning methods. They consider that the introduction of the curriculum has encouraged teachers in the greater use of group work and pair work in schools. However, many argued that more ‘traditional’ whole-class teaching

still dominates in primary classrooms, a pattern which echoes existing research findings (Dunphy, 2008; Murphy, 2004; OECD, 2004b; DES, 2005; NCCA, 2005, NCCA, 2008). For many, lack of physical space in classrooms and the teacher-pupil ratio were seen as a constraint on the full implementation of the primary curriculum. However, they acknowledged that teachers should be encouraged and facilitated in using more active methodologies, an issue which could be usefully addressed in teacher training. A number of respondents considered play and drama to be two key methodologies, particularly for younger children. Overall, there was a consensus among teachers that, in recent years, teaching and learning has become more child centred, with a focus on a 'hands on' approach, involving more active learning on the part of children. In general, all teachers reported using a combination of whole-class teaching, group work and pair work. In the four older schools, however, teachers emphasised the difficulties in delivering the primary curriculum to its full potential due to constraints on space within the classroom. In addition, attempting to have separate learning zones for different activities was seen as difficult in smaller and/or overcrowded classrooms. Not surprisingly, pupils were generally most positive about activity-based learning (pair and group learning) and subjects in which more active approaches are used (PE, Science, Art). Games were also seen as a way of helping pupils learn.

A good deal of the work on the future of teaching and learning is written from a technological stance (Rudd *et al.*, 2004). The use of ICT is seen as bringing increased flexibility in teaching and learning in the future. This flexibility applies to multiple sites of learning, access to materials, tutorials and changed assessment practices. The increasing use of ICT in schools is likely to place more demands on teachers' skills (Mortimore, 1998). Using ICT is also seen as impacting on the academic achievement of pupils. In Britain, the BECTA report (2001) showed that schools with good ICT resources tended to have better achievement than schools with unsatisfactory resources. A recent report by the DfES (2007) in the UK notes that ICT encourages pupils to collaborate with one another and take responsibility for their own learning. In addition to computers, schools are increasingly using interactive whiteboards (IWBs). According to Hall and Higgins (2005), IWBs are viewed very favourably by primary school children, enabling them to interact with various elements of the media. In the same vein, Walker-Tileston (2004) argues that children learn best through their dominant senses, seeing, hearing and touching. As a result, IWBs make learning more enjoyable and fun. However, it is important to note that an approach based on whole class teaching may render using IWBs less enjoyable for children.

While there seems to be a general consensus that meaningful use of ICT technologies enhances learning, it is important to note that a shortage of computers may mean that not all children have access to these learning opportunities. There are fewer computers per pupil in Irish primary schools compared with the European average. According to the Design Guidelines in Ireland, each primary school classroom shall have an IT or Computer area designed to accommodate five workstations (situated so as to not distract from other teaching activities). Several stakeholders highlighted the importance of including facilities for digital learning in primary schools. It was suggested that classrooms should be wired for computers with interactive white-boards and there should be a sufficient number of modern computers (preferably laptops) with good Internet access available for the pupil population. Adequate technical support was

seen as crucial to facilitating an increasing use of computers in schools. Several stakeholders were critical of the quality of ICT equipment currently used in primary schools. They argued that it is difficult to use the technology effectively if the computers are old, have no USB ports and Internet speeds are slow. Stakeholders were critical of the fact that there has been no large-scale investment in information technology since the IT 2000 project.

Similarly, teachers expressed a good deal of dissatisfaction with available computer facilities in their school. Such criticisms centred on the small number of computers available, lack of data projectors, the outdated nature of the equipment, and the lack of suitable software. The absence of technical support and maintenance services was also raised as an issue. All of the schools had a small number of computers in some, but by no means all, classrooms. In two older schools, Hillcrest and Lake View, there was a separate computer room. Teachers varied in their views on integrating computer provision into the classroom as opposed to having a separate computer room. The extent to which computers in the case-study schools were regularly used in the teaching process also varied. In addition to ICT, the case-study schools also made use of other audio-video equipment: TV, DVD-players, CDs and tapes. Television sets and similar equipment were often shared between classes and moved on a trolley from one classroom to the other. Overall, the use of audio-video equipment for educational purposes was limited. Considering the above, it is not surprising that pupils in the case-study schools reported a fairly limited use of computers in day-to-day learning, whether these were located in a computer room or in a classroom. A number of pupils commented on the outdated nature of their ICT equipment and the availability of computers in the school in general. Pupils generally favoured a greater use of computers in class as computers were seen to assist their learning and ‘fun’ and noted that there should be more computers available. Whiteboards were available only in two case-study schools and their use was limited. A report by the Department of Education and Science (2008a) shows that the student-computer ratio in Irish primary schools is 9.1:1, while several OECD countries are aiming for or achieving a ratio of 5:1. In addition, the report shows that the lack of technical support and maintenance is a significant barrier to using ICT in teaching and learning situations. Newly qualified teachers are more likely to use ICT and only 30 per cent of primary teachers rated their ability as either “intermediate” or “advanced” with regard to using teaching and learning methods that are aided by ICT.

Changes in pedagogy have resulted in a growing recognition of the need to provide flexible and adaptable spaces for teaching and learning (Wall *et al.*, 2008). As learning needs change, buildings should be ‘future-proofed’ in order to allow for greater levels of parental involvement in their child’s education (Desforges and Abouchar, 2003) and provision of facilities for new communication technologies in classroom (BECTA, 2007).

7.6 Summary

Environmental factors (air quality, temperature, lighting, noise, colour) are seen as significant factors in affecting perceptions of the school environment (Cooper, 1989). School/class size and classroom size are found to directly impact on academic achievement at primary school level (see Moore and Lackney, 1993). This study found that social and spatial density is a matter of concern for stakeholders, teachers and pupils. In general, all participants in this study favoured smaller schools (one or two class groups per year) and smaller class sizes (approximately 20 pupils) over larger sizes. Physical size also mattered, with teachers and pupils in a school where the average classroom floor area measured 81m² being more satisfied with the space available in the classroom. According to international studies, clear links can be drawn between poor quality school buildings in terms of temperature, heating, air quality and noise, and classrooms and poor outcomes for learners. In the same vein, fluctuating temperatures and excessive internal or external noise were identified as barriers to teaching and learning by study respondents. A school built according to the current DES guidelines had facilities for controlling lighting and temperature built into classroom design, hence making it easier for the teacher to adjust them. Outdoor areas, facilities for PE, integrated ICT and different learning zones in classrooms emerged as areas where significant improvements could be made. While newer schools have many of these facilities built into the design, older schools struggle to accommodate pupils' learning needs. Overall, consultation with the personnel and pupils is vital for school design in order to achieve a fully satisfactory result. It is also crucial that educational areas should be designed in accordance with curricula and teaching methodologies and taking into account on-going changes in the learning process. This chapter has provided a synthesis of the research findings, placing them in the context of international research on school environments. The following chapter discusses the implications of our findings for the future design of primary schools in Ireland.

8. A BRIEF FOR FUTURE SCHOOL DESIGN

There is an increasing awareness internationally of the importance of considering children as active agents in their own learning in order to foster pupil engagement and achievement. Such thinking underpins the key principles of the 1999 Primary Curriculum in Ireland, which emphasises active engagement and using the child's existing knowledge as a starting-point for learning. No systematic study has been conducted in Ireland on potential changes in teaching practices resulting from the introduction of the Primary Curriculum. However, initial research indicates that the use of whole-class teaching predominates in many strands of the primary curriculum, with more limited use of co-operative learning approaches in primary classrooms (NCCA, 2005; NCCA, 2008).

Changes in pedagogy have been paralleled in many countries by increasing attention to the potential impact of school design and classroom layout on day-to-day teaching and learning. However, to date little has been known about the nature and consequences of school design in the Irish context. Ireland perhaps has much to learn from international best practice; such innovations as flexible learning spaces, the use of outdoor space as a basis for learning through play, the participation of children themselves in the design process and a greater openness to community activities, could all inform practice in the Irish context. However, one should be cautious about whole-sale 'policy borrowing' from any single educational system. The primary school system varies significantly across countries in relation to the age-group covered, the nature of the curriculum, and the average size of schools among other factors (Riggall and Sharp, 2008). As a result, no 'one size fits all' solution should be advocated but rather elements of best practice in other countries can be adapted to inform Irish practice.

This chapter draws on the study findings to highlight the central principles to be taken into account in the future design of primary schools in Ireland. In doing so, it builds upon, and suggests amendments to, the current Department of Education and Science *Design Guidelines for Primary Schools* (2007). While specifying general features that should be taken into account, the study recognises that by their nature schools develop and transform over time in response to broader social change, and on-going consultation with teachers, parents and pupils is, therefore, a vital component in future planning. Furthermore, the interaction between school design and practice is a dynamic one, and professional development has the potential to enhance the more creative use of school spaces as a basis for teaching and learning.

8.1

School Size and Location

- There are obvious economies of scale attached to larger school size. However, international research and stakeholder perspectives generally favour small to medium-sized schools for educational and social reasons. Primary schools in Ireland are small by international standards, with the vast majority having fewer than 400 pupils. Stakeholders generally favour having one or two classes per year group, which would translate into an upper limit of sixteen classrooms per school. However, they also point to the challenges associated with the necessity of having multi-grade classrooms in very small schools.
- In choosing the location of a school, building in the centre of the community rather than on the periphery would enhance school-community links and parental involvement. Schools should be located on sites large enough to permit the use of the outdoor space for teaching and learning as well as play and sports. This would also help to reduce external noise (such as traffic) impinging on classroom work. From an environmental perspective, the capacity of pupils to walk to school and/or use local public transport should be considered.
- The size of a school population may ebb and flow in line with local demographic and residential patterns. A degree of ‘future-proofing’ is, therefore, necessary in order to allow for projected future enrolments and so reduce the possibility of a school needing further extensions within a short period of time.

Schools should be an important part of the local community. In particular, parental involvement in school life should be facilitated by providing space for parents to meet within the school during and after the school day. The potential to move towards an ‘extended school’ model with local social and community services provided within, or close to, the school should be explored. A systematic evaluation of the new St Ultan’s Integrated School Project, Cherry Orchard, would provide a vital evidence base for developing such a model.

School design should continue to encompass best practice regarding environmental sustainability. This approach can also contribute to pupil learning regarding their environment. In addition, it is important to ensure that schools are easy to maintain in order to minimise running costs.

School design should pay particular attention to health and safety issues. The *Design Guidelines for Primary Schools* highlight a number of areas where design should ensure a safe environment for the child (for example, in relation to door and window design, the materials used for the surface cover of outdoor play areas, and appropriate indoor finishes). In addition, school design should make it easy for the teachers to observe both indoor and outdoor spaces in order to easily notice any sign of bullying or other potential issues that may threaten a child’s physical and emotional well-being.

8.2

Class Size and Layout

- Class size, that is, the number of pupils per class, is perhaps the most controversial issue in educational policy internationally. An experimental study in the US, Project STAR, indicated achievement gains from being in smaller classes, especially for younger children. Later studies in the US and UK using real-life variation across schools in average class sizes have reached contradictory conclusions regarding the impact of class size, and the cut-offs for a 'small' class have varied from 17 to 25. Current class sizes in Ireland are seen by many stakeholders and teachers as being too large to ensure the effective implementation of the primary curriculum. The contribution of smaller class sizes to pupil development will depend on the use of appropriate and effective teaching and learning methodologies within the classroom.
- Classrooms should be large and flexible enough to facilitate the use of a range of teaching methodologies, including group work, pair work, individual discovery-based learning and play. Size should also permit setting up different zones (or 'areas of interest') within the classroom, with the use of different surfaces, textures and materials to enhance pupil engagement. There should be adequate space for displaying pupil work in the classroom and common areas since such display provides children with a sense of ownership over school life. There should also be access to adequate storage for resources and materials within the classroom. The current specification of 80 square metres for the overall floor area of the classroom should be regarded as the minimum necessary to ensure these facilities.
- Classrooms should be bright (utilising as much natural light as possible), airy, with a consistent temperature throughout the school week and year. The acoustics of the room should facilitate the use of group work and there should be soundproofing between classrooms and other areas of the school to minimise disruption to the class. Current DES Design Guidelines are seen as an exemplar in relation to light, heating, ventilation and lack of noise.
- The design and layout of classrooms and common areas should take account of the different needs of children within the school. In particular, the very different requirements of 4 year old and 12 year old children should be incorporated into classroom layout, sightlines (for example, in displaying work but also in younger children being able to see out of windows) and the furniture used.
- All furniture should be ergonomically designed to enhance pupil health, comfort and engagement, and should be light enough to be moved around the room for different tasks.
- Storage areas should be provided for pupil books and personal belongings.
- Common areas, such as corridors, should be bright, wide and welcoming, and the considerable potential for using non-classroom spaces (e.g. corridors) as learning sites (for example, for individual or small group work) should be exploited.

8.3 Other Indoor Spaces

- Child safety should be of paramount importance inside as well as outside of the school building, in particular with regard to ensuring physical safety, and removing the risk of bullying and abuse.
- In keeping with the existing guidelines, all schools and classrooms should be accessible for pupils with physical disabilities and space for the appropriate adaptive technology, where required, should be available in the classroom.
- In keeping with the existing guidelines, pupils should have access to library facilities (both within the classroom and in dedicated spaces) in order to enhance individual learning and discovery.
- The research findings point to a number of amendments to the existing design guidelines which would better enhance pupil experiences and the delivery of the primary curriculum. These include the following:
 - Flexibility should be possible within the school to provide a range of non-classroom spaces for learning support, resource teaching and English language classes, to reflect the greater diversity of the primary school population and/or to allow for future changes in pupil numbers or profile. At present, support rooms are allocated on the basis of the language and educational support needs of the current school population. However, many schools experience changes over time in their pupil profile; a recent example is the rapid growth in the need for language support provision for newcomer students in the primary sector. Future years are likely to see increased numbers of children with special educational needs enrolling in mainstream primary schools. Therefore, more flexibility in the provision of non-classroom learning spaces is needed in order to have the capacity to respond to the changing dynamics of the school population.
 - Children themselves favour having a non-classroom space in which to eat their lunch. Having a formal lunch area could also benefit children by enhancing their social skills. The Design Guidelines note that the General Purpose room can be used for pupil dining. Further research would be helpful in determining the extent to which General Purpose rooms are currently used as lunch facilities in primary schools and the degree to which other factors (such as cleaning and maintenance) facilitate or constrain such usage. In addressing the issue of space constraint, staggering break times for children might provide a solution.
 - Schools should be encouraged to use the staff room as a resource for holding meetings and providing materials regarding professional issues.
 - ICT should be increasingly incorporated into day-to-day teaching and learning. This integration would require access to adequate numbers of up to date computers (preferably laptops to allow for greater flexibility), appropriate software, broadband services, data projectors or interactive whiteboards, and technical support and maintenance services (see ICT Strategy Group

2008). However, it is important that the use of ICT should encourage active learning within the classroom rather than dictating the layout of desks and use of space.

8.4 Outdoor Space

There is considerable potential to develop outdoor spaces as a site for teaching and learning as well as play. Current design guidelines make provision for ball courts and play areas but are generally much less specific on aspects of outdoor space than on indoor space. Guidelines should be developed to incorporate the following:

- Outdoor spaces with a variety of surfaces (including soft non-grass surfaces, especially for younger children);
- A school garden and other habitats to be included in the landscaping of the site;
- A variety of playground and sports equipment to cater for the needs of different pupil groups;
- In addition, principals and teachers should be encouraged through professional development to use outdoor space as a learning zone.

8.5 Teacher Education and Training

Current pedagogical approaches suggest that the learner should be at the heart of future developments and the teacher's role is increasingly seen to be that of a facilitator. This perspective is evident in the Primary Curriculum, which emphasises active learning methods and the use of a variety of teaching approaches for young children at various stages of their development. Existing research (e.g. NCCA, 2005; 2008) indicates that while many teachers use a variety of methodologies in their day-to-day practice, many classrooms are still characterised by more didactic approaches. Our study indicates that teacher professional development is key to the full implementation of the primary curriculum:

- Continuous professional development for teachers should support the use of more innovative teaching approaches, especially effective group work, in the classroom.
- Initial and ongoing teacher education should highlight the potential of outdoor space in facilitating pupil learning.
- As the increasing use of ICT in schools is likely to place more demands on teachers' skills, in-service training should be available for teachers.

8.6 Further Research

There has been very little research in the Irish context on the implications of school design for teaching and learning. This study has represented a first step in addressing this gap in knowledge but further research could inform policy and practice in Irish schools. In particular, research could usefully address the following topics:

- Identifying best practice in using indoor and outdoor spaces to facilitate pupil learning through play;
- The relationship between the physical environment and pupil outcomes (in terms of academic achievement, social skills etc.);

- The vast majority of primary pupils attend schools built prior to the current design guidelines. For the purposes of future planning, it would be crucial to compile a database on existing school buildings, including information on when the school was built, its size and condition, etc. The adaptability of the existing stock of school buildings should also be considered.

In summary, the research study highlights greater satisfaction among staff and pupils in schools built according to current design guidelines than in older schools in relation to many aspects of the school environment, including classroom size, lighting, heating, ventilation and noise. However, our findings highlight the way in which further amendments to the current design model would enhance teaching and learning in primary schools. In particular, the improved design of outdoor spaces, flexible spaces for supplementary teaching, storage for pupil belongings, and lunch facilities emerge as the main requirements. Furthermore, it is evident that the best use of school space can be ensured by promoting teacher development to facilitate the greater use of more active and engaging methodologies.

REFERENCES

- ACHILLES, C.M., 1999. *Let's Put the Kids First, Finally: Getting Class Size Right*. Thousand Oaks, CA: Corwin Press.
- AHMAN, M., A. LUNDIN, V. MUSABASIC and E. SODERMAN, 2000. "Improved Health after Intervention in a School with Moisture Problems", *Indoor Air*, Vol.10, No. 1, pp. 57-62.
- AHRENTZEN, S. and G.W. EVANS, 1984. "Distraction, Privacy, and Classroom Design", *Environment and Behavior*, Vol. 16, No. 4, pp. 437-454.
- ALEXANDER, R., 1992. *Policy and Practice in Primary Education*, London: Routledge.
- ALEXANDER, R., 2000. *Culture and Pedagogy: International Comparisons in Primary Education*, US: Blackwell.
- ALEXANDER, R., 2010. *Children, Their World, Their Education: Final Report and Recommendations of the Cambridge Primary Review*, Abingdon: Routledge.
- ANDERSON, L. W., 2000. "Why should Reduced Class Size Lead to Increased Student Achievement? in M. C. Wang and J. D. Finn (eds.), *How Small Classes Help Teachers Do Their Best*, Philadelphia: Temple University Center for Research in Human Development.
- ANDERSON, K., 2004. "The Problem of Classroom Acoustics: The Typical Classroom Soundscape is a Barrier to Learning", *Hearing*, Vol. 25, pp. 117-129.
- ANDREWS, M., W. DUNCOMBE and J. YINGER, 2002. "Revisiting Economies of Size in American Education: Are we any Closer to a Consensus?", *Economics of Education Review*, Vol. 21, No. 3, pp. 245-263.
- APPLE, M., 1979. *Ideology and Curriculum*. London: Routledge and Kegan Paul.
- BAINES, L. A. and G. STANLEY, 2000. "We Want to See the Teacher: Constructivism and the Rage Against Expertise", *Phi Delta Kappan*, Vol. 82, No. 4, pp. 327-330.
- BARNITT, H., 2003. "Lighting for the Future", *Building Services Journal: The Magazine for the CIBSE*, Vol. 25, No. 1, pp. 38-39.
- BECTA, 2001. *Primary Schools of the Future – Achieving Today, A report to the DfEE*, Available online at: www.becta.org.uk, accessed 9.11. 2007.
- BECTA, 2003. *Primary Schools – ICT and Standards*. An analysis of national data from Ofsted and QCA. Coventry: Becta.
- BECTA, 2007. *Emerging Technologies for Learning*, Available online <http://partners.becta.org.uk/>, Accessed 12 September 2008.
- BENNETT, N., 1996. "Class Size in Primary Schools: Perceptions of Head Teachers, Chairs of Governors, Teachers and Parents", *British Educational Research Journal*, Vol. 22, No. 1, pp. 33-55.
- BENTLEY, T., C. FAIRLEY and S. WRIGHT, 2001. *Design for Learning: Joined Up Design for Schools*, London: Demos.
- BENYA, J.R., 2001. *Lighting for Schools*. Washington DC: National Clearinghouse for Educational Facilities, Available online at: <http://www.edfacilities.org/pubs/lighting.html>, accessed 9.11.2007.
- BERGLUND, B. and T. LINDVALL (eds.), 1995. "Community Noise", *Archives of the Centre for Sensory Research*, Vol. 2, No. 1, pp. 1-195.
- BOARD ON INFRASTRUCTURE AND THE CONSTRUCTED ENVIRONMENT (BICE), 2006. "Green Schools, Attributes for Health and Learning", available online: <http://nap.edu/the> National Research Council, Commission on Engineering and Technical Systems, Board on Infrastructure and the Constructed Environment (BICE).

- BLATCHFORD, P., 1989. *Playtime in the Primary School*, London: NFER-Nelson.
- BLATCHFORD, P. and C. SUMPNER, 1998. "What Do We Know about Breaktime? Results from a National Survey of Breaktime and Lunchtime in Primary and Secondary Schools", *British Educational Research Journal*, <http://www.informaworld.com/smpp/title~content=t713406264~db=all~tab=issueslist~branches=24-v24> Vol. 24, No. 1, pp. 79-94.
- BLATCHFORD, P., V. MORIARTY, S. EDMONDS, and C. MARTIN, 2002. "Relationships between Class Size and Teaching: A Multi-Method Analysis of English Infant Schools", *American Educational Research Journal*, Vol. 39, No. 1, pp. 101-132.
- BLATCHFORD, P., P. KUTNICK, E. BAINES and M. GALTON, 2003. "Toward a social pedagogy of classroom group work" in P. Blatchford, and P. Kutnick (eds.). Special Edition of *International Journal of Educational Research*, Vol. 39, pp. 153-172.
- BLATCHFORD, P., 2003. *The Class Size Debate: Is Small Better?* Maidenhead: Open University Press.
- BLATCHFORD, P., A. RUSSELL, P. BASSETT, P. BROWN, and C. MARTIN, 2006. "The Effect of Class Size on the Teaching of Pupils Aged 7-11 Years: Implications For Classroom Management And Pedagogy", Paper to American Educational Research Association Annual Meeting, San Francisco, April.
- BLATCHFORD, P., S. HALLAM, J. IRESON, P. KUTNICK, A. CREECH, 2008. *Classes, Groups and Transitions: Structures for Teaching and Learning*, Cambridge: University of Cambridge Faculty of Education.
- BLONDEAU, P., V. IORDACHE, O. POUPARD, D. GENIN and F. ALLARD, 2005. "Relationship Between Outdoor and Indoor Air Quality in Eight French Schools", *Indoor Air*, Vol. 15, pp. 2-12.
- BOARD on INFRASTRUCTURE and the CONSTRUCTED ENVIRONMENT (BICE), 2006. "Green Schools: Attributes for Health and Learning" available at: http://books.nap.edu/catalog.php?record_id=11756
- BOMAN, E. and I. ENMARKER, 2004. "Factors Affecting Pupils' Noise Annoyance and Testing Models", *Environment and Behaviour*, Vol. 30, No. 2, pp. 207-228.
- BRADLOW, A. R., N. KRAUSS and E. HAYES, 2003. "Speaking Clearly for Children with Learning Disabilities: Sentence Perceptions in Noise", *Journal of Speech Language and Hearing Research*, Vol. 46, No. 1, pp. 80-97.
- BROADHEAD, P., 2006. "Developing an Understanding of Young Children's Learning Through Play", *British Educational Research Journal*, Vol. 32, No. 2, pp. 191-207.
- BROPHY, J., 1999. *Teaching*, UNESCO: Lausanne.
- BRUBAKER, C.W., R. BORDWELL, G. CHRISTOPHER, 1998. *Planning and Designing Schools*, New York: McGraw-Hill.
- BUCKLEY, J., M. SCHNEIDER and Y. SHANG, 2005. "Fix it and They Might Stay: School Facility Quality and Teacher Retention in Washington DC", *Teachers College Record*, Vol. 107, No. 5, pp. 1107-1123.
- BURKE, C., 2007. "The View of the Child: Releasing 'Visual Voices' in the Design of Learning Environments", *Discourse: Studies in the Cultural Politics of Education*, Vol. 28, No. 3, pp. 359-372.
- BURKE, K. and I. GROSVENOR, 2003. *The School I'd Like: Children and Young People's Reflections on an Education for the 21st Century*, London and New York: RoutledgeFalmer.
- CARTY, L., 2007. "The Views of Young Children on Learning Spaces in Schools", CEDE Conference, Ireland.

- CLARK, A., 2007. "Views from Inside the Shed: Young Children's Perspectives of the Outdoor Environment", *Education 3-13*, Vol. 35, No. 4, pp. 349-363.
- CLARK, A. and P. MOSS, 2001. *Listening to Young Children: The Mosaic Approach*. London: National Children's Bureau, London.
- CLARK, A., S. McQUAIL and P. MOSS, 2003. *Exploring the Field of Listening to and Consulting with Young Children*. Sheffield: DfES.
- CLARK, H., 2002. *Building Education: The Role of the Physical Environment in Enhancing Teaching and Research*, London: Institute of Education.
- CODD, J., M. BROWN, J. CLARK, J. McPHERSON, H. O'NEILL, J. O'NEILL, H. WAITERE-ANG, N. ZEPKE, 2002. *Review of Future-Focused Research on Teaching and Learning*, Auckland: New Zealand Ministry of Education.
- COHEN, D.K., 1995. "What is the System in Systemic Reform?", *Educational Researcher*, Vol. 24, No. 9, pp. 11-7.
- CONROY, J., M. HULME and I. MENTER, 2008. *Primary Curriculum Futures*, Cambridge: University of Cambridge Faculty of Education.
- COOLAHAN, J., 1981. *Irish Education, History and Structure*, Dublin: IPA.
- COOPER, H.M., 1989. "Does Reducing Student-to-instructor Ratios Affect Achievement?", *Educational Psychologist*, Vol. 24, No. 1, pp 78-98.
- CORCORAN T.B., J. WALKER, and J.L. WHITE, 1988. *Working in Urban Schools*, Washington DC: Institute for Educational Leadership (ERIC Document Reproduction Service No. ED299356).
- COTTON, K., 1996. *School Size, School Climate, and Student Performance*. Available: www.nwrel.org/scpd/sirs/10/c020.html
- COTTON, K. 2001. *New Small Learning Communities: Findings from Recent Literature*. Available: www.nwrel.org/scpd/sirs/nslc.pdf.
- CREMIN, H. and B. SLATTER, 2004. "Is it Possible to Access the 'Voice' of Pre-school Children? Results of a Research Project in a Pre-school Setting", *Educational Studies*, Vol. 30, No. 4, pp. 457-470.
- CENTRAL STATISTICS OFFICE, 2008. "Components of Population Growth, p. 9, available online: www.cso.ie
- CUBAN, L., 2001. *Oversold and Underused: Computers in the Classroom*, Cambridge, MA: Harvard University Press.
- DENZIN, N., 1989. *The Research Act: A Theoretical Introduction to Sociological Methods*, Englewood Cliffs: Prentice Hall.
- DEPARTMENT OF EDUCATION AND SCIENCE, 1999. *Primary School Curriculum: Introduction*, Dublin: Stationery Office.
- DEPARTMENT OF EDUCATION AND SCIENCE, 2000. General Design Guidelines for Primary schools, available online at: <http://www.education.ie/home/home.jsp?pcategory=17216&ecategory=40650&language=EN>
- DEPARTMENT OF EDUCATION AND SCIENCE, 2004a. *Information and Communication Technology (ICT) Infrastructure Guidelines for Primary Schools*, available at: www.education.ie
- DEPARTMENT OF EDUCATION AND SCIENCE, 2004b. *Mechanical and Electrical Building Services Engineering Guidelines for Post Primary School Buildings*, February 2004 available at: www.education.ie
- DEPARTMENT OF EDUCATION AND SCIENCE, 2005. *The Sharing of School Facilities with the Community*, Primary Circular 16/05, Dublin: DES.
- DEPARTMENT OF EDUCATION AND SCIENCE, 2007. *Primary School Design Guidelines*, available online at: <http://www.education.ie/home/home.jsp?pcategory=17216&ecategory=40650&language=EN>
- DEPARTMENT OF EDUCATION AND SCIENCE, 2008a. *ICT in Schools*, <http://www.education.ie/home/home.jsp?pcategory=17216&ecategory=17237&language=EN>

- DEPARTMENT OF EDUCATION AND SCIENCE, 2008b. *The Provision of Schools and the Planning System. A Code of Practice for Planning Authorities*, the Department of Education and Science, and the Department of the Environment, Heritage and Local Government.
www.environ.ie/en/Publications/DevelopmentandHousing/Planning/FileDownload,17998,en.pdf
- DEPARTMENT OF EDUCATION AND SCIENCE, 2008c. *Projections of Full Time Enrolment at Primary, Second and Third Level 2008-2030*, available at: www.education.ie
- DEPARTMENT OF EDUCATION AND SCIENCE, 2009. *Ensuring Sustainability in School Buildings*. Department of Education & Science Presentation to the Oireachtas Joint Committee on Education and Science, available online: <http://www.energyeducation.ie/Publications.aspx>
- DEPARTMENT OF EDUCATION AND SCIENCE, 2010. *Projections of Full Time Enrolment at Primary, Secondary and Higher Level, 2009-2030*, available at www.education.ie
- DEPARTMENT OF EDUCATION AND SCIENCE INSPECTORATE, 2005. *An Evaluation of Curriculum Implementation in Primary Schools: English, Mathematics and Visual Arts*, Dublin: Stationery Office.
- DEPARTMENT FOR EDUCATION AND SKILLS, 2002. *Schools for the Future: Designs for Learning Communities (Building Bulletin)*, DfES, London: Stationery Office Books.
- DEPARTMENT FOR EDUCATION AND SKILLS, 2006. "Teaching and Learning 2020 Review Group Report", available online: publicationswww.teachernet.gov.uk/.../6856-DfES-Teaching%20and%20Learning.pdf
- DEPARTMENT FOR EDUCATION AND SKILLS AND CABE, 2003. *Picturing School Design. A Visual Guide to Secondary School Buildings and their Surroundings Using the Design Quality Indicators for Schools*, London: Stationery Office Books.
- DEPARTMENT FOR EDUCATION AND SKILLS, 2006. *Building Bulletin 99 Briefing Framework for Primary School Projects*, London: Stationery Office.
<http://www.teachernet.gov.uk/management/resourcesfinanceandbuilding/schoolbuildings/schooldesign/sbareguidelines/>
- DEPARTMENT FOR EDUCATION AND SKILLS, 2007. *Better Buildings, Better Design, Better Education, A Report on Capital Investment in Education*. Available online at: www.dfes.gov.uk
- DESFORGES, C. and A. ABOUCHAR, 2003. *The Impact of Parental Involvement, Parental Support and Family Education on Pupil Achievements and Adjustments: A Literature Review*, DfES. Available at: <http://www.dfes.gov.uk/research/data/uploadfiles/RR433.pdf>
- DEVINE, D., M. NÍ GHÍOLLA PHÁDRAIG and J. DEEGAN, 2004. "Time for Children – Time for Change? Children's Rights and Welfare in Ireland During a Period of Economic Growth", Report to the COST network.
- DfES, 2007. *Building Schools for the Future: First Annual Report*, available online at: <http://publications.dcsf.gov.uk/default.aspx?PageFunction=productdetails&PageMode=publications&ProductId=DCSF-RW032&>
- DIMMOCK, C.A., 2000. *Designing the Learning-Centred School: A Cross-Cultural Perspective*, London: Routledge.
- DOCKRELL, J. E. and B. M. SHIELD, 2004. "Children's Perceptions of their Acoustic Environment at School and at Home", *Journal of the Acoustical Society of America*, Vol. 115, No. 6, pp. 2964-2973.
- DUDEK, M., 2000. *Architecture of Schools*, Architectural Press.

- DUNPHY, L., 2008. "Developing Pedagogy in Infant Classes in Primary Schools in Ireland: Learning from Research", *Irish Educational Studies*, Vol. 27, No. 1, pp. 55-70.
- EADSNE, 2003. *Special Education Across Europe in 2003: Trends in Provision in 18 European Countries*, Middlefart: European Agency for Development in Special Needs Education.
- EARTHMAN, G., 2004. *Prioritization of 31 Criteria for School Building Adequacy*, available at: http://www.aclu-md.org/facilities_report.pdf, accessed 1.12.04.
- EARTHMAN, G. I. and L. LEMASTERS, 1998. *Where Children Learn: A Discussion of How a Facility Affects Learning*. Paper presented at the annual meeting of Virginia Educational Facility Planners, available online at: <http://educfacilities.org/pubs.pdf>. Blacksburg, Va., February.
- EBERTS, R., E. KEHOE and J. STONE, 1984. *The Effect of School Size on Student Outcomes*, Center for Educational Policy and Management, University of Oregon.
- EHRENBERG, R.G., D.J. BREWER, A. GAMORAN, and J.D. WILLMS, 2001. "Class Size and Student Achievement", *Psychological Science in the Public Interest*, Vol. 2, No. 1, pp. 1-30.
- ELMORE, R. F., 1995. "Structural Reform and Educational Practice", *Educational Researcher*, Vol. 24, No. 9, pp. 23-26.
- EUROPEAN COMMISSION, 2006. *Benchmarking Access and Use of ICT in European Schools 2006*, Bonn: empirica.
- EUROPEAN COMMISSION, 2008. *Migration and Mobility: Challenges and Opportunities for EU Education Systems*, Brussels: European Commission.
- EUROPEAN STANDARD ON SCHOOL FURNITURE, 2004 – BESA (2004) A new European standard for educational furniture, available online at: <http://www.besa.org.uk/besa/documents/view.jsp?item=1051>
- EURYDICE, 2001. Basic Indicators on the Incorporation of ICT into European Education Systems: Facts and Figures 2000/2001. European Commission.
- EURYDICE, 2005. Eurydice Key Data on Education in Europe 2005. <http://www.eurydice.org/portal/page/portal/Eurydice>
- EVANS, G. W. and L. MAXWELL, 1997. "Chronic Noise Exposure and Reading Deficits: The Mediating Effects of Language Acquisition", *Environment and Behaviour*, Vol. 29, No. 5, pp. 638-656.
- EVANS, G.W., S. SAEGERT and R. HARRIS, 2001. "Residential Density and Psychological Health among Children in Low-Income Families", *Environment and Behaviour*, Vol. 33, pp. 165-180.
- FAHEY, T., L. DELANEY and B. GANNON, 2005. *School Children and Sport in Ireland*, Dublin: Economic and Social Research Institute.
- FINN, J.D., S.B. GERBER, C.M. ACHILLES and J. BOYD-ZAHARIAS, 2001. "The Enduring Effects of Class Size", *Teachers College Record*, Vol. 103, No. 2, pp. 145-183.
- FINN, J.D., S.B.GERBER and J. BOYD-ZAHARIAS, 2005. "Small Classes in the Early Grades, Academic Achievement and Graduating from High School", *Journal of Educational Psychology*, Vol. 97, No. 2, pp. 214-223.
- FINN, J.D., G.M. PANNOZZO and C.M. ACHILLES, 2003. "The "Why's" of Class Size: Student Behaviour in Small Classes", *Review of Educational Research*, Vol. 73, No. 3, pp. 321-368.
- FJORTOFT, I. and J. SAGEIE, 2000. "The Natural Environment as a Playground for Children: Landscape Description and Analyses of a Natural Landscape", *Landscape and Urban Planning*, Vol. 48, Nos.1/2, pp. 83-97.

- FLETCHER, A., 2003. "Meaningful Student Involvement: Guide to Inclusive School Change", Olympia, WA: The Freechild Project and HumanLinks Foundation, Available online at: www.soundout.org/MSIGuide.PDF
- FLICK, U., 2002. *An Introduction to Qualitative Research*, London: Sage.
- FLUTTER, J., 2006. "This Place Could Help You Learn: Student Participation in Creating Better School Environments", *Educational Review*, Vol. 58, No. 2, pp. 183-193.
- FLUTTER, J. and J. RUDDUCK, 2004. *Consulting Pupils: What's in it for Schools?* London: RoutledgeFalmer.
- FOWLER, W.J., 1992. "What Do We Know About School Size? What Should We Know?", Paper presented at the American Educational Research Association conference, San Francisco (ERIC ED347675).
- FROST, R. and G. HOLDEN, 2008. "Student Voice and Future Schools: Building Partnerships for Student Participation", *Improving Schools*, Vol.11, No. 1, pp. 83-95.
- GALLAGHER, C.B., 2004. "Our Town: Children as Advocates for Change in the City", *Childhood*, Vol. 11, No. 2, pp. 251-262.
- GALTON, M., 1995. *Crisis in the Primary Classroom*, London: David Fulton Publishers.
- GALTON, M., L. HARGREAVES, C. COMBER, D. WALL, A. PELL, 1999. *Inside the Primary Classroom: 20 Years On*, London and New York: Routledge.
- GALTON, M., B. SIMON and P. CROLL, 1980. *Inside the Primary Classroom*, London: Routledge and Kegan Paul.
- GALTON, M. and J. WILLIAMSON, 1992. *Group Work in the Primary Classroom*, London: Routledge.
- GAUNT, L., 1980. "Can children play at home?" in P.F. Wilkinson, (eds.), *Innovation in Play Environments*, London: Croom Helm, pp. 36-51.
- GLASS, G.V., L.S. CAHEN, M.L. SMITH and N.N. FILBY, 1982. *School Class Size: Research and Policy*. Beverly Hills, CA: Sage.
- GOOD, T. L., R. L. SLAVINGS, K. H. HAREL and H. EMERSON, 1987. "Student Passivity: A Study of Question-asking in K-12 Classrooms", *Sociology of Education*, Vol. 60, pp. 181-199.
- GOSWAMI, U. and P. BRYANT, 2007. *Children's Cognitive Development and Learning*, Cambridge: University of Cambridge Faculty of Education.
- GOULDING, M. and C. KYRIACOU, 2008. A Systematic Review of the Use of ICTs in Developing Pupils' Understanding of Algebraic Ideas, London: EPPI Centre.
- GUERIN, S. and B. MERRIMAN, 2006. "Using Children's Drawings as Data in Child-centred Research", *The Irish Journal of Psychology*.
- GUMP, P.V., 1987. "School and Classroom Environments" in D. Stockol and I. Altman (eds.), *Handbook of Environmental Psychology*, Vol. 1, New York: Wiley, pp. 691-732.
- HAINES, M. M., S. A. STANSFELD, S. BRENTNALL, J. HEAD, B. BERRY, M. JIGGINS and S. HYGGE, 2001a. "The West London Schools Study: the Effects of Chronic Aircraft Noise Exposure on Child Health". *Psychological Medicine*, Vol. 31, pp. 1385-1396.
- HAINES, M. M., S. STANSFELD, R. JOB, B. BERGLUND and J. HEAD, 2001b. "Chronic Noise Exposure, Stress Responses, Mental Health, and Cognitive Performance in School Children", *Psychological Medicine*, Vol. 31, pp. 1385-1396.
- HAKKARAINEN, K., H. MUUKKONEN, L. LIPPONEN, L. ILOMÄKI, M. RAHIKAINEN and E. LEHTINEN, 2001. "Teachers' Information and Communication Technology (ICT) Skills and Practices of Using ICT and Their Pedagogical Thinking", *Journal of Technology and Teacher Education*, Vol. 9, pp. 181-197.

- HALL, E., S. HIGGINS. "Embedding Computer Technology in Developmentally Appropriate Practice: Engaging with Early Years Professionals' Beliefs and Values", *Information Technology in Childhood Education Annual 2002*, Vol. 1, pp. 301-320.
- HALL, I. and S. HIGGINS, 2005. "Primary School Students' Perceptions of Interactive Whiteboards", *Journal of Computer Assisted Learning*, Vol. 21, pp. 102-117.
- HANUSHEK, E.A., 1999. "The Evidence on Class Size", in S.E. Mayer and P.E. Peterson (eds.), *Earning and Learning: How Schools Matter*, Washington: Brookings Institution Press.
- HART, J. and B. TYRER, 2006. "Research with Children Living in Situations of Armed Conflict: Concepts, Ethics and Methods", RSC Working Paper No. 30, Queen Elizabeth House, Department of International Development, University of Oxford.
- HASTINGS, N., J. SCHWIESO and K. WHELDALL, 1996. "A Place for Learning" in P. Croll and N. Hastings (eds.), *Effective Primary Teaching: Research-Based Classroom Strategies*, London: Fulton.
- HAYHOW, D., 1995. "The Physical Environment in Primary Schools and Successful Differentiation: Impressions from a Development Project", *Schools' Special Educational Policy Pack: Discussion Papers*. London: National Children's Bureau.
- HENNESSY, E., 2001. "Children's Experience in After School Care" in A. Cleary, M. Nic Ghiolla Phádraig and S. Quin (eds.), *Understanding Children, Volume 2: Changing Experiences and Family Forms*. Dublin: Oak Tree Press.
- HEPPELL, S., C. CHAPMAN, R. MILLWOOD, M. CONSTABLE, J. FURNESS, 2004. *Building Learning Futures: A Research Project*, Ultralab, CABE/RIBA, Building Futures programme report.
- HESCHONG MAHONE GROUP, 1999. "Day Lighting in Schools: An Investigation into the Relationship between Day Lighting and Human Performance", Fair Oaks, Calif.: Available online at: http://www.pge.com/003_save_energy/003c_edu_train/pec/daylight/di_pubs/SchoolDetailed820App.PDF.
- HESCHONG MAHONE GROUP, 2003. *Windows and Classrooms: A Study of Student Performance and the Indoor Environment*. California Energy Commission.
- HEWETT, V.M., 2001. "Examining the Reggio Emilia Approach to Early Childhood Education", *Early Childhood Education Journal*, Vol. 29, No. 2, pp. 95-100.
- HIGGINS, S., E. HALL, K. WALL, P. WOOLNER and C. McCAUGHEY, 2005. *The Impact of School Environments: A Literature Review*, Newcastle: Design Council.
- HORNE, S.C., 1999. "Classroom Environment and its Effects on the Practice of Teachers", Ph.D, University of London.
- HOGARTH, S., J. BENNETT, F. LUBBEN, B. CAMPBELL, A. ROBINSON, 2006. *ICT in Science Teaching*, London: EPPI Centre.
- HOWLEY, C., 1997. *The Academic Effectiveness of Small-Scale Schooling*. Charleston, WV: Clearinghouse on Rural Education and Small Schools (ERIC Document Reproduction Service No. ED 433 175).
- HUNN-SANNITO, R; R. HUNN-TOSI, M TESSLING, 2001. "Classroom Size: Does It Make a Difference"? Master of Arts Action Research Project, Saint Xavier University and IRI/Skylight Professional Development Field-Based Masters Program.
- HYGGE, S., 2003. "Classroom Experiments of the Effects of Different Noise Sources and Sound Levels on Long Term Recall and Recognition in Children", *Applied Cognitive Psychology*, Vol. 17, pp. 895-914.

- HYGGE, S., G.W. EVANS and M. BULLINGER, 1996. "The Munich Airport Noise Study: Cognitive effects on children from before to after the changeover of airports", pp. 2189-2194 in *Proceedings of Inter Noise '96*. Volume 5. Poughkeepsie, NY: Institute of Noise Control Engineering.
- ICT Strategy Group Report, 2008. *Investing Effectively in ICT in Schools 2008-2013*, available online: <http://www.ncte.ie/NewsandEvents/Newsletter/title,10590,en.html>
- ILLINOIS FACILITIES FUND, 2004. "The Building Blocks of Design: A Handbook for Early Childhood Development Facilities". Available at: <http://www.iff.org/resources/content/8/7/documents/BBdesignmanual.pdf>
- INTERNATIONAL WORKSHOP ON EDUCATIONAL INFRASTRUCTURE, 2002. "Educational Infrastructure", available online at: http://www.eric.ed.gov/ERICWebPortal/custom/portlets/recordDetails/detailmini.jsp?_nfpb=trueandandERICExtSearch_SearchValue_0=ED478695andERICExtSearch_SearchType_0=noandaccno=E478695
- IRISH NATIONAL TEACHERS' ORGANISATION, 1980. "A Proposal for Growth. The Administration of National Schools", available at: <http://www.into.ie/ROI/publications/INTOPublications/>
- INTO, 1984. "Co-operative Teaching in Shared Area Classrooms", available at: <http://www.into.ie/ROI/publications/INTOPublications/>
- INTO, 1995. "Early Childhood Education, Issues and Concerns", available at: <http://www.into.ie/ROI/publications/INTOPublications/>
- IPPN, 2007. *Submission to NCTE*, Cork: IPPN.
- JAGO, E. and K. TANNER, 1999. *Influence of the School Facility on Student Achievement: Lighting; Colour*. Athens, Georgia: Department of Educational Leadership; University of Georgia, available online at: <http://www.coe.uga.edu/sdpl/researchabstracts/visual/html>
- JAMES, M. and A. POLLARD, 2008. "What Have We Learned from TLRP?", *Education Review*, Vol. 21, No. 1, pp. 90-100.
- JAWORSKI, B., 1994. *Investigating Mathematics Teaching: A Constructivist Enquiry*, London: Falmer Press.
- JOHNSON, D.J., M.J. COX and D.M. WATSON, 1994. "Evaluating the Impact of IT on Pupils' Achievements", *Journal of Computer Assisted Learning*, Vol. 10, No. 3.
- KARPEN, D., 1993. "Full Spectrum Polarized Lighting: An Option for Light Therapy Boxes", 101st Annual Convention of the American Psychological Association, Toronto.
- KENNEDY, M., 2003. "History in the Making", *American School and University*, Vol. 75, pp. 1-10.
- KHATTAR, M., D. SHIREY and R. RAUSTAD, 2003. "Cool and Dry – Dual-path Approach for a Florida School", *Asbrue Journal*, Vol. 45, No. 5, pp. 58-60.
- KILLEEN, J.P., G.W. EVANS and S. DANKO, 2003. "The Role of Permanent Student Artwork in Students' Sense of Ownership in an Elementary School", *Environment and Behaviour*, Vol. 35, No. 2, pp. 250-263.
- KIMMEL, R., P. DARTSCH, S. HILDENBRAND, R. WODARZ and F. SCHMAHL, 2000. "Pupils' and Teachers' Health Disorders after Renovation of Classrooms in a Primary School", *Gesundheitswesen*, Vol. 62, No. 12, pp. 660-664.
- KING, A., 1995. "Inquiring Minds Really Do Want To Know: Using Questioning to Teach Critical Thinking", *Teaching of Psychology*, Vol. 22, pp. 13-17.

- KIRKEBY, I.M., 2002. "The School of Tomorrow – Nordic Network of Educational Buildings", OECD Programme on Educational Building, International Seminar on Educational Infrastructure, Guadalajara, Jalisco, Mexico, 24-27 February.
- KRYTER, K.D., 1994. *The Handbook of Hearing and the Effects of Noise*, New York: Academic Press.
- LACKNEY, J.A., 1999. "Assessing School Facilities for Learning/ Assessing the Impact of the Physical Environment on the Educational Process". Mississippi State, Miss.: Educational Design Institute (ERIC Document Reproduction Service No. ED441330).
- LAMDIN, D.J., 1995. "Testing for Effect of School Size on Student Achievement within a School District", *Education Economics*, Vol. 3, pp. 33-42.
- Le METAIS, J., 2003. *International Trends in Primary Education*, London: INCA.
- LEE, S. and M. CHANG, 2000. "Indoor and Outdoor Air Quality Investigation at Schools in Hong Kong", *Chemosphere*, Vol. 41, Nos. 1-2, pp. 109-113.
- LEITHWOOD, K. and D. JANTZI, 2009. "A Review of Empirical Evidence About School Size Effects: A Policy Perspective", *Review of Educational Research*, Vol. 79, No. 1, pp. 464-490.
- LEMASTERS, L. K., 1997. *A Synthesis of Studies Pertaining To Facilities, Student Achievement, And Student Behaviour*. Blacksburg: Virginia Polytechnic and State University, Educational Leadership and Policy Studies, ERIC Document Reproduction Service No. ED447687.
- LERCHER, P., G.W. EVANS and M. MEIS, 2003. "Ambient Noise and Cognitive Process among Primary Schoolchildren", *Environment and Behaviour*, Vol. 35, No. 6, pp. 725-735.
- LOCAL GOVERNMENT ACT, 2000. *Building Schools for the Future*, London: HM Stationery Office.
- LINDSAY, P., 1982. "The Effect of High School Size on Student Participation, Satisfaction and Attendance", *Educational Evaluation and Policy Analysis*, Vol. 4, No. 1, pp. 57-65.
- LIPPMANN, P. C., 2007. *What Are Small Schools, Small Learning Communities, and Learning Communities of Practice?* Available: <http://www.edfacilities.org/rl/size.cfm>
- LOUGHLIN, C. and J. SUINA, 1982. *The Learning Environment: An Instructional Strategy*, Teachers College Press.
- LUCAS, J., 1981. *Effects of Noise on Academic Achievement and Classroom Behaviour*. Sacramento: California Department of Health Services.
- LUNDQUIST, P., K. HOLMBERG and U. LANDSTRÖM, 2000. "Annoyance and Effects on Work from Environmental Noise at School", *Noise and Health*, Vol. 8, pp. 39-46.
- McINTYRE, D., D. PEDDER and J. RUDDUCK, 2005. "Pupil Voice: Comfortable and Uncomfortable Learnings for Teachers", *Research Papers in Education*, Vol. 20, No. 2, pp. 149-168.
- McINTYRE, M. H., 2006. *A Literature Review of the Social and Economic Impact of Architecture and Design*, Edinburgh: Information and Analytical Services Division, Scottish Executive Education Department.
- McKINSEY AND COMPANY, 2007. *How the World's Best-Performing Schools Come Out on Top*. Paris: OECD.
- MALONE, K. and P. TRANTER, 2003. "Children's Environmental Learning and the Use, Design and Management of Schoolgrounds", *Children, Youth and Environments*, Vol. 13, No. 2, available at: http://www.colorado.edu/journals/cye/13_2/Malone_Tranter/ChildrensEnvLearning.htm

- MARTIN, S. H., 2002. "The Classroom Environment and its Effects on the Practice of Teachers", *Journal of Environmental Psychology*, Vol. 22, pp. 139-156.
- MARX, A., U. FUHRER and T. HARTIG, 1999. "Effects of Classroom Seating Arrangements on Children's Question Asking", *Learning Environments Research*, Vol. 2, pp. 249-263.
- MARX, A., U. FUHRER and T. HARTIG, 2000. "Effects of Classroom Seating Arrangements on Children's Question-asking", *Learning Environments Research*, Vol. 2, pp. 249-263.
- MAXWELL, L.E., 2000. "A Safe and Welcoming School: What Students, Teachers and Parents Think", *Journal of Architectural and Planning Research*, Vol. 17, No. 4 pp. 271-282.
- MAXWELL, L.E., 2003. "Home and School Density Effects on Elementary School Children. The Role of Spatial Density", *Environment and Behaviour*, Vol. 35, No. 4, pp. 566-578.
- MAXWELL, L. and G. EVANS, 2000. "The Effects of Noise on Pre-school Children's Pre-reading Skills," *Journal of Environmental Psychology*, No. 20, pp. 91-97.
- MAYO, L., M. FLORENTINE and S. BUUS, 1997. "Age of Secondary Language Acquisition and Perception of Speech in Noise", *Journal of Speech, Language and Hearing Research*, Vol. 40, pp. 686-693.
- MENDELL, M.J., and G.A. HEATH, 2004. "Do Indoor Pollutants and Thermal Conditions in Schools Influence Student Performance? A critical review of the literature", *Indoor Air*, Vol. 15, pp. 27-52.
- MEYENN, B., 2005. *Class Size Reduction Program Evaluation*, conducted for the NSW Government by Charles Sturt University Dean of the Faculty of Education, November.
- MILESI, C. and A. GAMORAN, 2006. "Effects of Class Size and Instruction on Kindergarten Achievement", *Educational Evaluation and Policy Analysis*, Vol. 28, No. 4, pp. 287-313.
- MITCHELL, J., 2008. "Building Schools for the Future: Setting the Hares Running", *Forum*, Vol. 50, No. 2, available at: www.wvwords.co.uk/FORUM
- MOLENBROEK, J.F.M., Y.M.T. KROON-RAMAEKERS and C.J. SNIJDERS, 2003. "Revision of the Design of a Standard for the Dimensions of School Furniture", *Ergonomics*, Vol. 46, No. 7, pp. 681-694.
- MOLNAR, A., P. SMITH and J. ZAHORIK, 1999. *1998-99 Evaluation of the Student Achievement Guarantee in Education (SAGE) Program*. Milwaukee, WI: University of Wisconsin-Milwaukee, School of Education. Available online at: www.uwm.edu/Dept/CERAI/documents/SageThirdYearReport.html.
- MONTELLO, D.R., 1992. "Classroom Seating Location and its Effect on Course Achievement, Participation and Attitudes", *Journal of Environmental Psychology*, Vol. 8, pp. 149-157.
- MOORE, G.T. and J.A. LACKNEY, 1993. "School Design: Crisis, Educational Performance and Design Applications", *Children's Environments*, Vol. 10, No. 2, pp. 1-22.
- MOORE, G.T., A.L. McCARTY and G. JELIN, 1995. "Children's Village: A Safe Haven for Children Stress and Violence", *Children's Environments*, Vol. 12, No. 1, pp. 1-24.
- MORTIMORE, P., P. SAMMONS, L. STOLL, D. LEWIS and R. ECOB, 1988. *School Matters: the Junior Years*. Wells, Somerset: Open Books, Sage: London.
- MORTIMORE, P., 1998. *The Road to Improvement: Reflections on School Effectiveness* (Contexts in Learning Series). Lisse: Swets and Zeitlinger.

- MOSS, P., P. PETRIE and G. POLAND, 1999, *Rethinking School: Some international perspectives* (Leicester, Youth Work Press for the Joseph Rowntree Foundation).
- MOUSSIAUX, S. J. and J. NORMAN, 1997. "Constructivist Teaching Practices: Perceptions of Teachers and Students", AETS Conference Proceedings.
- MURPHY, B., 2004. "Practice in Irish Infant Classrooms in the Context of the Irish Primary School Curriculum (1999): Insights from a Study of Curriculum Implementation", *International Journal of Early Years Education*, Vol. 12, No. 3, pp. 245-257.
- MYHRVOLD, A. N., E. OLSEN and O. LAURIDSEN, 1996. "Indoor environment in schools: pupils' health and performance in regard to CO₂ concentrations", *Indoor Air*, The Seventh International Conference on Indoor Air Quality and Climate, International Academy of Indoor Air Sciences, Vol. 4, pp. 369-71.
- NATIONAL CHILDREN'S STRATEGY, 2000. Available online: www.dohc.ie
- NATIONAL FORUM TO ACCELERATE MIDDLE GRADES REFORM, 2004. available online: <http://www.mgforum.org/>
- NCCA, 2004. *ICT in the Primary School Curriculum: Guidelines for Teachers*, Dublin: NCCA.
- NCCA, 2005. *Primary Curriculum Review: Phase 1. Final Report*. Dublin: NCCA.
- NCCA, 2008. *Primary Curriculum Review: Phase 2. Final Report*. Dublin: NCCA.
- NCTE, 2008. "Recommendations for ICT in Primary Schools" <http://www.ncte.ie/ICTAdviceSupport/NCTErecommendationsforICTinPrimaryschools/>
- NEDELLEC, V., 2005. *Indoor Air Quality in Some Schools in England*, http://rsein.ineris.fr/actualite/actu_pdf/11_Crump.pdf
- NELSON, P.B. and S. SOLI, 2000. "Acoustical Barriers to Learning: Children at Risk in Every Classroom", *Language, Speech and Hearing in Schools*, Vol. 31, No. 4, pp. 356-361.
- NODEN, P., A. WEST, M. NEWMAN, Z. GARRETT, D. ELBOURNE, 2006. "Does Secondary School Size Make a Difference? A systematic review", *Educational Research Review*, Vol. 1, No. 1, pp. 41-60.
- NORCONTEL, 2009. Schools Broadband Programme Evaluation Report, available online: www.education.ie
- NORMAN, R.D. and W.A. SCOTT, 1952. "Colour and Affect: A Review and Semantic Evaluation", *Journal of General Psychology*, Vol. 46, pp. 185-223.
- OECD, 1996. *Making Better Use of School Buildings*. PEB Papers. Paris: Programme on Educational Building, Organisation for Economic Co-operation and Development.
- OECD, 2000. *Innovating Schools*, Programme on Educational Building, Paris: Organisation for Economic Co-operation and Development.
- OECD, 2001. *Schooling for Tomorrow. What Schools for the Future?* available at <http://www.sourceoecd.org/>
- OECD, 2001a. *Teachers for Tomorrow's Schools*, Programme on Educational Building, Paris: Organisation for Economic Co-operation and Development.
- OECD, 2001b. *Schooling for Tomorrow. What Schools for the Future?*, Programme on Educational Building, Paris: Organisation for Economic Co-operation and Development.
- OECD, 2003. "Lessons in Danger", International Conference on School Safety and Security, J. Dolan, "Review of Security in School Design in Ireland", Chapter 6; Paris: OECD.

- OECD, 2003a. *Schooling for Tomorrow. Networks of Innovation – Towards New Models for Managing Schools and Systems*, Paris: Programme on Educational Building, Organisation for Economic Co-operation and Development.
- OECD, 2003b. *Schooling for Tomorrow. Analysing and Understanding the “Demand for Schooling” – Country Reports*, Paris: Programme on Educational Building, Organisation for Economic Co-operation and Development.
- OECD, 2004a. *International Schooling for Tomorrow Forum. Additional Country Papers: Ireland*, Paris: Programme on Educational Building, Organisation for Economic Co-operation and Development.
- OECD, 2004b. *OECD Thematic Review of Early Childhood Education and Care Policy in Ireland*. Paris: Organisation for Economic Co-operation and Development.
- OECD, 2005. *Formative Assessment. Improving Learning in Secondary Classrooms*, Paris: Programme on Educational Building, Organisation for Economic Co-operation and Development.
- OECD, 2006. *21st Century Learning Environments*, Paris: Programme on Educational Building, Organisation for Economic Co-operation and Development.
- OECD, 2008. *Education At A Glance*, Paris: OECD.
- OLDS, A.R., 1989. “Psychological and Physiological Harmony in Child Care Centre Design”, *Children’s Environments Quarterly*, Vol. 6, No. 4, pp. 8-16.
- OLIVER, C., 2004. “Teaching at a Distance: The Online Faculty Work Environment”, Unpublished Dissertation. New York: The Graduate Centre, The City University of New York.
- PANAGIOTOPOULOU, G., K. CHRISTOULAS, A. PAPANCKOLAOU and K. MANDROUKAS, 2004. “Classroom Furniture Dimensions and Anthropometric Measures in Primary School”, *Applied Ergonomics*, Vol. 35, No. 2, pp. 121-128.
- PARCELLS, C., M. STOMMEL and R. HUBBARD, 1999. “Mismatch of Classroom Furniture and Student Body Dimensions: Empirical Findings and Health Implications”, *Journal of Adolescent Health*, Vol. 24, No. 4, pp. 265-273.
- PICUS, L.O., S.F. MARION, N. CALVO and W.J. GLENN, 2005. “Understanding the Relationship Between Student Achievement and the Quality of Educational Facilities: Evidence from Wyoming”, *Peabody Journal of Education*, Vol. 80, No. 3, pp. 71-95.
- PIRLS, 2001. Progress in International Reading Literacy Study, available online: http://timss.bc.edu/pirls2001i/pirls2001_pubs_ir.html
- PLOWDEN, B., 1967. *Children and Their Primary Schools: A Report*, London: HM Stationery Office.
- POLLARD, A. and M. JAMES, 2004. *Personalised Learning*, London: TLRP/ESRC.
- PROJECT (Student Teacher Achievement Ratio [STAR]), available online: <http://www.heros-inc.org/star.htm>
- PROSHANSKY, H. M., 1978. “The City and Self-Identity”, *Environment and Behaviour*, Vol. 10, pp. 57-83.
- PROSHANSKY, H. M. and A.K. FABIAN, 1987. “The Development of Place Identity in the Child” in C.S. Weinstein and T.G. David (eds.), *Spaces for Children, The Built Environment and Child Development*, New York and London: Plenum Press.
- QUINN PATTON, M., 2002. *Qualitative Research and Evaluation Methods*, London: Sage.
- RASMUSSEN, K., 2004. “Places for Children – Children’s Places”, *Childhood*, Vol. 11, No. 2, pp. 155-173.
- RAYWID, M.A., 1999. “Current Literature on Small Schools”. ERIC Digest. Available online at: www.ericfacility.net/ericdigests/ed425049.html

- RAYWID, M.A., 2000. *Resisting the Urge to Merge: Does School Size Matter?* ERIC Document Reproduction Service No. ED464 793.
- READ, M.A., A.I. SUGAWARA and J.A. BRANDT, 1999. "Impact of Space and Colour in the Physical Environment on Preschool Children's Cooperative Behaviour", *Environment and Behaviour*, Vol. 31, No. 3, pp. 413-428.
- REVIEW GROUP, 2006. *The Report of the Teaching and Learning in 2020 Review*, <http://publications.teachernet.gov.uk/>
- RICKINSON, M. and D. SANDERS, 2005. "Secondary School Students' Participation in School Grounds Improvement", *Canadian Journal of Environmental Education* (www.cjee.lakeheadu.ca).
- ROSEN, K. G. and G. RICHARDSON, 1999. "Would Removing Indoor Air Particulates in Children's Environments Reduce Rate of Absenteeism – a Hypothesis", *Science of the Total Environment*, Vol. 234, No. 2, pp. 87-93.
- RUDD, T., C. GIFFORD, J. MORRISON and K. FACER, 2006. *What if... Re-imaging Learning Spaces*, Futurelab.
- RUDD, P., M. RICKINSON and P. BENEFIELD, 2004. *Mapping Work on the Future of Teaching and Learning*, Final report for the General Teaching Council, Slough: NFER.
- RUDDUCK, J. and J. FLUTTER, 2004. *How to Improve your School: Giving Pupils a Voice*, London: Continuum Press.
- SAAMI, L., C.H. NYGARD, A. KAUKIANEN and A. RIMPELA, 2007. "Are the Desks and Chairs at School Appropriate?", *Ergonomics*, Vol. 50, No. 10, pp. 1561-1570.
- SAVANUR, C.S., C.R. ALTEKAR and A. DE., 2007. "Lack of Conformity Between Indian Classroom Furniture and Student Dimensions", *Ergonomics*, Vol. 50, No. 10, pp. 1612-1625.
- SCHNEIDER, M., 2002. "Public School Facilities and Teaching", Washington, D.C., and Chicago. Available at <www.edfacilities.org>.
- SCHUTT, K.R., 1999. *Investigating the Social World*, 5th ed, Pine Forge Press.
- SCOTTISH EXECUTIVE, 2005. The Impact of ICT initiatives in Scottish Schools: Phase 3 Final Report, Condie, Munro, Muir and Collins, Scottish Executive, September 2005, available online at: <http://www.scotland.gov.uk/Publications/2005/09/14111116/11170>
- SEBBA, J., N. BROWN, S. STEWARD, M. GALTON, M. JAMES, 2008. *An Investigation of Personalised Learning Approaches Used by Schools*, Nottingham: DfES.
- SHENDELL, D.G., R. PRILL, W.J. FISK, M.G. APTE, O. BLAKE and D. FAULKNER, 2004. "Associations Between Classrooms' CO₂ Concentrations and Student Attendance in Washington and Idaho." *Indoor Air*, Vol. 14, pp. 333-341.
- SHEPPARD, T., 2008. "Generic Repeat Design Schools Ireland", Paper to the 25th Conference on Passive and Low Energy Architecture, Dublin.
- SHIEL, G. and A. O'FLAHERTY, 2006. *NCTE 2005 Census on ICT Infrastructure in Schools, Statistical Report*, Dublin: Educational Research Centre.
- SHUAYB, M. and S. O'DONNELL, 2007. *Aims and Values in Primary Education: England and Other Countries*, Cambridge: University of Cambridge Faculty of Education.
- SMITH, P.K. and K.J. CONNOLLY, 1980. *The Ecology of Preschool Behaviour*, London: Cambridge University Press.
- SMITH, F., F. HARDMAN and S. HIGGINS, 2006. "The Impact of Interactive Whiteboards in the National Literacy and Numeracy Strategies", *British Educational Research Journal*, Vol. 32, No. 3, pp. 443-457.
- SOMEKH, B. and R. DAVIES, 1991. "Towards a Pedagogy for Information Technology", *Curriculum Journal*, Vol. 2, No. 2, pp. 153-170.

- SOMEKH, B. and R. DAVIES (eds.), 1997. *Using IT Effectively in Teaching and Learning: studies in pre-service and in-service teacher education*, Routledge: London and New York.
- STEFFE, L.P., and J. GALE (eds.) 1995. *Constructivism in Education*, New Jersey: Lawrence Erlbaum Associates, Publishers.
- TANGEN, R., 2008. "Listening to Children's Voices in Educational Research: Some Theoretical and Methodological Problems", *European Journal of Special Needs Education*, Vol. 23, No. 2, pp. 157-166.
- TANNER, C. K., 2000. "The Influence of School Architecture on Academic Achievement", *Journal of Educational Administration*, Vol. 38, No. 4, pp. 309-330.
- TANNER, C. K. and S. LANGFORD, 2003. *The Importance of Interior Design Elements as They Relate to Student Outcomes*, Cambridge, MA: Harvard University Press.
- THE POWIS REPORT OF 1868 – Powis Commission of Enquiry into Primary Education in Ireland – referred to in *Irish Education, its History and Structure* by J. Coolahan, 1981, Dublin: IPA.
- TIBURCIO, T. and E.F. FINCH, 2004. "The Impact of an Intelligent Classroom on Pupils' Interactive Behaviour", *Facilities*, Vol. 23, No. 5/6, 2005 pp. 262-278, available at: www.emeraldinsight.com/researchregister www.emeraldinsight.com/0263-2772.htm
- TROUSSIER, B., 1999. "Comparative Study of Two Different Kinds of School Furniture Among Children", *Ergonomics*, Vol. 42, No. 3, pp. 516-526.
- UNESCO, 1994. *The Salamanca Statement and Framework for Action on Special Needs Education*, Paris: UNESCO.
- VEALE, A., 2005. "Creative Methodologies in Participatory Research with Children" in S. Greene and D. Hogan (eds.), *Researching Children's Experience: Approaches and Methods*, London: Sage.
- VERNON, S., B. LUNDBLAD and A.L. HELLSTROM, 2003. "Children's Experiences of School Toilets Present a Risk to Physical and Psychological Health", *Journal of Environmental Psychology*, Vol. 7, No. 3, pp. 253-262.
- VOGT, W.P., 1999. *Dictionary of Statistics and Methodology: A Nontechnical Guide*. Newbury Park: SAGE Publications.
- WALKER-TILESTON D., 2004. *What Every Teacher Should Know About Media and Technology*. Corwin Press, Thousand Oaks, CA.
- WALL, K., J. DOCKRELL and N. PEACEY, 2008. *Primary Schools: The Built Environment*, Cambridge: University of Cambridge.
- WASLEY, P., M. FINE, M. GLADDEN, N.E. HOLLAND, S.P. KING, E. MOSAK and L.C. POWELL, 2000. *Small Schools: Great Strides - A Study of New Small Schools in Chicago*. New York: Bank Street College of Education.
- WEBB, R. and G. VULLIAMY, 2007. "Changing Classroom Practice at Key Stage 2: the Impact of New Labour's National Strategies", *Oxford Review of Education*, Vol. 33, No. 5, pp. 561-580.
- WEINSTEIN, C.S. and T.G. DAVID (eds.), 1987. *Spaces for Children, The Built Environment and Child Development*, New York and London: Plenum Press.
- WENDLING, W.W. and J. COHEN, 1981. "Education Resources and Student Achievement: Good News for Schools", *Journal of Education Finance*, Vol. 7, pp. 44-63.
- WHELDALL, K. and Y. LAM, 1987. "Rows Versus Tables. II: The Effects of Two Classroom Seating Arrangements on Disruption Rate", *Educational Psychology*, Vol. 2, No. 4, pp. 34-39.
- WILKIN, A., R. WHITE, K. KINDER, 2003, *Towards Extended Schools: A Literature Review*, Slough: NFER.

- WILKINSON, R., 2002. "Monitoring and Evaluation of Public Policies for Educational Infrastructure", OECD Programme on Educational Building, International Seminar on Educational Infrastructure, Guadalajara, Jalisco, Mexico, 24-27 February.
- WILTZ, N. and E. KLEIN, 2001. "What Do You Do in Child Care? Children's Perceptions of High and Low Quality Classrooms", *Early Childhood Research Quarterly*, Vol. 16, No. 2, pp. 209-238.
- WOLFE, M. and L.G. RIVLIN, 1987. "The Institutions in Children's Lives" in C.S. Weinstein, T.G. David (eds.). *Space for Children: The Built Environment and Child's Development*, pp. 89-114. New York: Plenum.
- WOOLNER, P., E. HALL, S. HIGGINS, C. MCCAUGHEY and K. WALL, 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*, Vol. 33, No. 1, pp. 47-70.
- WOOLNER, P., E. HALL, K. WALL and D. DENNISON, 2007b. "Getting Together to Improve the School Environment: User Consultation, Participatory Design and Student Voice", *Improving Schools*, Vol. 10, No. 3, pp. 233-248.
- WURTMAN, R. J., 1975. "The Effects of Light on the Human Body", *Scientific American*, Vol. 233, No. 1, pp. 68-77.
- ZANDVLIET, D. and L. STRAKER, 2001. "Physical and Psychosocial Aspects of the Learning Environment in Information Technology Rich Classrooms", *Ergonomics*, Vol. 44, No. 9, pp. 838-857.

APPENDIX I

DESIGNING SCHOOLS FOR THE FUTURE - QUESTIONNAIRE FOR INSPECTORS

The Department of Education and Science has commissioned the Economic and Social Research Institute (ESRI) to carry out a study aimed at the development of a brief for the 'school of the future' for Irish primary schools, chiefly focusing on the link between school design and teaching/learning practices. As a part of the study, this questionnaire enables us to obtain your perceptions on design and other factors that potentially have an impact on pupils' and teachers' experiences in primary schools. Information provided by you in this questionnaire is confidential and will only be used for the purpose of this study.

1. How Important are the Following Factors in Designing a New Primary School?

	Very Important	Somewhat Important	Not Important
1. Distance from a main road (noise)	0	0	0
2. Having large school grounds	0	0	0
3. Adequate space within classrooms per pupil	0	0	0
4. School hall/general purpose room	0	0	0
5. Having wide corridors	0	0	0
6. Storage space within classrooms	0	0	0
7. Colour of walls	0	0	0
8. Design and type of furniture	0	0	0
9. Adequate layout and size of outdoor areas (play/sport)	0	0	0
10. Potential use of the school building as community centre (extended school)	0	0	0
11. Cost effectiveness (value for money)	0	0	0
12. Sustainability (environmental) of the school	0	0	0
13. Inclusivity (catering for children for special educational needs and disability, newcomer students)	0	0	0
14. Availability of ICT and Internet for teachers	0	0	0
15. Availability of ICT and Internet for pupils	0	0	0
16. Security	0	0	0
17. Space for small group or one-to-one tuition	0	0	0
18. Other, please specify:			

2. In Your Opinion, To What Extent Do These Aspects of the School Building Have an Impact on Teaching and Learning?

	To a Great Extent	To Some Extent	Not to Any Great Extent
Quality of lighting (use of natural light)	0	0	0
Space per pupil in a class	0	0	0
External noise (e.g. traffic)	0	0	0
Noise travelling between classrooms	0	0	0
Air quality (ventilation)	0	0	0
Colours used in interior design	0	0	0
Adequate temperature in the classroom	0	0	0
Other, please specify:			

3. How Satisfied are You in General with the Following Aspects of Existing Primary Schools

	V. Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Dis-satisfied	Very Dis-satisfied
1. Layout of classrooms	0	0	0	0	0
2. Furniture/equipment within classrooms	0	0	0	0	0
3. Storage space in classrooms	0	0	0	0	0
4. Areas for displaying student work/art	0	0	0	0	0
5. School hall/general purpose room	0	0	0	0	0
6. Design of outdoor play areas	0	0	0	0	0
7. Design of outdoor sport/ PE areas	0	0	0	0	0
8. Flexibility of classroom design	0	0	0	0	0
9. Bathroom facilities for pupils	0	0	0	0	0
10. Availability of computers for teachers	0	0	0	0	0
11. Availability of computers for pupils	0	0	0	0	0
12. Access to Internet for teachers	0	0	0	0	0
13. Access to Internet for pupils	0	0	0	0	0
14. Availability of audio/ visual equipment for teaching	0	0	0	0	0
15. Availability of adequate technical assistance with ICT	0	0	0	0	0
16. Class size (number of pupils in class)	0	0	0	0	0
17. Classroom size (space per pupil in class)	0	0	0	0	0
18. A variety of teaching methods used	0	0	0	0	0
19. Availability of software for teaching	0	0	0	0	0
Other, please specify:					

4. (a) To What Extent Do Primary Teachers Use ICT in the Delivery of the Primary Curriculum?

To a Great Extent	To Some Extent	Not to Any Great Extent
0	0	0

(b) In Your Opinion, What Are the Existing Levels of Knowledge and Skill Amongst Teachers in Relation to the Use of Computers in Primary Classroom?

Very Good	Good	Adequate	Not Very Good	Not At All Good
0	0	0	0	0

5. To What Extent Are the Following Approaches Used in Primary School Classrooms?

	Every Day	Most Days	Some Days	Hardly Ever/Never
Teacher reading from a book	0	0	0	0
Pupils working in groups	0	0	0	0
Pupils working in pairs	0	0	0	0
Pupils working on their own	0	0	0	0
Team teaching	0	0	0	0
Use of computers	0	0	0	0
Use of audio/ video equipment	0	0	0	0
Collaborative project work	0	0	0	0
Individual project work	0	0	0	0
Whole class instruction	0	0	0	0

6. Over the Past Five Years, To What Extent Has Frequency of Use of the Following Methods in Primary Classrooms Increased, Decreased or Stayed the Same?

	Increased	Stayed the Same	Decreased
Teacher reading from a book	0	0	0
Pupils working in groups	0	0	0
Pupils working in pairs	0	0	0
Pupils working on their own	0	0	0
Team teaching	0	0	0
Use of computers	0	0	0
Use of audio/ video equipment	0	0	0
Collaborative project work	0	0	0
Individual project work	0	0	0
Whole class instruction	0	0	0

7. In Your Opinion, Are These Teaching Methods Used More Frequently In?

	Large Classes	Average Size Classes	Small Classes
Pupils working in groups	0	0	0
Pupils working in pairs	0	0	0
Pupils working on their own	0	0	0
Use of computers	0	0	0
Use of audio/ video equipment	0	0	0
Collaborative project work	0	0	0
Whole class instruction	0	0	0

8. In Your Opinion, To What Extent is the Current Design of Primary Schools and Classes Suitable for Delivering the Primary Curriculum in the Following Areas?

	Very Suitable	Somewhat Suitable	Not Very Suitable	Not At All Suitable
Gaeilge	0	0	0	0
English	0	0	0	0
Mathematics	0	0	0	0
Languages	0	0	0	0
Religion	0	0	0	0
History/ Geography	0	0	0	0
Science	0	0	0	0
Religion	0	0	0	0
Arts/ Music/ Drama	0	0	0	0
Physical Education				
Social, Personal and Health Education (SPHE)	0	0	0	0

9. To What Extent Are the Following Layouts Used in Primary Schools?

	Most Schools	Some Schools	A Few Schools	No/Hardly Any Schools
Tables/ chairs in rows facing the teacher in front of the class	0	0	0	0
Teacher's desk in the middle of the classroom	0	0	0	0
Pupils' tables/chairs grouped together	0	0	0	0
Classroom has several different activity areas (e.g. wet area)	0	0	0	0
Layout is changed depending on subject/activity	0	0	0	0
Other, please specify:				

10. Please Name Other Areas in Primary Schools (Other Than Classrooms) That Are Used for Teaching Purposes:

1. _____ 2. _____

11. What Facilities Would You See as Priorities for Primary Schools in the Future? (Please Select All That Apply)

	Very Important	Somewhat Important	Not Important
1. Community access to ICT facilities	0	0	0
2. Community access to sports and leisure activities	0	0	0
3. Additional provision for pupils with special educational needs	0	0	0
4. Health facilities	0	0	0
5. Social Care facilities	0	0	0
6. Adult education	0	0	0
7. Resource centre for parents, including immigrant parents	0	0	0
8. Childcare facilities	0	0	0
9. Other please specify:			

12. Please Comment on Any Changes That Have Occurred in School Design in the Last Decade that Have a Potential Impact on Teaching and Learning in Primary School:

13. Finally, Please Tell Us if You Foresee Any Changes in Teaching and Learning Practices Occurring in the Near Future That Will Have a Potential Impact on School Design or the Level of Services to be Provided in the School?

We would like to thank you for taking the time to complete the questionnaire.

DESIGNING SCHOOLS FOR THE FUTURE – PRIMARY SCHOOL TEACHERS

The Department of Education and Science has commissioned the Economic and Social Research Institute (ESRI) to carry out a study aimed at the development of a brief for the ‘school of the future’ for Irish primary schools, chiefly focusing on the link between school design and teaching/learning practices. As a part of the study, this questionnaire enables us to obtain your perceptions on design and other factors that potentially have an impact on pupils’ and teachers’ experiences in primary schools. Information provided by you in this questionnaire is confidential and will only be used for the purpose of this study.

School: _____

Date: _____

SECTION A: BACKGROUND INFORMATION

1. Sex: Male 0 Female 0

2. To which age group do you belong?	Under 30 years	0
	30-39 years	0
	40-49 years	0
	50 years or older	0

3. How many years have you been teaching in this school (excluding your H.Dip. teaching practice, career breaks etc.?) _____

4. How many years were you teaching before joining this school?

5. Are you currently: Full-time 0 Part-time/Job-sharing 0

6. What class groups do you currently teach?

SECTION B: TEACHING IN PRIMARY SCHOOL

7. (a) There Are a Number of Statements About Teaching Shown Below. Please Indicate How Frequently the Following Things Happen in Your Lessons

	Never or Almost Never	Some Days	Most Days	Every Day
Students use computer facilities in class	0	0	0	0
You use video or audiotapes in class	0	0	0	0
Students ask you questions in class	0	0	0	0
You ask students questions in class	0	0	0	0
Students work individually in class using their textbook or worksheets	0	0	0	0
Students work in pairs or groups in class	0	0	0	0
Students copy notes from the board in class	0	0	0	0
You read aloud from the book	0	0	0	0
You use elements of play in teaching	0	0	0	0
Students move around the class doing different tasks	0	0	0	0

8. Please Indicate How Strongly You Agree or Disagree with the Following Statements About the Use of Information Technology in Your School (Please Tick (✓) One Box on Each Line)

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
There is adequate provision of computing facilities in the school	0	0	0	0	0
There is adequate provision of audio-visual equipment in the school	0	0	0	0	0
There is adequate provision of Internet access for teachers in the school	0	0	0	0	0
There is adequate provision of Internet access for students in the school	0	0	0	0	0
There is adequate provision of help with technical support in the school	0	0	0	0	0
You feel confident in using computers in teaching primary school children	0	0	0	0	0
You feel confident in using audio-visual equipment in teaching	0	0	0	0	0
The school has up-to-date computing and audio- visual equipment	0	0	0	0	0
You would like additional training in the use of information technology in teaching primary school children	0	0	0	0	0

9. (a) To What Extent Do You Use ICT in Teaching?

To a Great Extent	To Some Extent	Not to Any Great Extent
0	0	0

(b) How Would You Rate your Knowledge in Relation to the Use of Computers in Primary Classroom?

Very Good	Good	Adequate	Not Very Good	Not at All Good
0	0	0	0	0

10. Where Are the Computers for Students Located in this School?

In classrooms	0
In special computer room	0
Library	0
Elsewhere, please specify:	

11. What Layouts Do You Use With the Classes You Teach? Tick All that Apply in First Column

	Approaches You Use	Most Common in the Classes You Teach
Tables/chairs in rows facing the teacher in front of the class	0	0
Teacher's desk in the middle of the classroom	0	0
Pupils' tables/chairs grouped together	0	0
Classroom has several different activity areas (e.g. wet area)	0	0
Layout is changed depending on subject/activity	0	0

12. Please Name Other Areas in Your School (Other Than Classrooms) That Are Used for Teaching Purposes:

1. _____ 2. _____

13. Please Indicate If You Agree With the Following Statements:

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
1. There have been significant changes in approaches to primary teaching in the last 10-15 years	0	0	0	0	0
2. Teaching approaches in primary schools have become more child-centred in the last 10-15 years	0	0	0	0	0
3. Pupils use computers in their day to day lessons more often now than in previous decades	0	0	0	0	0
4. Teacher training courses provide a good knowledge of new teaching methods	0	0	0	0	0
5. Teachers are increasingly using new teaching methods in primary schools	0	0	0	0	0

14. In Your Opinion, To What Extent is the Current Design of Primary Schools and Classes Suitable for Delivering the Primary Curriculum in the Following Areas?

	Very Suitable	Somewhat Suitable	Not Very Suitable	Not At All Suitable
Gaeilge	0	0	0	0
English	0	0	0	0
Mathematics	0	0	0	0
Foreign Languages	0	0	0	0
Religion	0	0	0	0
History	0	0	0	0
Geography	0	0	0	0
Science	0	0	0	0
Religion	0	0	0	0
Visual Arts	0	0	0	0
Music	0	0	0	0
Drama	0	0	0	0
Physical Education	0	0	0	0
Social, Personal and Health Education (SPHE)	0	0	0	0

SECTION C: PRIMARY SCHOOL DESIGN

15. How Satisfied Are You in General with the Following Aspects of School Design in the School Where You Teach?

	Very Satisfied	Satisfied	Neither Satisfied Nor Dissatisfied	Dis-satisfied	Very Dis-satisfied
1. Layout of classrooms	0	0	0	0	0
2. Furniture/equipment within classrooms	0	0	0	0	0
3. Storage space in classrooms	0	0	0	0	0
4. Areas for displaying student work/art	0	0	0	0	0
5. School hall/general purpose room	0	0	0	0	0
6. Design of outdoor play areas	0	0	0	0	0
7. Design of outdoor sport/ PE areas	0	0	0	0	0
8. Flexibility of classroom design	0	0	0	0	0
9. Bathroom facilities for pupils	0	0	0	0	0
10. Availability of computers for teachers	0	0	0	0	0
11. Availability of computers for pupils	0	0	0	0	0
12. Access to Internet for teachers	0	0	0	0	0
13. Access to Internet for pupils	0	0	0	0	0
14. Availability of audio/ visual equipment for teaching	0	0	0	0	0
15. Availability of adequate technical assistance with ICT	0	0	0	0	0
16. Class size (number of pupils in class)	0	0	0	0	0
17. Classroom size (space per pupil in class)	0	0	0	0	0
18. A variety of teaching methods used	0	0	0	0	0
19. Availability of software for teaching	0	0	0	0	0
20. Bathroom facilities for teachers	0	0	0	0	0
21. Storage space in school	0	0	0	0	0
22. Suitability of classrooms for teaching of infants	0	0	0	0	0
23. Adequate heating	0	0	0	0	0
24. Adequate insulation	0	0	0	0	0
25. Working area for art	0	0	0	0	0
26. Working area for Science and other practical subjects	0	0	0	0	0
27. Noise levels from the outside	0	0	0	0	0
28. Noise travelling between classrooms	0	0	0	0	0
29. Other, please specify:					

16. In Your Opinion, To What Extent Do These Aspects of the School Building Have an Impact on Teaching and Learning?

	To a Great Extent	To Some Extent	Not To Any Great Extent
Quality of lighting (use of natural light)	0	0	0
Space per pupil in a class	0	0	0
External noise (e.g. traffic)	0	0	0
Noise travelling between classrooms	0	0	0
Air quality (ventilation)	0	0	0
Colours used in interior design	0	0	0
Adequate temperature in the classroom	0	0	0
Other, please specify:			

SECTION D: GENERAL COMMENTS

17. There Are Some Statements Below About this School in General. Please Indicate Whether You Agree or Disagree with the Statements.

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
School buildings require significant upgrading	0	0	0	0	0
Outdoor space (for sport and play) is adequate	0	0	0	0	0
Indoor space is adequate	0	0	0	0	0
Classroom size (physical space) is adequate	0	0	0	0	0
Class size (number of students in the class) is adequate	0	0	0	0	0
The school is a positive working environment for students	0	0	0	0	0
The school is a positive working environment for teachers	0	0	0	0	0

18. How Important are the Following Factors in Designing a New Primary School?

	Very Important	Somewhat Important	Not Important
1. Distance from a main road (noise)	0	0	0
2. Having large school grounds	0	0	0
3. Adequate space within classrooms per pupil	0	0	0
4. School hall/general purpose room	0	0	0
5. Having wide corridors	0	0	0
6. Storage space within classrooms	0	0	0
7. Colour of walls	0	0	0
8. Design and type of furniture	0	0	0
9. Adequate layout and size of outdoor areas (play/sport)	0	0	0
10. Potential use of the school building as community centre (extended school)	0	0	0
11. Cost effectiveness (value for money)	0	0	0
12. Sustainability (environmental) of the school	0	0	0
13. Inclusivity (catering for children for special educational needs and disability, newcomer students)	0	0	0
14. Availability of ICT and Internet for teachers	0	0	0
15. Availability of ICT and Internet for pupils	0	0	0
16. Security	0	0	0
17. Space for small group or one-to-one tuition	0	0	0
18. Other, please specify:			

19. What Facilities Would You See as Priorities for Primary Schools in the Future? (Please Select All that Apply)

	Very Important	Somewhat Important	Not Important
1. Community access to ICT facilities	0	0	0
2. Community access to sports and leisure activities	0	0	0
3. Additional provision for pupils with special educational needs	0	0	0
4. Health facilities	0	0	0
5. Social Care facilities	0	0	0
6. Adult education	0	0	0
7. Resource centre for parents, including immigrant parents	0	0	0
8. Childcare facilities	0	0	0
9. After school care facilities	0	0	0
10. Other please specify:			

20. If it were left up to you, what would you see as the main priorities for the future development of primary schools? (Is there any aspect of school policy or practice you would like to see changed or developed?)

We would like to thank you for taking the time to complete the questionnaire.

Please send the questionnaire to: Merike Darmody
The Economic and Social Research Institute, Whitaker Square,
Sir John Rogerson's Quay, Dublin 2

Alternatively, please email the questionnaire to: Merike.Darmody@esri.ie

Interview Guide – Interest Groups

General

1. Do you consider the topic of school design an important issue? Why?
2. In your opinion, have any changes occurred over the last decade in the architectural design of Irish primary schools?
3. In your opinion, have any changes occurred over the last decade in the teaching techniques in Irish primary schools? Please give an example.
4. Please comment on any changes that have occurred in architectural design in the last decade that have a potential impact on teaching and learning in primary school.

Teaching/Learning

5. In your opinion, has the general primary school design kept pace with the developments in pedagogy (e.g. new teaching approaches/ child-centred teaching, use of ICT).
6. In your opinion, to what extent is the current design of primary schools and classes suitable for delivering the primary curriculum? Is it more/less suitable in specific subject areas?
7. Can you comment on teaching approaches are most commonly utilised in primary classrooms? (**Probe: working in pairs/groups; learning through play/drama, etc.?**) Does this vary across subject areas e.g. languages, science, practicals?
8. In your opinion, are Irish primary schools in general adequately equipped with computers and Internet for a) staff and b) pupils for teaching/learning purposes? What about audio-visual equipment? **Probe: Where are the computers for pupils usually located? Is the use supervised? Is there sufficient technical support available?**
9. How relevant do you think it is to use ICT in teaching and learning in primary schools? Does it differ across subject areas?
10. Please name other areas in primary schools (other than classrooms) that are used for teaching purposes.
11. What facilities would you see as priorities for primary schools in the future?

Design

12. What are the main aspects to consider when planning to build a new primary school? [**Prompt: indoor design, outdoor design, location, access**]
13. In your opinion, how important is a) the size of primary school; b) the size of classroom [both in terms of pupils in the class and space per pupil]. Please comment on current student-teacher ratio in Irish primary schools.
14. What other factors do you think [prompt: light, noise, colour, air] are important in primary school design?
15. What is the most common classroom layout in a primary school? Please comment on the suitability of this design for teaching primary school pupils.
16. Please describe the size and layout of outside play area/ sport area in an average primary school.
17. Please comment on any changes that have occurred in school design in the last decade that have a potential impact on teaching and learning in primary school:
18. Finally, please tell us if you foresee any changes in teaching and learning practices occurring in the near future that will have a potential impact on school design or the level of services to be provided in the school
19. Is there anything else you would like to add?

Interview Guide: Principal

Use of Space

1. How long have you been principal in this school? Were you a teacher here before that?
2. Do you teach yourself? What class group? How many pupils are in the class?
3. When was this school originally built? Have any changes occurred since then in the design or layout of the school building(s)? To what extent have these changes affected teaching and learning in the school?
4. I would like to ask you a little about the space you have available in this school. How many classrooms are there? Are any of these temporary classrooms (that is, a prefab or another room used as a classroom)? How satisfied are you with the number and size of classrooms? With furniture and equipment within classrooms? With storage? With space available for the display of pupil work? With the amount of noise from outside or inside the school?
5. Where are learning support, resource or English as a second language classes held? How satisfied are you with the space available for this?
6. Are bathroom facilities for pupils en suite (within classroom) or in a separate area? How satisfied are you with these facilities?
7. What indoor facilities are available for PE, sport or drama? Satisfaction?
8. What outdoor facilities are available for play, PE or sport? (Prompt re equipment.) Satisfaction?
9. Are any other areas in the school grounds or immediate vicinity used for teaching purposes (e.g. nature study)?
10. What facilities are available for children with a physical disability? Satisfaction?
11. What facilities are available for teachers (e.g. staffroom, bathrooms)? Satisfaction?
12. What facilities are available for other staff? (Prompt re SNAs, secretarial/admin.) Satisfaction?
13. What facilities, if any, are available for parents or the wider community? Satisfaction?
14. Has the number of pupils coming to the school changed in recent years (increased/decreased)? Has this had any implications for space?
15. Is there anything you would change in the design or layout of this school if you could?

The School Day

16. I would like to ask you about a pupil's average day. What time does the school open at? Where do pupils wait if they're early? Do parents tend to come into the school with their children?
17. Where do pupils put their coats and bags?
18. What breaks do pupils have? Where do they go? What do they usually do? What happens if it's raining?
19. Is there a breakfast club in the school? Where do pupils usually eat their lunch?
20. What approach is usually taken if a child misbehaves?
21. What time does the school close at?

Teaching and Learning

22. Do you think that approaches to teaching and learning have changed at all over the past decade or so? In what way? [If teaching] Do you think your own approach has changed?
23. What teaching approaches do you most often use with your class? (**Probe: working in pairs/groups; learning through play/drama, etc.?**) Does your approach differ across different subject areas? What are the approaches children best respond to? What teaching approaches are used by (other) teachers in this school?
24. How would your classroom be laid out (e.g. in single desks, clusters of desks, facing teacher etc.)? How would classes generally be laid out in the school?
25. To what extent are there separate areas or zones within the classroom(s) for different activities?
26. To what extent is team or co-operative teaching used in the school?
27. What ICT facilities are available for teachers and pupils in the school? (Probe re location of computers, access to internet) How satisfied are you with what's available?
28. To what extent do you/other teachers use ICT facilities to support day-to-day learning in the classroom?
29. What audio or video facilities are available for teachers and pupils in the school? To what extent do you/other teachers use audio/video facilities to support day-to-day learning in the classroom?
30. In your opinion, how suitable is the school and classroom layout in this school for delivering the primary curriculum overall? More specifically, how suitable is it for Gaelge? Geography? Science? Visual Arts? PE?

31. Is there anything that could be done in order to better deliver the primary curriculum?

School Design

32. If you were building a new primary school, what do you think are the main factors which should be taken into account? (Leave as open to see what they emphasise.)
33. In your opinion, how important is school size? (What would you see as the ideal school size?)
34. How important is class size? (What would you see as the ideal class size?)
35. How should a classroom be best laid out in order to promote teaching and learning?
36. To what extent does teacher education or in-service training address the use of space in primary classrooms?
37. What facilities would you see as priorities for primary schools in the future?
38. To what extent do you think that schools should act as a resource for the wider community?
39. Do you think the approach to teaching and learning in primary schools will change in the future? Will this have any implications for how schools are designed?

THANK YOU

Interview guide: Resource/Learning Support/English Language Teacher

Use of Space

1. How long have you been teaching in this school? Were you teaching before that? For how long?
2. How are pupils identified for extra help? Do you take them on a one-to-one or small group basis? About how many pupils in all would you see every week?
3. I would like to ask you a little about the space available in this school. Do you teach in a regular classroom or designated area? Where is this room in relation to pupils' regular classrooms? How satisfied are you with the size and condition of the room you use? With furniture and equipment within the room? With storage? With space available for the display of pupil work? With the amount of noise from outside or inside the school?
4. Are bathroom facilities for pupils en suite (within classroom) or in a separate area? How satisfied are you with these facilities?
5. What indoor facilities are available for PE, sport or drama? Satisfaction?
6. What outdoor facilities are available for play, PE or sport? (Prompt re equipment.) Satisfaction?
7. Do you use any other areas in the school grounds or immediate vicinity for teaching purposes (e.g. nature study)?
8. What facilities are available for children with a physical disability? Satisfaction?
9. What facilities are available for teachers (e.g. staffroom, bathrooms)? Satisfaction?
10. What facilities, if any, are available for parents or the wider community? Satisfaction?
11. Is there anything you would change in the design or layout of this school if you could?

Teaching and Learning

12. Do you think that approaches to teaching and learning have changed at all over the past decade or so? In what way? Do you think your own approach has changed?
13. What teaching approaches do you most often use with your group? (**Probe: working in pairs/groups; learning through play/drama, etc.?**) What are the approaches children best respond to?

14. How is your room laid out (e.g. in single desks, clusters of desks, facing teacher etc.)?
15. To what extent would you be involved in team or co-operative teaching in the school?
16. What ICT facilities are available for you and your pupils in the school? (Probe re location of computers, access to internet) How satisfied are you with what's available?
17. To what extent do you use ICT facilities to support day-to-day learning in the classroom? How confident do you feel in your use of ICT?
18. What audio or video facilities are available in the school? To what extent do you use audio/video facilities to support day-to-day learning in the classroom?
19. In your opinion, how suitable is the school and classroom layout in this school for delivering the primary curriculum overall? More specifically, how suitable is it for Gaelige? Geography? Science? Visual Arts? PE?
20. Is there anything that could be done in order to help you better support the students you teach?

School Design

21. If you were building a new primary school, what do you think are the main factors which should be taken into account? (Leave as open to see what they emphasise.)
22. In your opinion, how important is school size? (What would you see as the ideal school size?)
23. How important is class size? (What would you see as the ideal class size?)
24. How should a classroom be best laid out in order to promote teaching and learning?
25. To what extent does teacher education or in-service training address the use of space in primary classrooms?
26. What facilities would you see as priorities for primary schools in the future?
27. Do you think the approach to teaching and learning in primary schools will change in the future? Will this have any implications for how schools are designed?

THANK YOU

Interview Guide: Class Teacher

Use of space

1. How long have you been teaching in this school? Were you teaching before that? For how long?
2. What class group do you teach? How many pupils are in the class?
3. I would like to ask you a little about the space available in this school. How satisfied are you with the size and condition of the classroom you use? With furniture and equipment within the classroom? With storage? With space available for the display of pupil work? With the amount of noise from outside or inside the school?
4. Are bathroom facilities for pupils en suite (within classroom) or in a separate area? How satisfied are you with these facilities?
5. What indoor facilities are available for PE, sport or drama? Satisfaction?
6. What outdoor facilities are available for play, PE or sport? (Prompt re equipment.) Satisfaction?
7. Do you use any other areas in the school grounds or immediate vicinity for teaching purposes (e.g. nature study)?
8. What facilities are available for children with a physical disability? Satisfaction?
9. What facilities are available for teachers (e.g. staffroom, bathrooms)? Satisfaction?
10. What facilities, if any, are available for parents or the wider community? Satisfaction?
11. Is there anything you would change in the design or layout of this school if you could?

Teaching and Learning

12. Do you think that approaches to teaching and learning have changed at all over the past decade or so? In what way? Do you think your own approach has changed?
13. What teaching approaches do you most often use with your class? (**Probe: working in pairs/groups; learning through play/drama, etc.?**) Does your approach differ across different subject areas? What are the approaches children best respond to?
14. How is your classroom laid out (e.g. in single desks, clusters of desks, facing teacher etc.)?
15. To what extent are there separate areas or zones within the classroom(s) for different activities?

16. To what extent would you be involved in team or co-operative teaching in the school?
17. What ICT facilities are available for you and your pupils in the school? (Probe re location of computers, access to internet) How satisfied are you with what's available?
18. To what extent do you use ICT facilities to support day-to-day learning in the classroom? How confident do you feel in your use of ICT?
19. What audio or video facilities are available in the school? To what extent do you use audio/video facilities to support day-to-day learning in the classroom?
20. In your opinion, how suitable is the school and classroom layout in this school for delivering the primary curriculum overall? More specifically, how suitable is it for Gaelige? Geography? Science? Visual Arts? PE?
21. Is there anything that could be done in order to help you better deliver the primary curriculum?

School Design

22. If you were building a new primary school, what do you think are the main factors which should be taken into account? (Leave as open to see what they emphasise.)
23. In your opinion, how important is school size? (What would you see as the ideal school size?)
24. How important is class size? (What would you see as the ideal class size?)
25. How should a classroom be best laid out in order to promote teaching and learning?
26. To what extent does teacher education or in-service training address the use of space in primary classrooms?
27. What facilities would you see as priorities for primary schools in the future?
28. Do you think the approach to teaching and learning in primary schools will change in the future? Will this have any implications for how schools are designed?

THANK YOU

Interview guide: 6th Class Pupils

1. School: _____ 2. Class: _____

First, I'd like to ask you about what happens in your school.

1. What time do classes start?
2. What happens if you get to the school early? Where do you wait?
3. Where do you put your coats and bags? Is there enough space?
4. What does your classroom look like? [Probe: is it a big room? Is there enough space for every pupil? Do you have a desk to yourself? How are the tables/chairs positioned? Where does the teacher usually stand? What is on the walls?]
5. Would you say that your classroom is bright or dark? Can the windows be opened?
6. Would you say that your classroom is too warm, too cold or just right? Does it ever get too cold in winter? Does it get too hot in summer?
7. Would you say that your classroom is too quiet, too noisy or just right? Can you hear noise (like traffic) from outside?
8. Are the bathrooms within the classroom or in a separate area? Are you happy with these bathrooms?
9. When do you have your break? Where do you go during the break? What if it is raining?
10. What is the schoolyard/outside space like? Is there any equipment for pupils to play on/with? Where do you usually go in the yard?
11. Where do you eat your lunch? Are there any activities in school during lunchtime?
12. What are the corridors and common areas like?

Now, I'd like to ask a few questions about what you learn at school.

What classes do you like best so far? Are there any classes you don't like? Why?

What sort of things do you usually do in a class? [Probe: working in pairs/groups; working on your own; learning through play]. Is this any different for different classes?

Do you usually get to move around the room during class or stay at your desk?

What do you think makes a lesson enjoyable?

Do you have computers in your classroom? Where are they? Do you ever use computers during your lessons? Which lessons? Are there enough computers for everyone to use?

Do you think using computers helps you to learn? Do you ever use computers at home?

Does the teacher ever use DVDs or tapes in class? Interactive whiteboard? Do you think this helps you to learn?

Do you have PE? Where do you go for PE? What is it like?

Do you sometimes have lessons (such as nature study) outside the school? Where? What do you think of this?

Is there a school library? What do you think of it?

What time do you finish school? Are there any activities after school?

Finally, I'd just like to ask you some general questions about the school.

What do you think of your school overall? If you had to describe it to someone in another school, what would you say?

What do you like best being in this school? Why?

What is your favourite place in this school?

Is there anything you don't like about this school? Why?

Is there anywhere/any part of the building you don't like?

If it were up to you, would you like to make any changes [to the school building]? Why?

Is there anything else you want to tell me about this school?

THANK YOU.

APPENDIX II: FURTHER REFERENCE MATERIAL ON SCHOOL DESIGN ACROSS THE WORLD

THE NETHERLANDS

360 Degrees: Issue 15 (2008). Keywords: sustainability, environment, eco-schools, the Netherlands.

<http://www.cabe.org.uk/default.aspx?contentitemid=2388>

OECD (2007) The Netherlands' School Building Prize (2006)

Keywords: innovative design, primary schools, secondary schools.

http://www.oecd.org/document/53/0,2340,en_2649_34527_38375797_1_1_1,00.htm

Not the Trailer: Provisional Classrooms for Primary Schools (2004)

Keywords: modular school design, innovation, interaction of architecture and education.

School Domein

Keywords: the Netherlands, school buildings, innovative school planning, searchable archive

<http://www.schooldomein.nl/>

NORDIC COUNTRIES

Denmark

Kjaervang, Ulla Power of Aesthetics to Improve Student Learning (2006)

Keywords: environments, student learning, behaviour.

<http://www.designshare.com/index.php/articles/aesthetics-and-learning/>

Danish Centre of Educational Environment (2001)

Act on the Educational Environment of Pupils and Students

<http://www.dcum.dk/neobuilder.2005032915381260000061502.html>

Finland

InnoSchool - Innovative School Concept for the Future

Keywords: future school concept.

<http://innoschool.tkk.fi/>

InnoPlay – Innovative Playful Learning Environments

Keywords: innovative school concept, learning, outdoor playgrounds

<http://www.ulapland.fi/?deptid=23296>

www.smartus.fi

Heinävaara Elementary School Heinävaara

Keywords: school building, floor plan, photos.

<http://archrecord.construction.com/projects/bts/archives/K-12/>

PEB Exchange; n41 , p19-22 ; Kivi, R. (2000) **New Technology and Education in Finland.**

Keywords: planning of educational facilities, virtual schools, technology.

<http://www.oecd.org/dataoecd/52/36/14642267.pdf>

Iceland

PEB Exchange; n47 , p9-10 ; Oct 2002 Design Down Process: Designing a School in Iceland with Its Users.

Keywords: Iceland, consultation with the stakeholders.

<http://www.oecd.org/dataoecd/46/18/34270624.pdf>

Jilk, Bruce A. (2002), Freedom and Creativity: A Story of Learning, Democracy, and the Design of Schools.

Keywords: Iceland, physical space, school planning, learning.

<http://www.designshare.com/index.php/articles/freedom-and-creativity>

SLOVENIA

Ivanic, Maja; Kuhar, Špela (2008), Contemporary School Architecture in Slovenia 1991–2007

Keywords: Slovenia, recent school buildings.

<http://www.springer.com/springerwiennewyork/architecture/book/978-3-211-76844-0>

Cercek, Emmanuel, PEB Exchange; 2008/14, (2008), **Sostanj Primary School**

Keywords: Slovenia, primary school, collaboration with community, environment.

<http://www.oecd.org/dataoecd/3/57/41533242.pdf>

ITALY

Ponti, Giorgio (2009), **Campania Region's Educational Quality Facilities Project.**

Keywords: renovation of school facilities, new builds, prototypes.

<http://www.oecd.org/dataoecd/5/18/42168897.pdf>

PEB Exchange; v2005/3 n56 , p11,12 ; Oct 2005 **An Urban Renewal School Project in Italy.**

Keywords: Italy, primary school, winning design.

<http://www.oecd.org/dataoecd/50/23/36010882.pdf>

Ponti, Giorgio, (2007), "Intelligent" Primary School Project in Italy.

Keywords: 'intelligent' primary school.

<http://www.oecd.org/dataoecd/27/27/38159957.pdf>

Ponti, Giorgio, (2008), A Flexible School for Early Childhood Education in Italy.

Keywords: flexible early childhood facility, indoor and outdoor learning environment.

<http://www.oecd.org/dataoecd/10/60/40802232.pdf>

AUSTRALIA

Griffiths, Jasmine; Podirsky, Michaela; Deakin, Suyin; Maxwell, Scott (2002), **Children's Learning Environments**

Keywords: learning environments, learning, classroom layouts, photos.

<http://ehlt.flinders.edu.au/education/DLiT/2002/environs/suyin/homepage.html>

Dept. of Education and Training, Melbourne, Australia (2005), Schools as Community Facilities: Policy Framework and Guidelines

Keywords: community use of schools, guidelines.

<http://www.eduweb.vic.gov.au/edulibrary/public/propman/facility>

Robinson, Leigh; Robinson, Taylor (2009), **An Australian Approach to School Design**

Keywords: exemplary school design.

<http://www.oecd.org/dataoecd/5/59/42168991.pdf>

NEW ZEALAND

Best Practice in Classroom Design.

Keywords: best practice examples

<http://www.minedu.govt.nz/index.cfm?layout=document&documentid=11938&data=1>

UNITED KINGDOM

British Council for School Environments, London, United Kingdom (2006), **Ideas Book: Global Learning Environments.**

Keywords: learning spaces, future pedagogy, case studies

http://www.bcse.uk.net/downloads//Ideas_Book.pdf

Annesley, Barbara; Horne, Matthew; Cottam, Hillary (2002), **Learning Buildings.**

Keywords: secondary schools, building environment.

<http://www.school-works.org>

Children in Scotland (2005), Architecture and Design for Young Children. International Award Winners 2005

Keywords: winning projects with photos.

<http://www.childreninscotland.org.uk/award/>

School Buildings Information Centre

Keywords: best practice in design, use and management of school facilities.

<http://www.teachernet.gov.uk/>

FRANCE

PEB Exchange; n35 , p17-18 ; (1998), A Visit to Three Parisian School Libraries.

Keywords: school libraries, design, technology.

<http://www.oecd.org/dataoecd/18/42/1821495.pdf>

Horn, Christian (2002), **Parisian Elementary**.

Keywords: elementary school design

http://www.architectureweek.com/2002/0327/design_1-1.html

Alt, Patrick (2001), School Design and Management: Three Examples In France.

Keywords: school construction, school design, teaching and learning.

<http://www.oecd.org/dataoecd/52/13/14642252.pdf>

AUSTRIA

PEB Exchange; v2005/3 n56 , p10,11, (2005), **School Grounds in Austria**.

Keywords: guidelines for schools and school grounds.

<http://www.oecd.org/dataoecd/50/23/36010882.pdf>

Schwarz-Viechtbauer, Karin (2003), Current Concerns for Austrian School Facilities.

Keywords: educational buildings

<http://www.oecd.org/dataoecd/46/62/34276712.pdf>

IRELAND

Greville, Eamonn, (2009), Including Pupils with Special Educational Needs in Schools in Ireland.

Keywords: special needs, learning spaces, guidelines, inclusion.

<http://www.oecd.org/dataoecd/5/10/42168831.pdf>

PEB Exchange; 2007/10 (2007), Using Minimum Energy in Ireland's Schools.

Keywords: low energy design, primary and post-primary schools.

<http://www.oecd.org/dataoecd/16/63/39344619.pdf>

PEB Exchange; v2004/2 n52 , p20-23 (2004), **Low Energy Schools in Ireland.**

Keywords: reduced energy consumption, building materials.

<http://www.oecd.org/dataoecd/16/13/36134510.pdf>

PORTUGAL

Freire da Silva, Jose (2002), Primary School Architecture in Portugal: A Case Study.

Keywords: historical development of school design

<http://www.oecd.org/dataoecd/10/62/40802346.pdf>

Martinho, Miguel; da Silva, Jose (2008), Open Plan School in Portugal: Failure or Innovation?

Keywords: open plan school design, case study.

<http://www.oecd.org/dataoecd/4/12/41533062.pdf>

GERMANY

Ziegler, Mark; Kurz, Daniel (2008), Changing School Architecture in Zurich.

Keywords: improving learning spaces.

<http://www.oecd.org/dataoecd/25/35/40051085.pdf>

VARIOUS LOCATIONS

Designshare Awards Program For Innovative Learning Environments. 2007

Keywords: innovative projects on learning environments from around the world.

<http://designshare.com/index.php/awards/2007/>

Dudek, Mark (2007), **Schools and Kindergartens: A Design Manual.**

Keywords: international case studies.

<http://www.springer.com/birkhauser/architecture+%26+design/book/978-3-7643-8126-4>

OECD (2007), Evaluating Quality in Educational Facilities

Keywords: educational facilities.

<http://www.oecd.org/edu/facilities/evaluatingquality>

OECD (2006), Compendium of Exemplary Education Facilities

Keywords: good practice and design in OECD member states.

<http://www.oecd.org/edu/facilities/compendium>

OECD (2005), **School Safety and Security: Lessons in Danger.**

Keywords: school safety, security in 14 countries.

<http://www.oecdbookshop.org/oecd/display.asp?sf1=identifiers&st1=952004031P1>

OECD (2001a), **Schooling for Tomorrow. What Schools for the Future?** Keywords: future development of school design,
<http://www.sourceoecd.org/>

Designing the Sustainable School.

Ford, Alan (2007)

Keywords: A survey of K-12 Schools from around the world.

[http://www.imagespublishing.com/index.cfm?siteaction=details&id=1058
&masterid=27](http://www.imagespublishing.com/index.cfm?siteaction=details&id=1058&masterid=27)

OECD (1998), **Under One Roof: The Integration of Schools and Community Services in OECD Countries.**

Keywords: community services on school sites.

<http://www.oecdbookshop.org/oecd/>

OECD (1996), **Making Better Use of School Buildings**

Keywords: broadening the use of educational facilities.

<http://www.oecd.org/>

Programme on Educational Building (PEB)

<http://www.oecd.org/edu/facilities>

PEB Exchange; n37 , p11-16 ; (1999), **After-Hours Use of Schools.**

Keywords: extending use of school buildings, outdoor areas.

<http://www.oecd.org/dataoecd/18/33/1822106.pdf>

Canizares, Ana; Fajardo, Julio, eds. (2007), **Kindergartens, Schools and Playgrounds.**

Keywords: school facilities, learning environments.

<http://www.loftpublications.>

Published by
The Economic
and Social
Research Institute
Whitaker Square
Sir John Rogerson's
Quay
Dublin 2



THE ECONOMIC AND SOCIAL RESEARCH INSTITUTE

ISBN 978 0 7070 0303 0