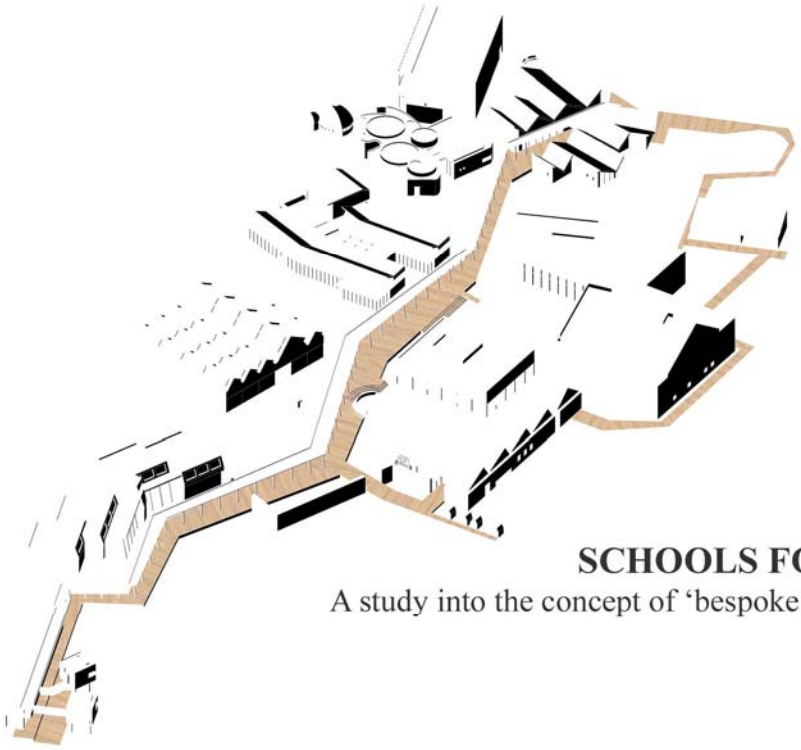

SCHOOLS FOR SUSTAINABLE FUTURES

A study into the concept of 'bespoke primary school' design in South Wales

VOLUME I

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This thesis is being submitted in partial fulfilment of the requirements
for the degree of Master of Philosophy.

ABSTRACT

In comparison to other contributors, schools as polluters play a small role in the national total of carbon dioxide emissions. However, in the area of national reform towards this future shift in all sectors becoming more environmentally aware, schools and education are pivotal. There is political focus on carbon reduction as it is more easily measured than social developments; however, sustainable design seeks to improve the well-being of our communities and the individuals that live within them as well as global problem of climate change. The aim of this research was to interpret a design solution to satisfy the existing debate surrounding the future of primary school design in Wales. This research has investigated how the architecture of schools can respond to the needs of a community, its culture and social issues as well as the education of its pupils.

This research outlines the elements that encompass 'good school design' and the philosophical drivers behind developments of the school plan. It includes a summary of the current political and cultural aspirations towards school buildings and education in Wales and considers how the built environment can influence a child's cognitive development. Through literature review, site investigations and critical analysis of four established successful primary schools in South Wales, a series of design proposals are developed for Williamstown primary school in the Rhondda Valley. It is the author's intention to display an 'idealistic' design proposal of a primary school that highlights the possible influence that architectural design of schools can have over the social habits and culture of its users. The design is a series of concepts developed in parallel with the research, used to interrogate the potential of bespoke school design.

The authors design for Williamstown challenges what a school can be. Nestling the buildings within the landscape and sprawling the physical morphology changes the very nature of the school as a single institution. The school can act as a cultural centre with the children themselves actively promoting a social change towards a rejuvenated sustainable community. The research suggests the favoured places within a school are those that have involved the users and are more cherished for their unique nature. Bespoke design is informed through consultation with the community, it is not a school given to them, but created with them.

ACKNOWLEDGEMENTS

First, I would like to thank the staff and students of the four schools which were used as case studies. In particular I would like to thank Mrs Lilly from Llanbedr Church in Wales School; Mr Davies from Edwardsville Primary School; Mrs Miles from Rogerstone Primary and Mrs Winters from Nant-y-Cwm Steiner School. Without their help, knowledge and experience, much of this research would not have been possible.

Secondly I would like to thank my tutor Dr Julie Gwilliam for her invaluable guidance and support through this course of research, and my colleagues who participated with me in the *'Learning Curve: Designing Schools in Wales'* competition; Phil Henshaw, Chris Wilkins and Rob Thomas.

Finally I would like to thank my father Trevor Roach for his continued assistance and advice, and my mother Teresa Roach for her support throughout this work. I am forever grateful for all the encouragement and support I have received from my family whilst writing this thesis, and throughout my university and professional education.

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VOLUME 2

Williamstown Primary School Design Concept

1. INTRODUCTION

"we will only achieve a better, secure, future for us and our children by considering the economy, the environment, and society together in decision making."

"we need a sustainability literate, globally aware population. This is the challenge for education at every level"

Welsh Assembly Government
Education for Sustainable Development

Over the last few decades the national realisation that we were heading in the direction of an unsustainable future has steadily risen. The publication of the Stern Review Report in 2006 highlighted not only the environmental impact of climate change but the effect it will have on both local and global economies. The UN Secretary General Ban Ki-Moon describes that *"slowing and even reversing the effects of climate change is the defining challenge of our age."* [1] It is commonly agreed that there is not purely one solution for climate change, only the requirement of a global shift towards a sustainable future. This has to happen at all levels; from decisions about the national source of power down to individual actions such as "a walk to work."

The Welsh Assembly Government has set the national ambition that by 2011 all new development will be carbon zero. The formation of the 'Zero Carbon Hub Wales'[2] in March 2009, highlights the current political focus towards more environmentally responsive building design. Long term changes in the built environment are a large factor in the ultimate goal of reducing national carbon emissions by 3% every year. There are organisations and advisory bodies working for all sectors both nationally and internationally towards a global environmental reform. The commission for architecture and the built environment (CABE), the UK government's advisor on architecture, urban design and public space until 2010, stated that;

> *"Schools contribute 2% of national carbon dioxide emissions and almost 15% of the UK public sector carbon emissions. To help meet its target of cutting its overall emissions by 60% the government has pledged that it aims for all schools to be 'sustainable' by 2020."*[3]

[1] Ban Ki-Moon; UN secretary General, speech at the launch of the fourth assessment of the Intergovernmental Panel on Climate Change (IPCC) 17th Nov 2007
[2] The 'Zero Carbon Hub Wales' is a coalition of key members of the building industry, housing and voluntary sectors who are committed to helping Wales achieve its carbon reduction targets
[3] Nancy O'Brien, 2008: 'Engaging Pupils in Sustainable schools', *360º (CABE Journal)*, Issue 15, pp 6-9

In comparison to other contributors, schools as polluters play a small role in the national total of carbon dioxide emissions. However, in the area of national reform towards this future shift in all sectors becoming more environmentally aware, schools and education are pivotal. For long term gains in the national reduction of carbon emissions, it is a vital sector for investment with education being a key component in the objective to stabilise climate change through future generations.

Sustainable development is often measured by percentages of carbon reduction, however a sustainable school design is not a merely a structure equipped with the latest low-energy technologies. There is political focus on carbon reduction as it is more easily measured than social developments; however, sustainable design seeks to improve the well-being of our communities and the individuals that live within them as well as global problem of climate change. A new build primary school should contribute effectively towards a community's sustainable future and support a social cohesion. It should do this by considering the physical morphology and materiality of the structures and the descriptive language used to identify them. It should respond to, and represent its culture and historical context whilst looking to the future aspirations of its children. *"People cannot maintain their spiritual roots and their connections to the past if the physical world they live in does not also sustain these routes."* [4]

An understanding that school and learning starts at home and occurs in the wider community is not a new idea. The Plowden Report[5] (full title, 1967 report of the Central Advisory Council for Education into Primary Education in England) highlighted the "*dominant factor behind attainment was parental attitudes*."[6] Unfortunately however it can not so easily be measured and compared. It is far easier to conclude a study of classroom design based on a natural ventilation strategy or measure of daylight into a space. Models can be produced to analyse specific data which can then be correlated against attainment levels. Design research into how architecture can improve social habits, community well-being, environmental

[4] Alexander, Christopher, et al, *A pattern language: towns building construction* (New York: Oxford University Press, 1977) p132
[5] The Plowden Report: *Children and their Primary Schools,* A Report of the Central Advisory Council for Education (England) (London: Her Majesty's Stationery Office 1967)
[6] Shipman, M.D., *Exploring Education, Childhood: A Sociological Perspective* (Windsor , Berks: NFER publishing Co., 1972)p65

understanding and a sustainable holistic pedagogy is not so easily assessed. Social and cultural changes introduced in the learning environment spread into the communities through the children. There are examples through history to support these facts that are discussed in chapter three; however perhaps it can not be measured or observed quickly enough to satisfy the critics.

School design has developed considerably in the last hundred years. The design of classroom spaces has improved to support the change towards multiple learning methods. This highlights an early established theory that the environment within which one learns has an impact on their education process. Key architectural tools have developed through the history of school design; the concept of streets and settings, the fragmentation of shared space, the transparency of thresholds within a classroom, the potential of what is considered 'flexible' space, a strong connection to the surrounding landscape. All should be considered and interpreted to suit the community of which the school is for. The successful school designs highlighted in this research have been bespoke solutions for a particular style of education, or area for which it serves. The research touches upon environmental performance as they form the foundations of all future school design and cannot be ignored. Passive strategies and carbon reducing technologies are key considerations for any design; however the focus of this research is on the design intension of the spaces created, the connection to the surrounding landscape and community it serves.

The school is becoming a much more flexible learning environment. As a result of a changing curriculum there is increasing encouragement for education to take place outside the classroom with pupils learning through experience at all levels. Recent generations have had a childhood with diminished experience of nature and the outdoors. Professor David W. Orr writing for the publication Every Child Outdoors[7] highlights statistics produced by Natural England (the UK's government advisor on the natural environment) that less than 10% of children today play in natural places such as woodlands and the countryside, when compared to 40% of children a

[7] Every Child Outdoors, *Children need Nature, nature needs children*, (RSPB Publication, 2010)

generation ago. As the research of Robert Ian Baird[8] describes, an increase in contact and understanding with the natural environment has shown to engage children in sustainable lifestyle choices. Consideration needs to be given to the design process to include the use of outdoor spaces as well as indoor, learning in the 'outdoor classroom'. The government is encouraging the blurring of school boundaries, offering more opportunity to learn outside school and the school to offer community services within. The way in which pupils learn is rapidly changing, the impact of ICT and other technologies as well as the idea of increased stimulating learning experiences all challenge the way we design and use schools of the future.

> *"Buildings have the power to bring about a change in social behaviour, leading in turn to changes in attitude. A well designed school can serve its users well and draw a more positive attitude from pupils, teachers, parents and the wider community."* [9]

This research has a focus on primary school design. Secondary schools have more inflexible requirements with regards to programme and curriculum, however one can not ignore sustainable school design at other stages. Significant design alternatives have occurred at different school levels which have been influential across the age boundaries. Through design, the author will test the practicalities of the romantic notion of the school as a community facility; a community resource rich in culture. A school which is an extension of its environment, maintained by all, designed for multiple new learning methods and with a backdrop of educating towards a more sustainable future. The research outcomes should not be viewed necessarily as practical design proposals. The spaces developed are concepts extracted from the research that interrogate the potential of bespoke school design.

1.1. Statement of Aim

The aim of this research is to interpret a design solution to satisfy the existing debate surrounding the future of primary school design in Wales. This research will investigate how the architecture of schools can respond to the needs of a community,

[8] [8] Baird, R. I. School Based Environmental award Schemes and their performance in achieving durable changes in young people's pro-environmental attitudes and behaviour.Diss (Open University, UK, 2009)
[9] Building Schools for the Future; design quality and sustainability www.teachernet.gov.uk/schoolsforthefuture

its culture and social issues as well as the education of its pupils. The specific objectives of the research can be summarized as follows:

- To gain an understanding of the broader political and cultural aspirations towards school buildings in Wales;
- to identify key philosophical drivers behind the development of the school organisation and plan;
- to draw research conclusions for the significant elements of a school, using evidence from precedent, site investigations and the critical analysis of four established successful primary schools in South Wales. The significant elements include the school grounds, circulation routes, library, main hall and classrooms for each age group of children;
- and through the application of the gathered knowledge from the studied literature and case studies, illustrate a series of design proposals to establish an argument towards bespoke design in the delivery of sustainable schools.

1.2. Structure of Document

The **introduction** outlines the field of investigation and explains the importance of research into the area of school design from a global perspective. It includes a statement of aim for the dissertation and outlines the structure of the document.

The **second chapter** describes the reasoning behind the significance of research into the area of sustainable school design. The chapter summarises the current political aspirations and highlights existing programmes, legislation and targets for the environmental and functional operation of schools in Wales.

The **third chapter** contains the majority of the literature review and presents the specific areas of research carried out. The chapter analyses key contributions towards the development of school design throughout the twentieth century and the philosophical drivers behind contemporary design precedents. It highlights the power of a cultural transfer from early education through a generation of people. The chapter investigates modern patterns of design, the organisation of schools and the success of key spaces. It focuses on the relationship between architecture, landscape and design

as an extension of its surroundings. A consideration of Herman Hertzberger's notion of the 'space of form' and how the articulation of learning space can accommodate multiple learning methods is also identified.

Chapter four introduces a competition held by the RSAW[10] and Value Wales[11] in November of 2007 entitled 'Learning Curve – designing schools in Wales'. The competition was to design a sustainable primary school for a model local authority in Wales. The chapter describes the aims of the competition and the organiser's future development goals. It introduces the winning entry designed by the author and his colleagues, the review of this entry and outlines the reasoning for undertaking further research into the area.

The **fifth chapter** contains the methodology of the investigation into four case studies of what are widely considered to be "eco-schools" in South Wales. The chapter introduces the schools and outlines the process of analysis for each of the case studies.

Chapter six is structured with four detailed accounts of the researched case studies, Llanbedr Church in Wales School, Edwardsville Primary School, Rogerstone Primary School and Nant-y-Cwm Steiner School. The case studies are related back to the educational and design theory reviewed in chapter 3. The chapter highlights the building forms, the school grounds, the organisation and the daily sustainable educational processes present in each of the schools.

Chapter seven introduces the authors design response to the issues generated through the research. The chapter presents the authors own design for a primary school in the Rhondda Valley based on the brief written for the 'Learning Curve' design competition. It is an analysis of the trends and shared opinions from the case studies to obtain a general attitude about the direction of school design and teaching in Wales. This section is accompanied by a volume of architectural drawings in document two of the dissertation. The chapter introduces the geographical, historical and cultural research of the site. It records the design challenges met, the connections with the community and the implementation of cultural links into the design. It is a report and

[10] Royal Society of Architects in Wales
[11] Part of the Welsh Assembly Government which leads on public sector procurement

conclusion of the process of research, through design, into a site specific sustainable primary school. The chapter contains a critical response to the case studies and how they have informed the author's design of Williamstown primary school.

The **eighth chapter** presents the conclusion for the dissertation. It includes a summary of the gained knowledge from the research completed and a response to the initial statement of aim.

2. DEVELOPMENT TOWARDS A 'SUSTAINABLE' FUTURE

The UK government advocates an understanding of the importance of schools and education in the target for controlling climate change. In Wales, the funding for improving the quality of the schools is delivered by the Welsh Assembly Government through the School Buildings Improvement Grant[12]. In July 2010 a third major funding package of £144.8 million in new capital projects for schools across Wales was announced[13]. This takes the school capital investment programme up to £702.8 million in total across all authorities in Wales since 2002. Each county and county borough council in Wales has an education authority and is responsible for the organization and distribution of funds between the schools in their region. This research focuses on school development in Wales, however, the scale of investment in England must also be highlighted. The 'Primary Capital Strategy' outlined a £1.9 billion investment programme between 2008 -11, followed by a further £500 million a year with the goal of renewing at least half of the primary schools by 2023[14]. 'Building Schools for the Future' was the largest secondary school building investment programme and the previous Labour government increased investment from £700 million in 1997 to over £6 billion by 2008[15]. The long term goal was to renew or rebuild every school over a ten to fifteen year period. However, following the economic recession over the past two years and the change of government, there have been major spending cuts in the education sector. With inevitable change to the programme of funds distribution the future is very uncertain and the direction of school building is in debate amongst architects, economists and educationalist's alike.

[12] Welsh Assebmly Government: *School Funding* http://wales.gov.uk/topics/educationandskills/schoolshome/fundingschools/schoolfunding/?lang=en [First accessed August 2010]
[13] Welsh Assembly Government: *£144.8 million demonstrates continuing commitment to improving school buildings in Wale,* July 2010: http://wales.gov.uk/newsroom/educationandskills/2010/100714schoolbuildings/;jsessionid=R4hjNFnGw8DyF5PNcH1r0c18ww9LTGFQvwptktGPnNNcbpLKs0Vx!-1787364033?lang=en [First accessed August 2010]
[14] Teachernet: *Primary Capitol Programme* (December 2008) http://www.teachernet.gov.uk/management/resourcesfinanceandbuilding/Primary_Capital_Programme/ [First accessed September 2009]
[15] Teachernet : Other funding; *The bigger picture*, November 2007: http://www.teachernet.gov.uk/management/resourcesfinanceandbuilding/bsf/aboutbsf/otherfunding/ [First accessed June 2008]

2.1 Existing Programmes and Targets for Schools

There are numerous existing schemes throughout Wales and the UK with the common intension of developing sustainable schools. Forest Schools[16] is an initiative in the UK supported by the Forestry Commission to promote the use of woodlands for learning. The Healthy Schools Programme[17] is intended to promote healthy eating; exercise and life-styles amongst the children who participate. Sustainable Learning, Green School Awards, Sustainable Schools, the on-line Carbon Detectives Kit, Ashden Awards all have similar objectives to engage pupils with their lifestyle choices. Eco-Schools[18] is one such programme and arguably the most recognised across the UK. It is an international award programme that 'guides schools on their sustainable journey,' providing a framework to help embed sustainable principles into everyday school life. It encourages schools to assess their day to day running through nine different environmental topics; water, biodiversity, energy, global perspectives, healthy living, litter, school grounds, transport and waste. From an architectural point of view the design of a school, its organisation through to building design, has a great impact on each area. School building design, in particular, has a rich heritage and can be a source of inspiration for learning about changes in society, why and how these have happened and their impact on the environment. School grounds, however, have historically been poorly considered spaces consisting of flat concrete or tarmac and 'green deserts'.

In England nearly 15000 schools are registered with the Eco-Schools programme however this is only half of all schools. Of those registered just over 1100 have achieved their prestigious 'green flag' status therefore there is still a lot of progress to be made. In Wales, however, the Eco-schools programme has proved much more successful. In 2008 Jane Davidson AM commented in a speech at an Eco-Schools award ceremony;

[16] Forest Schools Wales http://www.forestschoolwales.org.uk/ [First accessed November 2010]
[17] Healthy Schools: http://home.healthyschools.gov.uk/ [First accessed March 2010]
[18] Eco-Schools Wales <http://www.eco-schoolswales.org/home.asp> [First accessed November 2007]

"The growth in Eco-Schools has been remarkable. The green shoots of the scheme started in 1995 with 10 pilot schools. From there the scheme has blossomed and now there are over 1600 Eco-Schools, almost 90% of all Welsh schools." [19]

The scheme does not directly lead to social change as the principles are not necessarily embedded into the culture of the school. However research by Robert Iain Baird highlighted that *"pupils who attended eco-schools showed evidence of a greater 'eco-activity' at home than those who had not."* [20] Programmes such as this are valuable tools with which to raise awareness and areas for reform. To surround pupils in the choices and benefits of a sustainable lifestyle will result in children themselves actively promoting a social change.

School buildings are required to serve their pupils, staff and the wider community for many generations therefore the design quality is very important. The various programmes such as Eco-Schools are valuable frameworks that can influence the way a school operates and engages with the curriculum. However, when it comes to school design there is no framework that can be as easily adopted. From an environmental design point, all new school buildings and refurbishments now have to aim for a 'very good' or 'excellent' BREEAM[21] rating. Therefore the government is setting goals and standards through various building guidelines. Can we automatically assume that a school designed to BREEAM standards of excellence will, by this very nature, be a more effective learning environment in educating for a sustainable future? There are well designed modern schools yet there is little research to show the correct design path for the learning environments of the future. In December 2007 the Department for Children Schools and Families[22] published the first 'Building Schools for the Future Annual Report.' The report summarised the key findings from the work of the programme as follows; design attributes such as noise, heat, cold, light and air quality impact on teaching and learning and the negative impact of poor design on pupils is clearly evident. For example, the report identifies research evidence from a doctoral thesis on the relationship between daylight levels and performance in a classroom. The research indicated that pupils based in newly refurbished school facilities with the

[19] Jane Davidson, Minister for Environment, Sustainability and Housing, Welsh Assembly Government. Speaking at Eco-Schools award ceremony 18th March 2008
[20] Baird, R. I. School Based Environmental award Schemes and their performance in achieving durable changes in young people's pro-environmental attitudes and behaviour.Diss (Open University, UK, 2009)p65
[21] BREEAM; The building research establishments environmental assessment method
[22] Department for Children Schools and Families (DCSF) - procured PricewaterhouseCoopers to carryout an independent evaluation of BSF- 1st Annual Report, December 2007

highest daylight factors achieved up to 18% higher in test scores then those schools in the study with the lowest light levels. The report highlights the premise that poor building design can have a strong influence on the performance of its pupils; therefore there is without question a minimum standard that has to be reached.

In Wales the government's ultimate ambition is to create learning opportunities for all individuals of all ages:

> *"Our policies aim to raise the levels of achievement in Wales and achieve a social well being that is vital to developing a prosperous economy. We promote a culture of lifelong learning to help improve opportunities for people at all stages of their life."*[23]

This statement highlights the desire for a sustainable society of lifelong learners in Wales. This ideal does not stop at the four walls of a classroom. There is an ambition for a wider sustainable social well-being, from the children in the community school to a group of colleagues at work.

The introduction of the Foundation Phase in Primary Education in Wales, first piloted in September 2004[24], is a new approach to early learning aimed at improving the way children learn.

> *"The Foundation Phase is based on the principle that early years' provision should offer a sound foundation for future learning through a developmentally appropriate curriculum."*[25]

The Foundation Phase is unique to Wales. It combines the Early Years (ages 3-5) with Key Stage 1 (ages 5-7) and removes the testing at this level common in England (see figure 1.) The goal of the Foundation Phase is to instil a desire for knowledge in children. To learn by 'doing,' through play, exploration and experimentation and hence provide a foundation for the rest of their lives. Children in the foundation phase gain more hands on experience, learn outside the classroom and are challenged with

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[23] Welsh Assembly Government: *Education and Skills* <http://wales.gov.uk/topics/educationandskills/?lang=en> [First accessed August 2010]
[24] Welsh Assembly Government: *Foundation Phase Pilot* http://wales.gov.uk/topics/educationandskills/earlyyearshome/foundation_phase/whyintroducefoundation/foundationphasepilot/?lang=en [First Accessed August 2010]
[25] Welsh Assembly Government: *What is the Foundation Phase?* <http://wales.gov.uk/topics/educationandskills/earlyyearshome/foundation_phase/?lang=en> [First accessed November 2010]

solving real-life problems whilst learning about conservation and sustainability. Testing is removed so children have longer to develop reading and writing skills before following a more prescribed curriculum.

Age on 1st Sept	Year	Curriculum stage	Schools
3	Nursery	Foundation Stage (Year 1+2 = Key stage 1 in England)	Nursery school
4	Reception		Infant school
5	Year 1		
6	Year 2		
7	Year 3	Key Stage 2	Junior school
8	Year 4		
9	Year 5		
10	Year 6		

Figure 1: Table of primary school years and corresponding ages in Wales

The architect and author Mark Dudek, describes that in order for a school with a sustainable ethos to thrive it must influence and be influenced by the community in which it operates. A society that does not communicate and care for each other, as well as the landscape and buildings it lives in, lends itself to greater acts of anti-social behaviour, community dispersion and a generally unhealthy living environment. Dudek illustrates that ideally the school needs to be part of a wider sustainable community. A sustainable community provides places for people to live in an environmentally friendly way; be well represented with a thriving locally economy; be well connected with good transport, health and other services; be driven by sustainable development, with high quality designed homes and community buildings; be home to an active, inclusive and safe society with a strong local culture. The UK government intends that all communities exist with such a lifestyle with the passing of the Sustainable Communities Act 2007[26]. The Act provides a statutory framework for councils, through collaboration with community groups, to put forward proposals on sustainable improvements to economic, social and environmental wellbeing. The concept of the sustainable community should perhaps start with its school, its future generations. The school can be the heart of a community, its social and cultural centre with its young occupants being its wider voice promoting their own sustainable future.

[26] Sustainable Communities Act 2007 <http://www.lga.gov.uk/lga/core/page.do?pageId=561616>[First accessed October 2010]

When critics of new school design quote attainment records, they question the size of the improvement over the economic investment. Academic attainment is not the sole purpose of a school or a child's school life experience. To forget the wider intensions and principles of sustainable bespoke school design is negligent. The Foundation Phase in Wales is a positive step towards a child's all round development and well-being.

The research period of this dissertation has spanned the largest change in economic fortunes of any UK school building programme. When the author began investigating school design the future looked bright with aspirations of redeveloping every school across Britain. However, due to the current economic climate, the future of the UK's school building programme and the direction of school design is decidedly uncertain. Standardised school design is a considered and debated option to meet the large demand for new school buildings across South Wales and the rest of the UK. Entire classroom blocks replicated from site to site to provide new school facilities quickly and cheaply to different communities. There are many positives to this model, however the author struggles to highlight any that are not based on an economic foundation.

It is the opinion of the author that designers should not look to compromise the 'bespoke' direction of school design but look to achieve its goals in a more economical and sustainable way. Standardisation is not the answer. Let us hope the concepts behind the contemporary design of schools do not become predominantly economic based decisions. A knee-jerk reaction by a new government to be seen to be improving school buildings with cost-effective standardised school units would be a neglect of the wider picture. The idealistic design proposed by the author through this research is a bespoke design for Williamstown Primary School. The intension was to design a school for the people of that community, a building with identity, to be proud of and call their own.

3. CULTURAL TRANSFER THROUGH HISTORY

Charting the history and development of schools in Wales is a process that parallels the cultural transfer through religious changes over the generations. Research into the future of school design can not ignore the history of schools and changes of the past. The connection between learning environment and the wider social and cultural position of a community are intertwined. This correlation is evidence that the school is a vital tool in shaping the way we live outside the classroom. The research on the changing face of the British school is vast; the public, the grammar, the boarding, the village school etc. all have well documented histories. The following chapter highlights some of the key changes more relevant to the culture and society surrounding rural/semi-urban schools in Wales. This is the focus of the research and the setting in which the authors own bespoke design is located.

It can be argued that to find the truest example of an education of *"learning through experience"* we have to look back to the Middle Ages in Wales. At that time school, for the majority of children was their everyday life, learning through doing, watching and communicating in preparation for a practical life. Depending on wealth and status, tutors would be engaged to educate students (or their charges) about the world beyond the day to day experiences of life. Such education took place with small groups in small halls or individually in homes. Most formal education experiences involved large amounts of rote learning.

The first reaction to informal and undetermined schooling came in the late fourteenth and early fifteenth century with the founding of colleges such as Winchester and Eaton in England. The early colleges led to the spread of the education of Latin grammar and hence the development of the grammar school through the fifteenth century. Soon after, some schools began to admit 'petties', younger children who were being taught to read before their later education of Latin, and thus the first primary education level was established. In Wales the majority of the early grammar schools were founded in the sixteenth century, however little of the actual school buildings remain today. The purpose of these schools was to educate young men for a profession linked with the church or in the legal and administrative system. Schools at

this time were still rare institutions with informal schools or private tutoring still the most common form of education. The Welsh gentry used their wealth to provide tuition for their children/heirs to ensure they reach a level of academic intelligence high enough to journey colleges in England, namely Oxford and Cambridge.

During the seventeenth century the number of schools rose dramatically in Wales. Grammar schools were established in most of the market towns and followed the curriculum of Latin and the Classics set out in the previous century. During this time an alternative form of education also began to rise. Non-classical schools were established where, for a fee, boys could be educated in a wider subject range. The introduction of the 'petties' was also more common, with boys receiving an education similar in length to today's child. The common location for schools of this period was in the centre of the town. Many were closely linked with the church and built alongside the parish church. Alternatively they were found adjacent to the market square, nevertheless always central and heavily involved in the society and workings of everyday life. Many educational writers of the time however were in opposition about the location of schools. Schools should be *"planted in the skirts and suburbs of towns…for the benefit of the open fields for exercises of more range."*[27] This ideal gradually became more common, with the school master having his own dwelling linked or near the school hall building, on the fringe of a town.

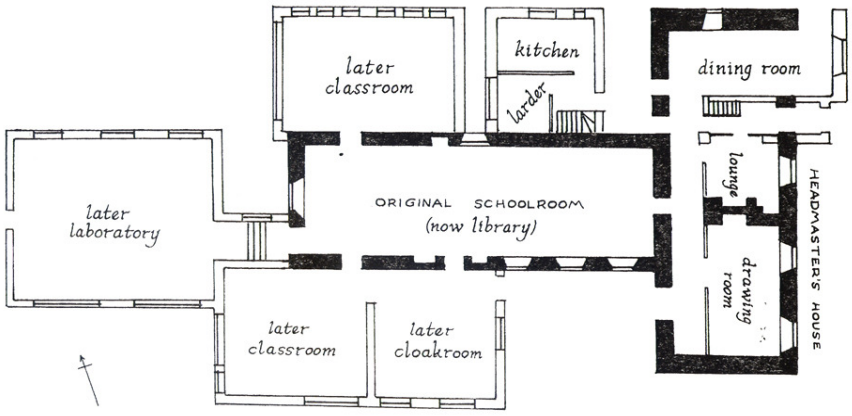

Figure 2: Llanrwst grammar school, Denbighshire 1612 (ground floor plan)

[27] Richard Mulcaster, a leading Elizabethan educational writer from: Malcolm Seaborne, *Schools in Wales 1500-1900 : a social and architectural history* (Denbigh : Gee and Son, 1992) p31

The architecture of the school at this time reflected the method of learning, whether centrally located or in the suburbs. A single hall-house for lecture style education was all that was required with a secondary chamber for the master (see figure 2).

The new religious outlook across England following the English Civil War (1642-1651) and the reformation of the church in the seventeenth century did not have large effects on the lives of the public in Wales until the early eighteenth century. It was during this period that the effects of Puritanism on the established church in Wales became more apparent. This filtered through to the schools associated with the church and the everyday lives of children began to adjust to the influences of the Protestant Reformation.

The Society for Promoting Christian Knowledge, founded in 1699 was the major advocate towards the shift in education in Wales. The SPCK also urged for more English-medium schools in Wales, however this quickly generated an adverse response from Welsh-speaking areas. The Society later became major publishers of the Welsh translated Bible and other religious texts and at this time it educated half the population in the language of Welsh. Therefore towards the end of the eighteenth century there was a new front to education in Wales. A higher proportion of students were learning Welsh through the education system and Protestant ideals. This cultural shift in Wales spread from the Church of England in Wales through the Welsh school system as generations passed through the communities.

The nineteenth century saw, what is described by many educational historians as a ‘national manifestation of voluntary effort’ towards school building. There was a great movement in Wales to provide elementary schools for all the poorer sections of society which spread even to the remote rural areas. This development of schools came about following the growth of the population across the country due to the rapid spread of industrialization. The first half of the century saw schools constructed rather unsystematically and haphazardly to accommodate the rising population. They were almost never designed by architects and became society, self build projects. Thirty two such schools were built in Merthyr Tydfil alone. It was not until 1839 when the

National and British School Society[28] decided to increase their contribution and support of school building in Wales with funding for purpose built schools. Between 1840 and 1875, in this time of rapid industrialized growth, funding was provided for 434 schools to be constructed in Wales. In the decades following, schools in the most rural of locations were abandoned as groups of villages were serviced by a single school which could be easily reached by improved road networks. Perhaps these were the first signs of the commuter age. In the last 20 years from 1990, Wales has seen 255 of its Primary schools close with 1462 remaining today[29].

In 1870 the UK Elementary Education Act was passed. The act required all children between the ages of six and eleven should attend school and included the distribution of government money across the UK to cater for the increased requirement. The Architect and Surveyor E. R. Robson was employed to direct the expansion. Robson was highly influential in the direction of school design and shaped the plan of a school for the next hundred years. Robson introduced the system of separate classrooms surrounding the school hall (see figure 3).

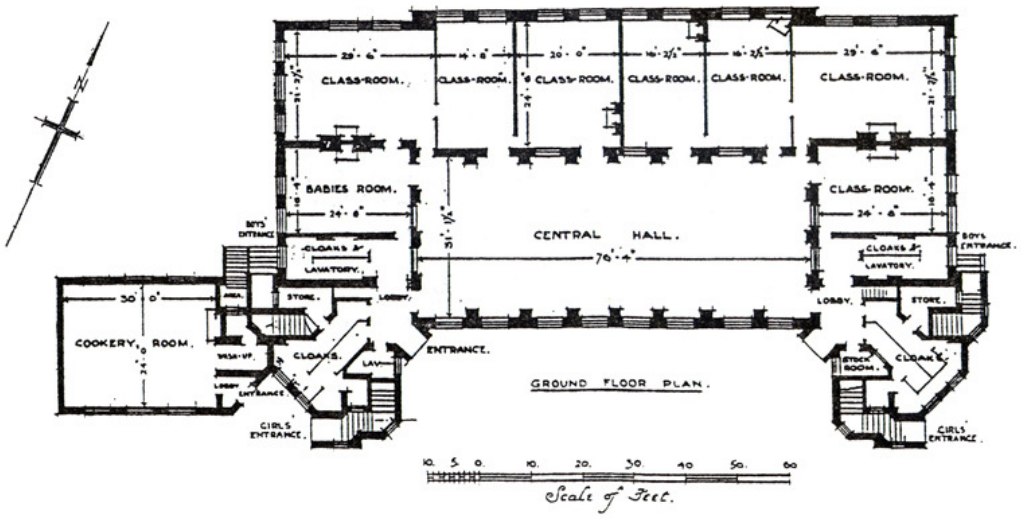

Figure 3: Manselton Board School, Swansea 1900 (ground floor plan)

He recommended classroom sizes, proportions of north facing window to floor area, desk arrangement, display and circulation space. *"Robson was the first designer to*

[28] Established in 1811 to found Church of England Schools
[29] School Census 2010, Welsh Assembly Government Website: http://wales.gov.uk/topics/statistics/headlines/schools2010/1006291/?skip=1&lang=en

marry educational theory and architectural practice in any meaningful way." [30] Design was based on classrooms for rote learning and a hall for group worship and announcements. No consideration was given to outside space, with resulting small confined areas of yard.

The later half of the nineteenth and early twentieth century saw another cultural shift of education in Wales, a Nonconformist sway towards a secular state system. Whilst Latin remained a requirement in schools the non-classical approach to education continued to grow, along with the population of nonconformists in Wales. A religious census taken at the end of the nineteenth century highlighted that Anglican worshippers had already become the minority. This shift from a religious teaching in Wales to a Nonconformist society in schools is why by 1990 there remained only 3% of children in Church of Wales Schools and 5% in Roman Catholic schools. All others controlled by local council educational authorities. Religion was filtered out of the majority of schools; the resulting effect could only become a large contributor to the national decline of religion in Wales

What is clear from history is that there is direct correlation between the way we teach and what we teach our children with the resulting culture of our communities. Whether the aspirations of individuals and societies or culture dictates what is taught, it is clear that there is a ripple effect to future generations. Therefore what we teach, and how we teach today, will remain important to the generations of tomorrow.

3.1. Significant Contributions of the Twentieth Century

The architecture of British schools over the course of the twentieth century has reflected the modern methods of construction or favoured style of the time and place. In the poorer rural communities of Wales extensions or new builds were predominantly one or two storey, over-glazed, prefabricated framed units. Classrooms were commonly steel or concrete frames with brick and glass infill and to today's

[30] Dudek, Mark, *Architecture of Schools: the new learning environment* (Oxford: Architectural Press, 2000) p15

standards extremely poorly insulated (see figure 4). The architecture of schools is often dictated by budget, regulations, guidelines of proportions and ratios before an architect has even put pencil to paper. However, the following section highlights some significant contributions from architects who have addressed more than dimensions and fabrication choices. The direction of school design has been influenced by the architects who have considered the way in which we teach, how children learn and the society within a school and the surrounding community.

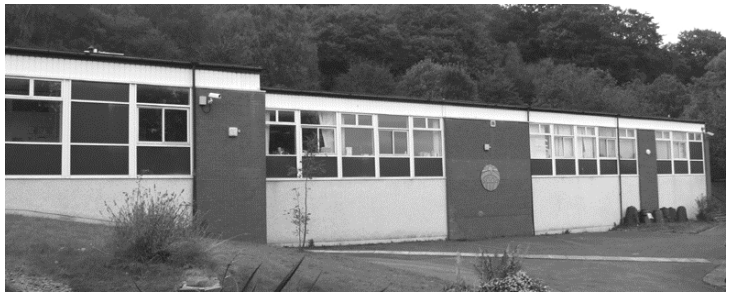

Figure 4: Edwardsville Primary School, built in the early 1970's. Example of single storey, poorly insulated school building common to communities across Britain.

In the 1930's Architect Walter Gropius, a founder of Bauhaus, was introduced to Henry Morris, the Chief Education officer for Cambridgeshire. A meeting described by designer Jack Pritchard as *"enlightened architect met enlightened educationalist: result: orgasm."*[31] Morris commissioned Gropius and the British architect Maxwell Fry to design his vision for integrated community learning, a village collage. The resulting Impington Village College educated eleven to fifteen year olds during the day and provided educational and leisure facilities to the wider community in the evenings and weekends. The institution, still operating today, in plan follows the traditional classroom corridor arrangement; however the spaces include workshops, kitchens, quiet rooms, a library, a social promenade and a theatre.

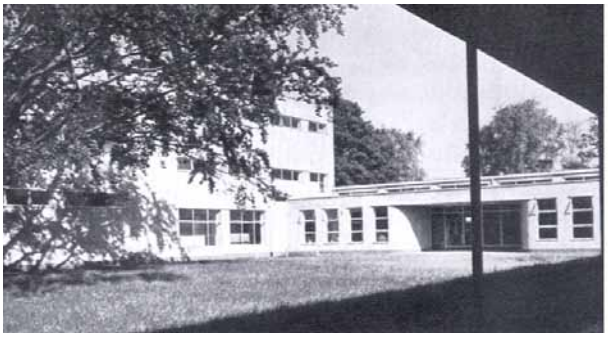

Figure 5: Impington Village College central courtyard

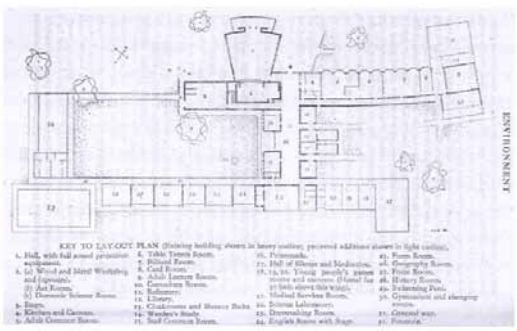

Figure 6: Ground floor plan Impington Village College

[31] Burke, Catherine and Ian Grosvenor, *School* (London : Reaktion Books, 2008) p.86

Morris's model of the village college was a focal building for the whole community, a grouping of the previous poorly serviced array of back street schools across a community. Impington opened in 1939 and was described by Nikolaus Pevsner as *"one of the best buildings of its date in England, if not the best"* (Burke 2008, p.87). The village college was a realisation of great consideration previously not given to the landscaping, the choice of facilities and the needs of the wider community within school design.

The German architect Hans Scharoun, most famous for the Berlin Philharmonic Concert Hall, designed three schools in the 1950's. The first, an un-realised project, was for the Darmstadt conference in 1951, a cultural event entitled 'man and space'. The design prompted discussions about the specificity of design for such institutions. A debate this work aims to continue today. Scharoun believed in a functionalist approach relating to the social structure of a school community. He created flowing spaces in plan in which each spatial sequence was intended as a stage for a particular behavioural or social learning. Rhythm only occurred where a space was required more than once due to pupil numbers. The plan pays great respect to the morphology of the site and the associated human interaction within it. The Darmstadt School was designed around three age groups of children and the particular requirements for the needs of their learning environment. For the younger children, aged one to three, the classroom resembled a nest or cave like environment in character (see figure 8 zone A). The design is based on the creativity of play, with south facing windows to enhance the changes of light and colour in the classrooms during different times of the day. The middle school children, aged four to six, are housed in more geometric spaces (see figure 8 zone B). The classrooms are orientated for a consistent level of light and are based on a concept of exactness. For the oldest children aged up to nine years, the classrooms were a platform for the child to find identity within the school community (see figure 8 zone C). The spaces were larger open expanses with predominantly north facing light. "*Here the discovery of the self, the finding of the pupils own personality, stands in the centre."* [32]

[32] Frederich Mebes, Peter Blundell Jones, ed. *Hans Scharoun and urban structure,* (arq: Vol 1:autumn 1995) p49

Figure 7: Model of Darmstadt school

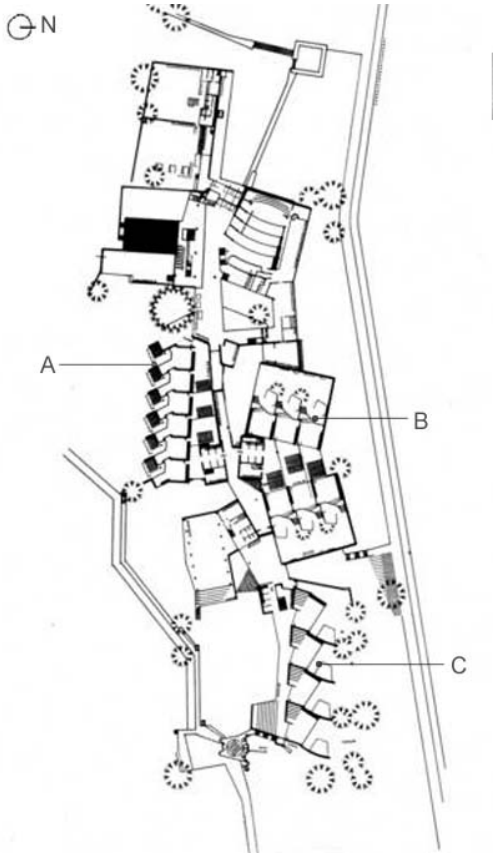

Figure 8: Ground floor plan of Darmstadt school

Following the publication of the Darmstadt school Scharoun was commissioned to design and build schools in Lünen in 1956 and Marl in 1960. The schools were based on the principles he had laid down in the design of the Darmstadt school. Fredrich Mebes[33] reports that the School in Marl had not been used as a primary school as its design intended. For many years the school had been operating as a secondary school for which none of the spaces were designed. Mebes writes that the staff of the school was offered an alternative building more suitable for the education of the students. However following a unanimous decision, they elected to stay in the Scharoun school. The staff refused to leave the building as they were all so happy with the environment of the school, despite the spaces not meeting certain requirements for secondary education. Scharoun's schools *"succeeded in establishing an alternative approach to the mechanistic layouts of most other schools being built at the time."* [34]

[33] Frederich Mebes, Peter Blundell Jones, ed. *Hans Scharoun and urban structure,* (arq: Vol 1:autumn 1995) p50
[34] Dudek, Mark, *Architecture of Schools: the new learning environment* (Oxford: Architectural Press, 2000) p35

The Dutch architect Aldo van Eyck bought a new dimension to the language of school design. He was one of the first designers to shift the linear arrangement of classrooms to corridor with consideration to the resulting in-between spaces (see figure 9). In the Early 1950's Van Eyck was commissioned to design three primary schools in Nagele, a new village community on the outskirts of Amsterdam. Each school had a 'centrifugal open centre' with the rest of the school accommodation circulating the space. The playground was the heart of the school (see figure 9 zone A), with the classrooms staggered and rotated around its perimeter (zone B). The shifting of the classrooms relative to each other creates a flow of 'in-between space' of changing scale (zone C). The varying scale of the spaces provided different functional use and created a social community within the schools. The articulation of the classrooms also increases the wall surface area to the outside. This allows for large corner windows which connect each space with the surrounding landscape.

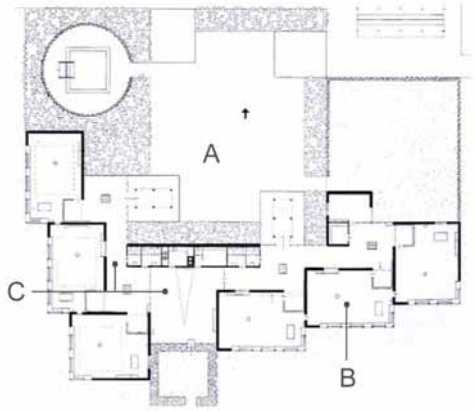

Figure 9: Ground floor plan of Nagele school

Figure 10: External view of Nagele school

There was on underlying interlocking of space from the classrooms, the halls to the playground and surrounding landscape. Despite the open connection to the site, the immediate landscaping was the typical 'green desert' surrounding the classrooms (see figure 10). Whether dictated by budget or not, less consideration was given to the use of outdoor teaching space as is so commonly found. The Nagele schools whilst architecturally featureless were among the first schools to open to the idea that all parts of the school can be used for activity and education, the elimination of corridors for extended flexible space.

The Nagele Schools were the largest influence for the Montessori school in Delft designed by Dutch architect Herman Hertzberger in the early 1960's. Van Eyck's ideals were a model, a new form of which the Montessori school gave substance and life too. The Montessori School is so named after the alternative form of education by which it teaches. The Montessori Method is an education by which the child has a certain freedom, an undisturbed lesson to engage in self directed activity. This method of educating was pioneered by the Italian Educator and Philosopher Maria Montessori in the early twentieth century. The method of teaching is a radical return to a self learning society, by which the children learn through discovery with the teacher in the role more of observer then lecturer.

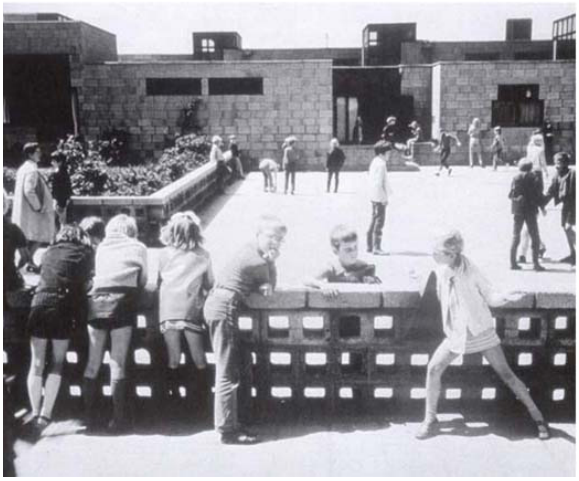

Figure 11: Montessori school in Delft

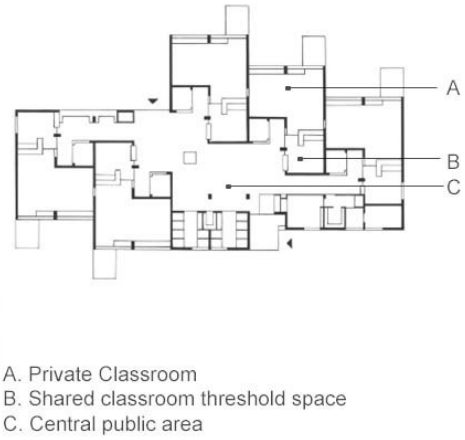

Figure 12: Ground floor plan of Montessori school

Hertzberger's Montessori school in Delft consists of a series of repetitive classroom units. Each unit is not completely enclosed with a flow of space from secluded and private through to a central overlooked and public area. The zoning of the spaces are shielded from each other without being closed off. The school is designed from a functional approach with the articulation of space suggestive of various learning practices. The classrooms provide a home, a sense of ownership to each age group, situated along the communal hall or learning street. Consideration is given to every 'in-between' space as opportunity for activity to occur. The theories are continued from the entrance steps through to the landscaping, the building itself is a tool of the Montessori education method.

School design in post war Britain was in many ways falling behind the pioneering schemes and theories being created across mainland Europe. However in the late 1960's architects Robert Maguire and Keith Murray brought a gritty, urban, tenaciously industrialized British approach to open plan school design to London's East-End; the now named St.Lukes, Bow Common Primary school. The architects had never designed a school before, they were known for their church architecture and had previously built the now grade II listed St.Pual's on the site at Bow Common in the 1950's. The architects, as parents, held strong views regarding children being given the chance to develop naturally and shared convictions regarding the practical responsibilities of Christianity within a community. In conjunction with the publication of the Plowden Report in 1967 and their own philosophy Maguire and Murray set about designing an open plan school, flexible to the needs of a child-centred learning environment. The Plowden Report stated that *"at the heart of the educational process lies the child."* The report stressed a connection between the school and the children's homes, the school building and grounds should be used out of ordinary hours as much as possible, class sizes should be reduced and national policy of 'positive discrimination' should favour schools in deprived neighbourhoods.

Maguire and Murray were not the first architects in Britain to design based on an open plan arrangement however they felt that the development towards the option had happened too quickly and not been fully understood. Eveline Lowe Primary School in Southwark, London designed by David and Mary Medd (now a grade II listed building based on its early educational philosophy) is one example Maguire and Murray studied for its shortcomings however it was widely regarded as a beacon school at the forefront of educational reform. Before St Luke's, open plan classrooms simply had the classroom walls removed with little consideration to the resulting impact on the daily running of the school. Corridors remained the same, wasting gross internal floor area, increasing budgets and adding little in terms of educational advantage. Budgets were extremely tight for school developments therefore Maguire and Murray proposed the cheapest possible structure for St. Luke's allowing for a higher quality of services and internal environment. *"Industrialised agricultural*

buildings were the cheapest of all. This lead to the finished design. St Paul's Primary school is quite clearly and unashamedly a barn." [35]

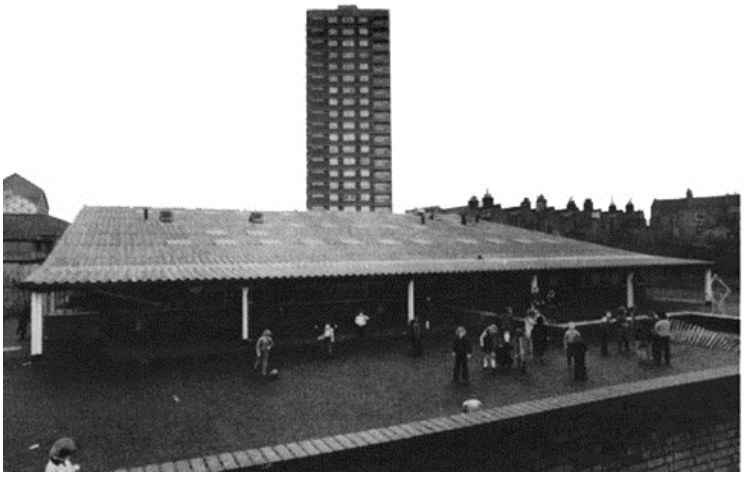

Figure 13: External view of St. Luke's Bow Common Primary School

Figure 14: internal view, St. Lukes

The construction of the school is simply a steel portal frame left exposed internally. The option allowed for a complete freedom of educational space within the constraints of a singular larger form. The roof consists of cement roof tiles and the walls are concrete block faced with brick built to a low height to allow for a continuous ring of windows (see figure 15). A significant part of the budget was spent on internal services to maintain a habitable environment within the building. From the outside you would not realise the building was a school, however internally a network of educational spaces have been created with no corridors to cater for the new approach to learning *"less than half a percent of the total floor area is circulation"* (Waterhouse). Maguire and Murray produced a school that had a functional environment however as the internal forms were not structural they were easily adapted to any required changes. The school had two halves of flowing space for the junior and infant sections, however they shared a central communal zone designed for eating and larger group activities. The windows were all specifically placed within the shell to provide adequate light yet avoid over heating and the reflective roof insulation was left exposed to help spread the natural light. The building also had a strong internal to external connection. Areas of the roof extended past the walls to create covered shaded areas (see figure16), whilst external low brick walls correspond to internal walls to provide mirrored zones.

[35] Robert Waterhouse, 1972: Primary instruction, children and their primary schools. *Design journal*, 1st April. pp 48-52

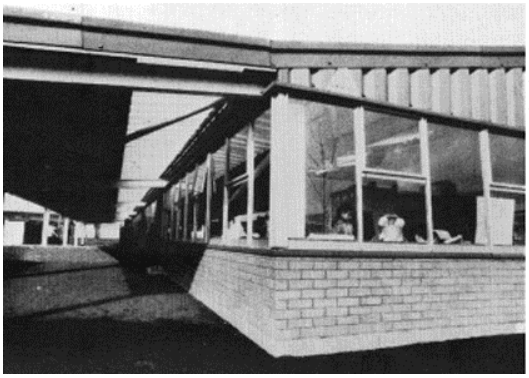

Figure 15 External view of St. Luke's

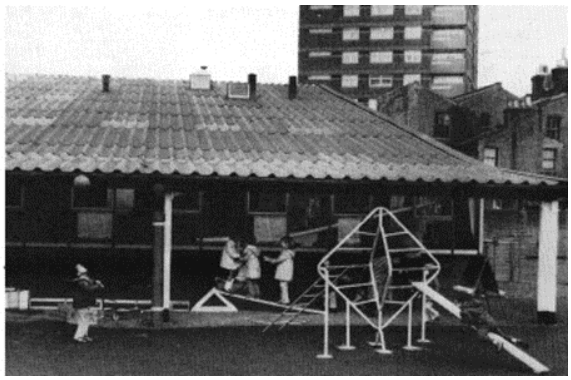

Figure 16: St. Luke's external threshold

St Luke's Primary school was completed in 1971. It was a cost effective, innovative approach to functional design in a flexible manner. Over the next few decades the open plan nature of the school was not widely imitated to the same degree; however the use of industrial structures and scale slowly became more common. As school sizes grew with the often amalgamation of smaller schools, cost effective, flexible portal frame structures became a regular feature of school construction across the UK. It is slightly ironic that these are often the structures school designers today are replacing with forms containing articulated flexible space for which Maguire and Murray endeavoured to create.

3.2. Considerations for the Classroom

> *"Everything you find comes from somewhere. The source was not your own mind, but was supplied by the culture you belong to."* [36]

In its simplicity this statement covers all areas of society today. Relating the quote to school design, I query what reference school designers of recent decades have used as precedent for school design. It is widely agreed that the direction of school design needs to alter to accommodate the change in teaching and learning methods; to establish a balance tipping increasingly toward the learning community centre and away from that of the traditional closed classroom environment. Therefore, should architects be looking for inspiration not merely from the bank of already established

[36] Hertzberger, Herman, *Lessons for students in Architecture,* 3rd revised edn (Rotterdam: 010 Publishers, 1998) forward

schools, but the social and cultural nuclei that make up a "functional" British community? Perhaps there is no need for a new design invention to produce schools for the future but merely a widening of sources and their application.

A large majority of recently published literature on school design is in the form of case studies; lists of schools, illustrating their environmental performance factors and the make up of their plans. From these examples, site specific positives can be extracted. Elements which are performing successfully in a particular environment can be used as precedent for future designs. Most of the stated positives are low-carbon technologies and environmental performance factors. There is little about the social interactions within a school and its links to the surrounding community. It is not my intension to produce a formula for the best arrangement of zero energy principles and technologies or to merely present a string of case studies and review their distinctive features in turn. Therefore the authors' reading has included research into the different social components of form and space. How the architecture can inform a certain social interaction or activity. The author has investigated wider elements found within urban planning, such as thresholds, gateways and the layering of a street and related them to the design of a school.

> *"The Climate in which schools are developed today, with heavy reliance on educational specifications, design guidelines, exemplars and prototypes, leaves little room for real creativity and innovation. Educational specifications create a school before it is created – design guidelines are too prescriptive (so that architects are often relegated to the role of assembling pieces instead of doing real design)."* [37]

To what extents can the architecture of school design respond to the needs of a community, its culture and social issues, as well as the education of its pupils? Is it a question of budget or the skills of the chosen designer, do regulations hinder the development of alternative solutions to the question; 'how should schools of the future look?'

There is an importance in understanding the complexity of the human experience to avoid the common stagnant spaces so commonly found throughout school design. A design has to consider four major and simultaneous realms of human experience.

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[37] Nair, Prakash and Randall Fielding, *The Language of School Design: Design Patterns for 21st Century Schools* (Minneapolis, Minn. : DesignShare, 2005) p2

Firstly the spatial; is the space bright, intimate, open, connected to nature. The psychological, does the space feel safe, awe-inspiring, playful, spiritually uplifting, creatively stimulating. The physiological; is the space warm, breezy, textured, or visually pleasing. And finally behavioural; is the space designed for team building, quiet individual work, writing, reading, sporting activities, communicating with nature.

> *All buildings, all places teach, this raises the question: what are we teaching children all the time we are not teaching them? What will their everyday environment teach?* [38]

The design of school spaces should encompass more than merely a blank box characterized as flexible space or a regulation of net to gross area. It should be a complex organisation of experiences to create healthy, functional yet varied learning environments.

3.3. Sociological and Cognitive Development

The 'foundation phase' in Wales is based on a principle of independent learning through a freedom of play and exploration. The phrase 'learning through play' has a range of connotations. There are three types of play as categorised by Dr. Corrine Hutt.[39] Hutt describes the first as it ludic behavioural. This responds to a state of aimless play, repeating games or processes already learnt or observed. The second is 'games with rules'. These are important for co-operation, competition and social development. The third is epistemic behaviour. This involves the use of knowledge and problem solving. A child learns during an epistemic behavioural period through an activity which involves exploration and experimentation. Imitation and repetition are not cognitive learning processes. Therefore an environment that supports self exploration, variety and intrigue will improve the child's development as well as the teacher's ability to teach.

[38] Day, Christopher, *Environment and Children: Passive lessons from the everyday environment* (Oxford: Architectural Press, 2007)p147

[39] Dr. Corinne Hutt, 1934-79. Former member of the Department of the Psychology at Keele University and researcher of behavioural development

> *"There is a difference between play that introduces children to necessary alternatives and play that allows children to consider the play of alternatives."*[40]

Repetitive stimuli lead to boredom and indiscipline and children particularly at the foundation level have a very short attention span. Therefore variety of texture, colour, and light within the learning environment is very important for perceptive development. Children have wide imaginations and need diverse stimuli for epistemic behavioural activities. The indoor environment should support this as much as possible however nature and the outdoors will never be matched by the classroom for its range of experiences and should be utilised.

Role play is an important activity for the development of children in the search to find their individuality. Children adopt characters, copy adults, relive stories and verbally respond to themselves in the roles. In a role play scenario a child pretending to be a doctor may help a patient, the child then assumes the role of the patient and responds with kindness. The characters are real to the child, they are part of the cognitive development of that child as they gradually learn the processes of a social interaction.

> *"The infant can begin to develop a personal identity, a self which can be enriched through his or her interaction with the world of shared reality."*[41]

During the foundation phase children learn through direct hands on experience. They start to develop an interest in their community and the outside world and, as previously mentioned, through role-play develop an early self-objectification. Children from the age of 7-9 develop the ability to work in groups. They can appreciate their own culture and begin to understand the concept of cause and affect. Children at this age begin to form conclusions and self correct. Throughout Primary school children continue to learn through direct hands on experience however by the later years, aged 9-11, a broader knowledge can be grasped through lecture style education. Children at this age develop cooperation and social skills and begin to realise the worth in learning from their peers.

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[40] Brian Sutton-Smith, *Play and Learning* (New York: Gardner Press Inc. 1979) p316
[41] Patricia A. Adler, ed. Peter Adler, ed., *Sociolocical studies of child development: volume 1* (London; Connecticut: JAI Press Ltd., 1986)p45

"Because children spend many years in these buildings, living, working, celebrating and experiencing community, it is not unreasonable to suspect that this experiential place will 'rub off' on personal impressions and moods."[42]

Primary school classrooms should be more than 'spaces' for varying activities but diverse experiences that support the sociological and cognitive development of children.

3.4. Multiple Thresholds

"The more flexible are movement patterns, room activities and public –private choice, the less institutional do buildings feel."(Day 2007, p142)

.

Public and private or 'collective and individual' spaces have an added level of complexity within a school. A public area can be described as a space accessible by all where the responsibility for upkeep is shared. In a private area accessibility is restricted to an individual or small group who accept responsibility for the upkeep. In a school there are different degrees of public and private space. It is not as distinctive as a walled in private house. There are numerous thresholds between levels of public and private space within and including the perimeter of the school grounds. The territorial claims within a traditional school are very similar to that of a home. Everyone has a shared living space, kitchen and garden however your bedroom is private. In a traditional school the children share a hall and canteen and have a designated classroom. The theory behind the modern 'community' school concept is more like that of a city. A city is made up of smaller districts, territories of different people, each with its own amenities and green spaces. There are larger bisecting streets linking the communities to a centre in the form of a piazza or market square. This concept relates to the learning communities of a school.

"Buildings where large numbers of people come together take to functioning as tiny cities. So they ought in fact to be organized and designed as such." [43]

[42] Rotraunt Walden, ed. *Schools for the Future* (Washington USA : Hogrefe & Huber Publishers, 2009)p16

[43] Hertzberger, Herman , *Space and the Architect, Lessons for Students in Architecture 2* (Rotterdam: 010 Publishers, 2000) p136

Children of a similar age have a shared territory with their own facilities. The shared learning community is a grouping of zones serviced by a larger main vista linking them within the school. Like a city the links draw you to the centre, the school hall or main courtyard. The public to private threshold is much less obvious and therefore must be sensitively handled to maintain the successful use of the spaces on both sides.

> *"If the boundary is too weak the neighbourhood will not be able to maintain its own identifiable character."* [44]

Interior and exterior vistas are extremely important within school grounds. Firstly they connect spaces within a school, orientate you and provide a connection to the surrounding environment. There is also a health advantage to long views from learning spaces. Especially with young children there is evidence that relief on the eyes to sights of over fifteen meters is very valuable following long periods of close focusing on books and computer screens. It keeps the eyes healthy and prevents tiredness and strain. The degree of transparency is an important factor to control within school design, the issue of distraction must be carefully considered. *"Transparent schools convey an idea that learning should be visible and celebrated." (Nair and Fielding 2005, p40)* Transparency can provide an acoustic barrier when needed whilst maintaining an element of passive supervision. Throughout a school it aids the distribution of natural light and creates a sense of openness to people and to the surrounding environment.

Natural light must be carefully controlled in a school design. Avoiding overheating, it must be managed to provide daylight to key spaces for as much of the school day as possible. It can also be harnessed using technologies for energy gains and used to potentially teach the students about energy conservation. Trees, vegetation, strategically placed shading devices and careful orientation of spaces on a site must all be considered in order to get the most value from daylight. Natural ventilation also contributes to a healthy learning environment. It provides a better quality of air within the spaces and also by providing the occupants with the power to open windows to the outside it connects the users with their environment. Through good design by

[44] Alexander, Christopher, et al, *A pattern language: towns building construction* (New York: Oxford University Press, 1977) p87

maximising the gains of natural daylight and ventilation a schools energy costs can be noticeably reduced.

The writing of architect Christopher Day highlights the classroom's connection with the outside world is a fundamental element in future school design, this is supported by the visited case studies in chapter six. To encourage generations of environmentally aware children, an interaction with your local climate and surrounding landscape is vital. The most effective learning method for children is through hands on experience. Making nature visible within a school surrounds children with the natural patterns of life.

> *"De-natured environments ignore our need and our potential for learning. Making natural cycles and processes visible brings the designed environments back to life. Effective design helps inform us of our place within nature."*[45]

The interior exterior threshold from the education space is one of the most important in the whole school. Learning through contact and experience is a necessity. Every opportunity in a design should be explored to create strong connections between indoor spaces and external learning terraces, gardens and outdoor vistas.

> *"The more outside spaces integrated as an extension of the field of learning, the better the children fare both emotionally and developmentally."* [46]

3.5. The Learning Community

The expression 'learning community' not only refers to the desire to involve and enrich pupils, teachers, parents and the wider community but a new approach to the design of the traditional school. A school is no longer composed of classrooms but learning 'suites or clusters' which for all ages should support numerous learning methods; Independent study, peer tutoring, team collaborative work in small groups, one on one learning with a teacher, lecture format with a teacher at centre stage, project based learning, technology based learning with mobile computers, student presentations, performance and music based learning, outdoor education, seminar

[45] Van der Ryn, Sim, *Ecological Design* (Washington, D.C. : Island Press, 2007)p185
[46] Dudek, Mark, *Architecture of Schools: the new learning environment* (Oxford: Architectural Press, 2000) p109

style instruction, community service learning, social/emotional learning, art-based learning, storytelling and learning by building (a hands on approach). The incorporation of multiple learning methods into a curriculum is often described as holistic education. The term suggests an approach to learning which fully engages all aspects of a child on a level of 'mind, body and spirit'. In a practical sense it refers to a learning process which is based on the premise that by exercising each of the human modes of thinking, feeling, imagination and physical, the sum is greater than any individual method. Through connections with other individuals, the community and the natural world, the philosophy implies every pupil finds identity and primary human values within the education process. In terms of mainstream education I believe the concept of holistic education is more easily applied, and in some ways more valuable at primary level when education is encouraged through discovery.

The micro communities within a school provide a safe nest for young children. Familiar surroundings where they feel safe and can concentrate are vital to the education process. Areas they can call there own, be proud, decorate and want to maintain. *"There can be no adventure without a home-base to return to: everyone needs some kind of nest to fall back on."* (Hertzberger 1998, p28) Giving the children the ability to control their environment to a certain extent, provides them with a sense of ownership as well as valuable lesson in self sufficiency. For example; allowing them to regulate the central heating per classroom or zone within a learning suite, will heighten the children's understanding of warmth within a building; competition between pupils on lowering the cost of heating per week will aid in their understanding of the use of energy and the simple measures to preserve it. The engagement with the building as a learning tool is very important. Design is one aspect, training the teachers who will "live in it" is just as crucial.

A learning community has to be fairly complete with toilets, its own links to the outside, and in terms of variable space be able to accommodate as many of the new holistic learning methods as possible. The learning communities or neighbourhoods must then be connected to create the overall town or school. These 'connectors' as termed by Nair and Fielding, whenever possible can also be used as unifying elements for the whole school, to provide identity. A popular modern concept is for the connectors to be seen as a learning street (like the main street through a town.) A

learning street can take many forms. It provides locations for some of the other learning methods which are not found within the learning community. The street orientates the users with direct vistas to other areas of the school and provides valuable lingering and display space for students, teachers and visitors.

The threshold between a classroom suite and the main learning street can be viewed as a lobby or porch like area; the transition between areas of varying territory. This important public to private threshold regulates the contact, offering a degree of openness to the street whilst maintaining the required seclusion. It can provide a stage or workspace to showcase the work and activity of the learning community beyond. The in-between space connecting school grounds and surrounding community provides a location for social interaction between parents. It unites members of the wider community. *"The threshold of a built facility is just as important for social contacts as thick walls are for privacy."* (Hertzberger 1998, p35) A welcoming entry is a very valuable element of school design. This threshold should be inviting and contain a signature element which gives the school identity relating to the wider community. Architecturally a welcoming entry should provide a sheltered transition into the school grounds; a safe zone for waiting, dropping of students. It provides a ceremonial quality to the school as a whole. This community space should contain the 'gate house', the reception/office space that monitors the entry into the school. It is also an opportunity to highlight that this is a place of learning; a welcoming entry may contain display space, views to students at work or even a space for one particular kind of learning method. It could also be viewed as a meeting place, a place where parents can begin to build friendships and social cohesion, a place for two way communication between the school and the community.

3.6. Streets and Settings

When discussing the concept of street, the relative notions of interior and exterior space must be incorporated. The way in which materiality, form, dimensions, illumination and vegetation are handled can change the way in which people perceive a certain space. The spatial quality created by a designer through the careful

organisation of these factors can diffuse the borderlines between what is essentially interior and exterior space whilst blurring the division of what is public and private territory within a street. This same notion can be applied to the concept of the learning street within a school. With a street of varying experience of openness and enclosure the changing space will also suggest certain usage. Through providing a sequencing of spaces provoking varying learning methods the boundary between classroom and corridor can be softened.

It seems the modern developer's prerogative is to smooth over with a paved mass the periphery of any modern building; sadly the author has witnessed this cheaper option all too often. I believe it's a safe assumption to say we are all aware the world isn't flat; however it seems to be the desire of man to level the land at any opportunity. On a local scale the topography of Britain, especially in the countryside of Wales is far from a spirit levelled car park. The most instinctive way for a person to connect with their surroundings is to take seat within it, to take a breath and look up. Just by sitting, one steps off the line of traffic, has an altered perspective and can temporarily absorb the surroundings. I am not simply referring to placing an arm chair in an empty space. Firstly an arm chair states its purpose and is not open for interpretation. It also can suggest ownership, privacy held to the owners of the space by being so obvious in its function. By introducing a step or wall to sit on, a railing to hang your jacket on, a column to lean against, featureless in-between spaces begin to provide a stage; *"always searching for an appropriate space in which to stimulate occasion."* [47] It is the challenge of the architect to sculpt the landscape so there is no wasted space, maximising the potential of often ignored in-between spaces that can be interpreted as pleased. *"So now we not only have city as building and building as city but also site as building and building as site." (Hertzberger 2000, p248)*

A learning street or public space's common downfall is its scale. If the street area is too large, too little happens in too few places, a square will assume a 'baron landscape' like character if it is too empty. Scale is a fundamental element of which the architect must control. The scale of a space goes a long way to dictating what a

[47] Van Bergeijk, Herman and Deborah Hauptmann, *Notations of Herman Hertzberger* (Rotterdam :NAi Publishers, 1998) p111

space may be used for. It is not simply the case that the larger an area the more activities it can be used for. If two people wish to take a seat and converse in an open courtyard, they choose the shelter of the colonnade perimeter or the ledge of the central fountain. A courtyard is full of space but it is the instances of 'place' that are chosen to locate oneself. *"They are the largest, most public rooms that the town has. But when they are too large, they look and feel deserted."* (Alexander 1977, p311) A courtyard can be described as a large scale form however it is predominantly circulation, an open crossing of motion. It is the small scale places which are repetitively used for an activity. It is this notion which should be explored when designing a learning street or cluster for multiple learning methods. A large open classroom provides space for any number of activities however actually caters for none. The issue of scale is therefore linked to that of flexibility. The architect should create opportunity for varied activities through careful fragmentation whilst maintaining a unified flow through the space. It is this concept that Hertzberger refers to as articulation of space.

3.7. Flexibility?

When new projects are discussed today, the need for flexibility is a commonly used phrase. It is considered sustainable to be able to reuse a space with a different function should the need for the previous cease. A neutral space can adapt to different functions, times and situations however is it ever truly efficient towards its initial intention? *"Neutrality in fact consists of the absence of identity."* (Hertzberger 1998, p146) The need for a changeable, flexible space which can adapt is financially very important to developers but also from a sustainable standpoint. If the school boundary is to be a permeable threshold to the community, the need for learning clusters to adapt to the requirements of community events and activities is very important. However if a space is void of any distinctive feature intended for a particular function, it is always in a state of uncertainty. The vagueness of a space will limit its success in providing desired functions.

> *"No building ever feels right to the people in it unless the physical spaces (defined by columns, walls and ceilings) are congruent with the social spaces (defined by activities and human groups)."* (Alexander 1977, p941)

An argued solution to the stale flexible space lies in the interpretation of the feature. A form that is inherently designed with a sense of permanence, with efficiency towards a suggested function, however, a form that can still be put to different uses without having to undergo radical changes itself. If this can be achieved, the identity of a space remains. The repetitive, lifeless flexible unit is avoided. Form and character remain despite perhaps a changing programme.

Hertzberger describes the interaction between user and form as the key to flexible space. Designers should *"organise material in such a way that its potential is fully exploited."* (Hertzberger 1998, p150) If a form is designed for a particular function it will inherently be better suited for that function. However, forms can be read in different ways by different people at different times. It is in this means of experience how the same form can produce different understanding; evoke varying images of use in individuals. *"Predetermining nearly every aspect of children's interaction with their environment limits the range of possible learning experiences, minimizing the development of creativity."* [48] By the way different users interact with form and interpret a space, the more functions it can serve. Despite being initially designed to its potential for a sole function, 'the space of form' can take on new meanings.

It is the role of the designer not to merely outline the possibilities of a certain space; these should be discovered or interpreted in the way of the user. However the architect should show the potential within reach should the need for adaptation arise.

[48] Dudek, Mark, *Children Spaces* (Amsterdam : Architectural Press, 2004) p43

3.8. Theory Into Practice_ The Bristol Metropolitan

The Bristol Metropolitan College opened its doors in April 2008. The school is a rebuild as part of the English 'Schools for the Future' programme designed by Wilkinson Eyre Architects. The community college has space for just over a thousand students aged eleven to sixteen. The concept for the school is a series of classroom clusters linked across an internal street to a linear strip of central facilities (see figure 18). This dissertation is focused on Primary school design for Wales however the Bristol Metrolpolitan is a prime example of modern precedent striving to achieve the educational philosophies outlined in the previous chapters. The following analysis identifies the attributes of the building and to what degree the modern concepts of school design are applied.

Figure 17: Entrance view of the Bristol Metropolitan

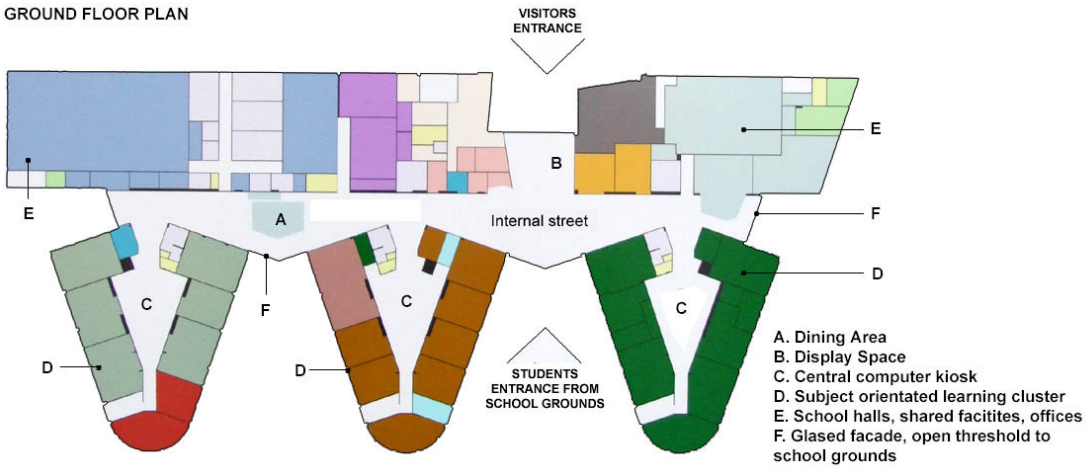

Figure 18: Ground floor plan of the Bristol Metropolitan

The design of the school is a positive approach to a holistic education. The intension of the clusters and the central street is to maximise the opportunities for learning outside the classroom. The street is the main hub of the school; it's the key circulation space and houses the main dining and display spaces (see figure 19). The undulating roof of the street and the composition of the threshold to the clusters are intended to provide an intimate scale and variety to what is a large space. The classroom clusters are arranged over two floors around a central computer kiosk (see figure 20). The clusters provide secondary smaller neighbourhoods to that of the main street. This dissertation is not focusing on the environmental performance of the schools highlighted; however it is worth noting the high environmental standards of the Bristol Metropolitan. It has a biomass heating system, uses natural ventilation and maximises natural light gains throughout.

The school was designed to promote the concept of inclusion, reinforcing its relationship with students and the community. The street and clusters are communal and the toilets all unisex. The intension was to minimise common locations of bullying within the school. The school is under passive supervision from staff with views from offices spread around the campus.

Figure 19: Internal street beneath the undulating roof

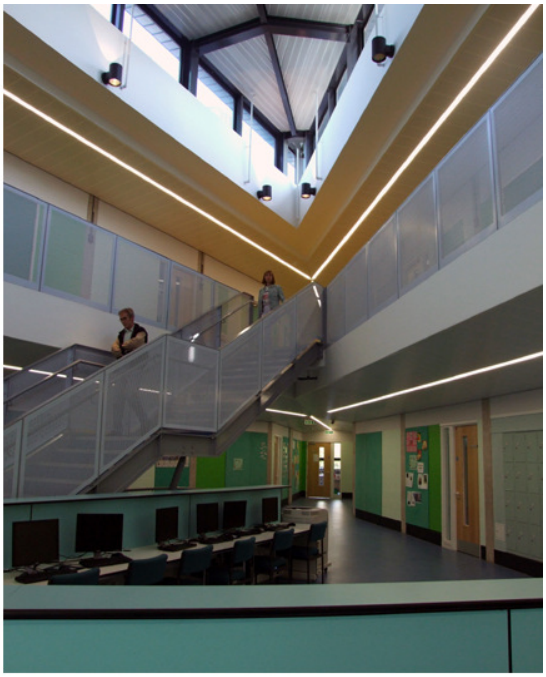

Figure 20: IT kiosk in central hub of cluster

On first impressions, the school appeared to be built to a high standard and with a high quality of conceptual endeavour. The clean new finishes and latest technologies employed are very inspiring and there is a certain grandeur to the whole complex.

The plan is very coherent to the modern concept of the learning street and classroom neighbourhood cluster, however it is the author's opinion that the venture stops there. The learning street has a slight air of shopping mall about it; it is fundamentally circulation or route and activity is restricted to the two café areas. The school since opening has been running at half capacity, however after a few years, when the school will have reached it's designed for number of students it would be interesting to query the success of the space. British climate factors and the structure of the school year necessitate that a large proportion of student's free time is spent indoors and the 'learning street' is designed to accommodate these occasions. There are so few instances of place within the complex (perhaps in an attempt to limit locations of bullying and provide passive supervision) that the street may become a stale social space.

Figure 21: Café area at the end of the internal street

The success of the schools highlighted in chapter 3.1, such as Hertzberger's Montessori school in Delft, is the fine detailed articulation of space. Consideration is given to every 'in-between' space as opportunity for activity to occur. Excluding the two café's at either end of the street (see figure 21), in the whole volume there is not

one opportunity to rest your feet outside of the classroom. The Montessori school takes advantage of the entrance steps as seating through to the subtle internal level changes creating a hierarchy of zones. In the authors opinion it is slightly frustrating to see the missed opportunity to sculpt the landscape of the street, articulate the space into more than a sterile strip for hundreds of children to stand side by side in.

As previously mentioned the design does follow a classroom cluster arrangement, and this is specifically what it is. It is a traditional corridor classroom arrangement however misshaped into a cluster. The new shape does provide the space for the locations of the IT kiosks and opens up the corridor to provide views across the two levels. However it is in no way a suite with varied places for different activities. The variety in the colouring of the internal facades helps you orientate yourself within the school, however the central hub of the clusters are identical. Each hub is successfully illuminated with natural light however there are still several awkward zones within the corridor spaces and under the stairs where moments of 'place' could have been investigated (see figure 22). It is the lack of possibilities and 'movement patterns' as described by Christopher Day in chapter 3.4 that give the street a very institutional feel.

There are some very successful moments within the building. The IT kiosks in the centre of the clusters and the seated café areas at either end of the street promote a more holistic approach to learning. The large expanse of glazing connects the street with the external landscape in places quite successfully and the careful positioning of offices and windows do provide an element of passive supervision (see figure 23). The two storey glazed walls (which can be seen at the end of the learning street in figure 21) do bathe the street in natural light and provide a transparent threshold to the immediate external play spaces. Following the discussion in chapter 3.4, the connection could have been strengthened, perhaps through some vegetation within the street, a continued floor finish or zoning of the internal external threshold with semi exposed spaces.

Figure 22: Redundant space within clusters

Figure 23: Passive supervision

The school is beginning initiatives to integrate the wider community. The hiring of sports/music and drama facilities, evening classes and performances to the community are all underway with the new term. The Bristol Metropolitan is an exciting new school built to a high standard with the latest technologies; it will be interesting to observe how the architecture informs its operation from an educational and social view over the coming years.

3.9. A Lost Opportunity? – Legislation, Budget and Programme

The author's design for Williamstown Primary school is an idealistic interpretation of the gathered research. An idealistic design has no constraints of budget, legislation or programme. Excluding the underlying factor of the skill of the design team, one has to ask how much of an idealistic design can be achieved if these factors are included?

Legislation: architects will always have to work within guidelines. An important skill of the architect is to design with guidelines in mind from day one so they do not hinder an already developed design. This is about preparation and understanding from early on in a design process. In the authors opinion however, it is important that architects continuously challenge regulations within school design to prevent environments becoming so scripted that they remove the freedom for childhood play and exploration.

Budget: another fundamental for an architect is to achieve a client's ambition within a given budget. With regards to school design, unless from a private source, budget is determined by the size and location of the school as a proportion of a wider government grant. Economics are an obvious obstruction. Evidently, with larger funds there are greater options open to the designer. However, throughout history some of the most ingenious designs have developed as a result of the constraints of budget. Maguire and Murray's St. Luke's Bow Common Primary School highlighted in chapter 3.1 is an example of revolutionary design on a minimal budget.

If legislation and budget can be accommodated, **programme** must then be a considerable contributing factor to poor school design. This theory is based on the experiences and research of the author. The large majority of school projects today are delivered on design-build contacts. A design-build contract has a reduced programme length, as design and construction stages overlap. This form of contract gives the design team a very short design development period. To achieve a functional, personalised school design with thriving cultural connections and community involvement requires real design consideration and research. A process that is not included merely as a secondary gesture to accompany a planning application. Perhaps increased programme length and more design freedom would create greater identity to the schools being delivered today.

Over the past ten years, billions of pounds have been spent across the United Kingdom developing the standards of education and its buildings. Many excellent schools have been built to high environmental performance standards. From the research carried out however, it is the opinion of the author that there seems to be a sense of missed opportunity in the architectural community. There has never been such a large influx of money to develop school building, however, at the forefront running the show are often contractors and education authorities. During this affluent period the people with the design skills to question, reinterpret and improve the evolving environments in which children learn were often too far down the pecking order of decision makers. In the current economic environment and with the axing of the Building Schools for the Future and Primary Capital Programmes, it is now more important that any funds (in whatever programme is established) are spent in the correct way on the schools that require them the most.

4. LEARNING CURVE CONFERENCE

– *Designing Schools in Wales*

In December 2007 The Royal Society of Architects in Wales and Value Wales[49] held a week long conference to discuss the design of schools in Wales. The conference was accompanied by a design ideas competition. The key-note speaker of the *'Learning Curve'* conference was Dutch architect Herman Hertzberger. On the last day of the conference he presented his contribution with over fourty years work in the subject area. Hertzberger believes in creating spatial frameworks which can be interpreted and adapted to the users needs. He closed by encouraging us all to continue the debate of the future of school design. In August of 2008 the RSAW published the booklet of the review of the Learning Curve '*Designing Schools in Wales*' competition including the winning entry design by the author and his colleagues.

> *"It is the challenge of every architect to produce learning environments that stimulate, inspire and which can ultimately improve the daily lives of our children. Achieving this requires a balance of functional simplicity and architectural delight."* [50]

The conference inspired, and formed the foundation of this course of research. Beginning with the Learning Curve design competition, the author has continued to use design as a method for exploring the issues raised. Though critical analysis of the planning and operation of the schools featured in this research, and the studied literature, the author has developed a design response based on the theory extracted.

4.1. 'Learning Curve' Competition Brief

The competition was to design a sustainable primary school for a model local authority in South Wales. The location of the site for the school was on the periphery of Williamstown in the Rhondda. The region is on the side of a valley accessible from a major road, it contains a spread of mature trees and a small stream meanders across the site.

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[49] Value Wales_ branch of the Welsh Assembly Government which leads public sector procurement
[50] Healy-Jones, P. (2008) *Learning Curve, designing schools in Wales*, RSAW Publication. P30

Competitors were invited to consider the relationship between architecture, landscape, ecology and sustainable learning environments. The brief provided a suggested list of facilities, spaces and relationships to include in the design aimed at approximately 300 children. It encouraged the design entries not to simply respond to the schedule of areas but reflect upon the needs and activities of the children, the teachers and the wider community. With the target of zero-carbon building in Wales by 2011 the entries were asked to consider the environmental performance of the school. Designers should highlight the sustainable attributes of their schemes and the consideration towards the existing landscape.

The Judges of the competition were asked to assess the design based on the following criteria;

- the design quality of the schemes based on the internal and external spatial quality and organisation;
- the indoor environmental quality, delivered through effective ventilation and daylight strategies;
- design for the future – design for a flexible curriculum;
- the ability of the scheme to be adopted as a replicable model.

The judges also considered the capacity of the scheme to stimulate and engage with pupils and visitors; the extent of the innovation/originality of the design and the response to the issues of sustainability and other social factors.

4.2. Learning Curve - Competition Entry Statement

The following extract is the design statement in support of the entry from the author and his colleagues. The title of the entry was ‘cultivating a sustainable generation’. Please refer to volume two of this dissertation to view the full extent of the design entry.

> *Sustainable learning environments are only as effective as the interrelationships of two factors: the building design and the culture of the community (as ‘users’ of the building). A fuel efficient car can be designed but it will still need to be driven in a*

fuel efficient way; driving at 50mph uses less fuel than at 70mph. Architects can lead the way with a sustainable physical environment but it is the occupants of a building and residents of a community that have to create the sustainable social environment to complete the recipe for a sustainable future.

The concept behind the morphology of the site was to respond to the existing topography and ecology. The primary route weaves across the side of the valley mimicking the natural path of the existing stream whilst the physical interventions respond to the existing mature vegetation of the site. In addition to an appreciation of the value and potential of the existing landscape the arrangement of the buildings evoke a traditional townscape.

This sustainable learning environment involves the children in the cycle of community sustainable living. They monitor their own energy and water consumption; they grow their own food and recycle their waste. Every school year has allotment space for cultivating food and rearing small livestock. They deliver the food to the kitchens and are involved in the preparation of meals. The children recycle their own synthetic and organic waste and use the resulting compost on their allotments.

The social centre of the initiative is defined by a ring of community orientated buildings which will create a vibrant environment similar to a lively town square. The physical heart will be used by everyone from community volunteers who aid with the maintenance and cultivation of the allotments, the young and old through to the local farmers market on a Sunday afternoon. In addition to these activities and by way of linking to the community, the scheme proposes an exciting new venture to integrate art and music into the working of the school and to celebrate the traditional culture and heritage of the valley.[51]

All members of the design team went to primary schools in rural/semi-urban locations. We drew on our own experiences and memories about the successful aspects of our schools. Common themes were the varied outdoor play spaces, the connection with the landscape and the favoured moments of 'place' within each of our childhood learning environments. We considered the nature of rural play spaces and the sense of ownership you develop over your classroom. These ideas manifested in the individual classroom units and the romantic notion of the reading towers. We considered the aspirations within the brief to explore issues of sustainability and

[51] Design Statement in support of competition entry 'cultivating a sustainable generation' _ Author

conservation and challenged the way a school could be run. The design developed with a series of allotments and gardens in which the children themselves learn to cultivate and harvest to sustain their own school environment. Through this action they learn about the cycles of life and gain an appreciation of the landscape. The design team reminisced about our favourite days in school. These often involved community involvement and school open days. This progression led to the concept of the school as a town with the concept of the main playground as a town square which could be open to community use. The buildings surrounding the square lend themselves to community involvement, through local commerce, dining, or arts and cultural events.

Figure 24: Ground floor plan of learning curve design entry

4.3. Review of the Entry

The written review of the scheme focused on the fact that the authors design team were the only entry who *"dared to imagine beyond the brief."* [52] The proposal was centred on a schools link to its surrounding community. *"Engage with the real possibility that schools can be the catalyst to regenerate failing communities"* (RSAW). The review lists other positives including the response to the site, the site specific arrangement and additional community cultural centre. *"This design solution is a natural product of this place and could not have been derived from any other site"* (RSAW).

As this was a design competition the proposal was kept to a very imaginative and playful level. The design team believed it was appropriate to draw a scheme that was inspiring and fun for young children, which also educated them about their cultural routes, their futures and the way they live each day. A school which is not simply a 'closed centre' for children for the six hour school day, but an open community facility for all the family (see figure 25). It was this attitude and approach that the judges applauded. *"With visionary staff and a willing community, schools like this can transform the way we learn in Wales and play a part in the rejuvenation of our communities."* [53]

The concept of the school was seen as perhaps a romantic vision of the way we could one day live and learn in our communities. It obviously raised certain practical issues with the judges; the challenges of security and management of the site, the practical nature of our sanctuary reading rooms and environmental strategies (see figure 26). However it is the belief of the author that the theory behind the design is achievable and could be the direction school design takes in Wales. It is the aim of the author to develop the competition design (based on the original 'Learning Curve' brief), focusing on the specific nature and potential of bespoke teaching spaces without loosing the strengths of the initial overall conceptual endeavour.

> *"Well designed schools can contribute to raising the aspirations of students and parents, as well as motivating learning and achievement."* [54]

[52] RSAW comments. *Learning Curve, designing Schools in Wales,* RSAW Publication. p8
[53] RSAW comments. *Learning Curve, designing Schools in Wales,* RSAW Publication. p9
[54] S. Williams, (2008) *Learning Curve, designing schools in Wales*, RSAW Publication. p30

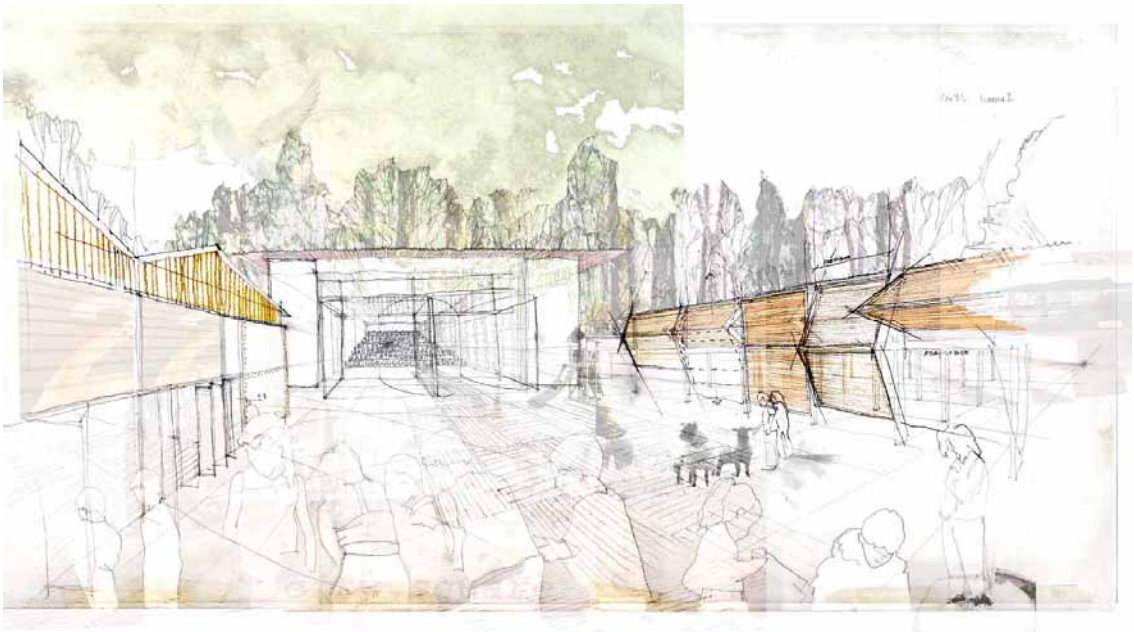

Figure 25: Town Square: dining pavilion on the right, hall in the distance and cultural centre to the left form the sides of this community square. Can open up for market days, sporting events, fates and performance events

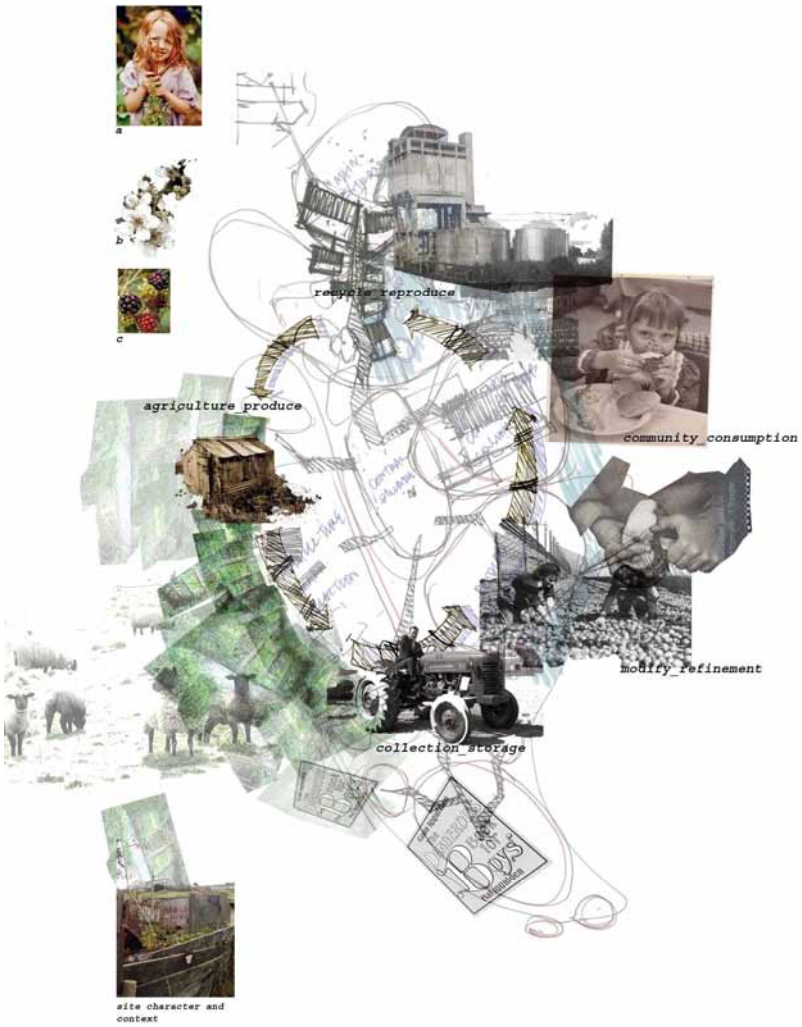

Figure 26: Resource concept diagram: a cycle of produce/ collection/ refinement/ consumption and recycle through the workings of the school

One of the stated aims identified by Jane Hutt AM[55] in the forward for the publication of the competition is for *"well designed schools which incorporate both environmental and functional excellence."* She also remarks that *"remaining adaptable and durable is crucial."* If a space is purely designed with flexibility in mind then it can never truly fulfil one purpose. As stated by Hertzberger in chapter 3.7, *"Neutrality in fact consists of the absence of identity."* Therefore it is the challenge of designers to create functional places which can still be adaptable. It is the belief of the author that true 'functional excellence' can not be achieved through a modular open classroom design. Only with the carefully arranged fragmentation of space will future school designs truly cater for the modern variety of learning methods.

Through design it is the author's intention to investigate the theory surrounding flexible articulated space and to apply it to the development of the 'Learning Curve' school design. The proposal for the design competition was described as being too inflexible. One of the successes agreed by members of the judging panel of the other joint winner was the ease of flexibility. It is the author's opinion that the ease of flexibility is produced by the stale traditional nature of a lot of repetitive spaces; the open plan classroom, void of 'place'. It is widely debated that this kind of environment is the wrong direction for school design in the future. It is understood that there is sometimes a requirement for this type of open space, for example in an exam situation in secondary school design, however if a sequence of spaces can be developed specifically for numerous modern learning methods which may be interpreted for different functions, perhaps a model for future school design can be achieved.

[55] Jane Hutt AM, Minister for Children, Education and Lifelong Learning and Skills

5. METHODOLOGY

In order to gain a more comprehensive understanding of primary schools and the direction of sustainable teaching methods in Wales the author visited the following case studies; Llanbedr Primary School, Edwardsville Primary School, Rogerstone Primary School, and Nant-y-Cwm Steiner School. The case studies are all considered 'sustainable' primary schools, however they portray a cross section of the variety of schools in Wales. Each school has unique sustainable attributes, cultural and social interactions with its community, methods of providing a flexible learning environment and educational philosophy;

- Llanbedr Primary school is a traditional church of Wales school,
- Edwardsville primary school was the Wales Eco-School of the Wales in 2008,
- Rogerstone primary school was built in 2007 labelled a flagship eco-school using the latest in sustainable technologies and building methods,
- Nant-y-Cwm operates under the Steiner educational principles.

The schools were selected as they are all well established successful schools with many positive characteristics to be evaluated and compared. The author chose not to analyse recently completed schools or new buildings under construction to avoid the influence from their proposals. The design concepts developed through this research are to be derived from the successful attributes of working community schools and not the ideals of another current design team.

There are many issues surrounding visitors to schools in today's society and this research carried significant ethical implications. Therefore the method of research carried out during each of the case study visits varied slightly depending on the opportunity presented to the author from each of the schools. (For the full methodology for the case study visits and the ethical approval applications please refer to the appendix.)

The research into each of the case studies followed two phases. Each phase required a different ethics approval from Cardiff University due to the nature of the research. The

Ethics Approval for phase 1 is completed based on the author's interviews with the teaching staff; phase 2 is based on interaction with the children of each school.

5.1. Phase 1 of Case Study Visits

The first contact made with each of the schools was through a written letter requesting an opportunity to meet with the head teacher to discuss the research goals and any further investigation. Each school is significant to this research for different sustainable rationale however themes such as the sustainable technologies; the classrooms design for multiple learning methods; flexible communal space; the extents of teaching outside the classroom and the schools connections to the community, its local history and culture are elements for investigation in all the case studies. The preliminary research into each of the schools revealed features of design and practice which provoked particular interest. However to investigate some of the more common themes of school design a set of structured questions were asked of each of the schools. (Please refer to the appendix section 11.3 for the full list of questions and the transcript of the answers.) The following summarises the key themes covered:

Organisation of the school

How has the school layout been arranged? What are the functions of the communal spaces within the school? Are the spaces used by people other than the children, the wider community or visitors for example? How are the spaces used: for example display space, threshold/gallery to classrooms, lingering/meeting places, orientation within the school, passive supervision?

Independent Learning/ the Classrooms

The Welsh Assembly Government advocates an education based on life-long learning. A nation with the opportunity and ambition to learn at all ages. This starts at the foundation level in primary school with children developing the ability to learn independently. How does the classroom support an education based on independent learning? How does the classroom design support/hinder the variation of learning methods and tasks undertaken within the spaces?

Outdoor Environment

How much teaching takes place outside the classroom and for what kinds of activity? Do the school grounds support this style of education of learning in an outdoor classroom? Has consideration been given to the design of external spaces to encourage the learning process outside the classroom? how successful are the connections between internal and external play education spaces.

Community Involvement

How much involvement does the school have with the local community? Do the children benefit from any community facilities and vice-versa? Does the school hold evening classes, how does the school accommodate the change in function of the spaces?

Does the school uphold cultural traditions? Is the history/culture of the area involved in the daily teaching/play of the children, in the design of the play spaces or perhaps in the architecture itself?

5.2. Phase 2 of the Case Study Visits

The second phase of research into the four case studies varied depending on the children, staff and areas of the school the author was granted access to. The research was observational and included all the fundamental elements of site analysis, from community connections, typography and climate through to people, habitat and the use of the already created spaces within the school. Through sketches, ideograms, analytical plans and sections the author recorded as much information as possible during the visit, again based on the following themes of:

- School organisation
- The classroom design
- The outdoor environment
- Community and cultural inclusion.

For a full list of the observational research elements that were considered and analysed during the visits please refer to the appendix section 11.4.

The author questioned teachers about the common practice of the children and the popular spaces. He investigated the amount of education that takes place through experience; the level of independent learning and freedom the children are granted to choose activities and how the design of the school helps or hinders the way they wish to teach.

The four case studies are all successful sustainable schools and will be analysed following the same structure outlined in the appendix, however, there were areas of interest particular to each which required individual investigation.

1. Llanbedr Primary School

Community Involvement: The school has strong cultural routes and is at the heart of its community. It has educated children in the village since 1728 and still maintains its close connection with the parish church of St. Peter. The author wanted to understand the history behind the community village school, how it upholds cultural traditions and the nature of its relationship with the community.

2. Edwardsville Primary School

Outdoor Environment: Edwardsville has been nationally rewarded for its integrated culture of sustainable education. The grounds are equipped, and regularly used as an outdoor classroom. The school contains a herb and sensory garden, it is situated in an area rich in culture and transformed its front garden into an eco-historical sculpture park. The author was interested to learn more about these areas, what do they include and how do the children interact with the environments. Last summer the school built a cob play shelter within the school grounds. It is used to educate about welsh history as well as present day issues regarding local sources and connections to the earth. The project had the children involved in the construction process and is now used as an educational tool as well as a site for play. The author required more information about this project. Were there things that could be done more successfully and could the

materials, construction and teaching methods be transferred to a grander scale within the school?

3. Rogerstone Primary School

Organisation of the School: Are the sustainable technologies within Rogerstone School used in the teaching? For example, do the children measure and control their own energy use or are the technologies merely part of the building fabric.

Community Involvement: The author was interested to investigate the success of the adult learning and community activities within the school. How are these accommodated within the school spaces?

Outdoor Environment: Rogerstone is a promoter of outdoor learning. Within the grounds are a sensory garden and an adventure playground. During the visit the author wanted to investigate the connection the students have with the 'outdoor learning spaces.' How are these environments involved in the schools philosophy of developing children who can learn independently?

4. Nant-y-Cwm Steiner School

Organisation of the School: Nant-y-Cwm is the only Steiner primary school in Wales to educate up to GCSE level. Education at the 'Foundation Phase' in Wales is now based on a more 'Steiner', independent learning style approach. The author was interested to learn more about Steiner education, the underlying philosophy and the methods of teaching. The pedagogy requires a strong connection to nature with specifically designed spaces and toys at different age levels. Through visiting the learning spaces the author can understand how they support the independent style of learning, investigate the level of freedom the children are given and how it is monitored and controlled.

6. CASE STUDIES _ PRIMARY SCHOOLS IN WALES

The following chapter documents the four case studies visited by the author following the methodology outlined in the previous chapter; Llanbedr Church in Wales School; Edwardsville Primary School; Rogerstone Primary School and Nant-y-Cwn Steiner School. The schools were chosen due to their diverse histories, locations within Wales, scale and educational philosophies. Each case study however is from a rural or semi-urban site and is structured with a focus on the cultural background of the school; the architectural organisation; the use of the classroom spaces; its outdoor teaching environment and the schools community connections.

6.1. Llanbedr Church in Wales School

Figure 28: Llanbedr Church in Wales School

Figure 29: Llanbedr Church in Wales School aerial plan highlighting site

Llanbedr School has been educating children in its village since 1728. It is situated in the heart of the Black Mountains just north of the town Crickhowell. Common to many new schools of the time, it was established through the Christian community in the local church of St Peter. The school was first housed in the village rectory and educated children to the protestant Church of Wales ideals. In 1911 a new school building was built. The building was typical of the time and style of education; a stone building consisting of a small school hall and several adjacent offices for the school master. Due to changes in teaching methods and the increased numbers of children wishing to attend, the school expanded in 1990 with the construction of three new classroom spaces. The new classrooms were an extension of the old stone building with the hall remaining as the main communal space.

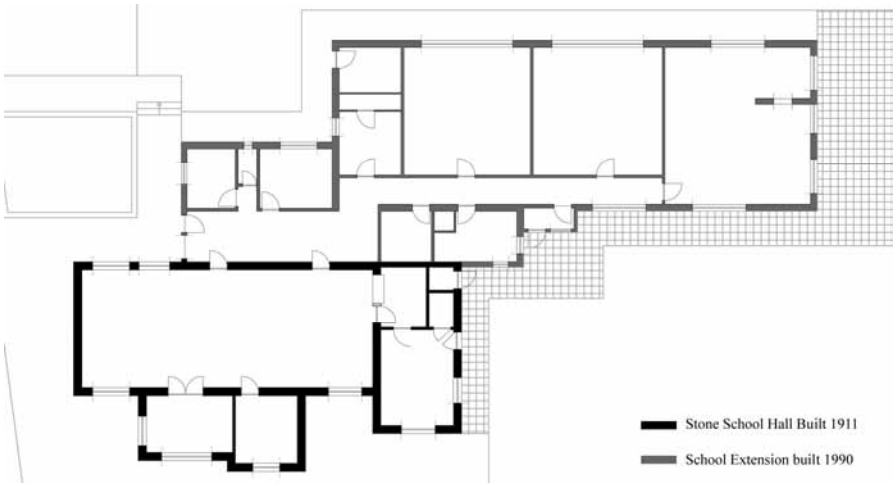

Figure 30: Plan of Llanbedr Church in Wales School

The School educates children aged three to eleven. It holds the Primary Quality Mark[56] and is an accredited Eco-School. The school still has a strong partnership with the local St Peters church with collective worship incorporated into the daily school assembly. The school follows a religion based education of the Christian calendar. Special events of which are still held at the church of St Peter. The school is bilingual with every interactive word game or poster in the school in both English and Welsh.

6.1.1 Organisation of the School

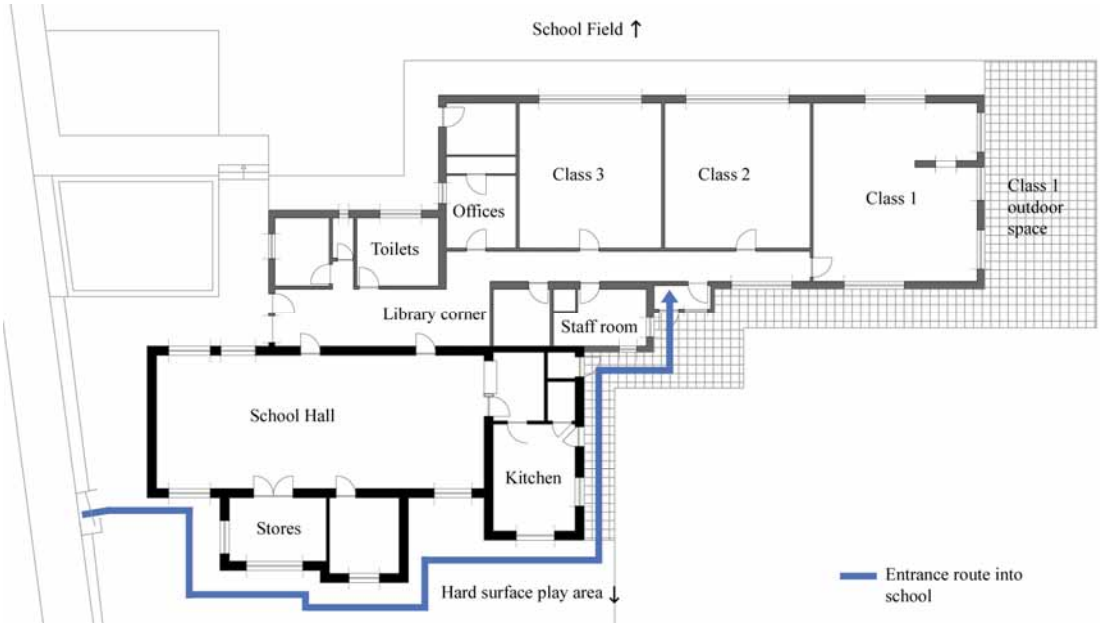

Figure 31: Organisation plan

[56] The Primary Quality Mark is a nationally recognised symbol of good practice in the teaching of basic skills.

The school grounds are raised from the road providing an element of security and a swing gate prevents any child from being able to run directly into the road (see figure 31/32). To enter the school one must loop around the front of the old stone building past the staff room to a double door system with a door bell and sign in. The route to the entrance provides a sense of protection. From the doorway you enter into a long corridor which services the three classrooms (see figure 33). The corridor is an exhibition space for the school. It contains a visitor's book, the schools trophy cabinet, a gallery of recent projects the school has been involved in and photographs of the children, teachers and governors. It is a welcoming entry, full of colour and light with a warm sense of achievement and security.

Figure 32: Main entrance through Swing Gate

Figure 33: Main circulation corridor

The three classrooms are arranged to suit the needs of three different age groups. Class 1 is the reception class for children aged three to five. This classroom is the largest in the school and also has its own adjacent external space. It is the most complex of spaces in the school. The classroom has to accommodate numerous learning methods and activities which often occur simultaneously. There is a ratio of one teacher to every eight children at this level to observe and monitor the children's activities. The class contains a kitchen area, a role play area, an IT kiosk, a reading nook, a large carpet area and numerous small desk arrangements. Class 2 is for children aged six to eight, here there is ratio of one teacher to every 15 children. The classroom also has a clear zoning with a kitchen area, IT kiosk and role play area. The resulting space is filled with groups of four to six desks. The ergonomics of the furniture are all designed for slightly larger children but the classroom is still arranged for simultaneous multiple activities. Class 3 is for the oldest children in the school aged nine to eleven years. In Class 3 there is a larger IT kiosk stretching the

length of one wall and a small kitchen area. The rest of the space is filled with desk arrangements. In this class however the furniture are the traditional flip top storage desks. Each child has a specific space, an ownership over a desk space unlike in the younger aged classes.

The old stone school hall is still the centre to the school (see figure 34). It is the largest space used by all the children. The space is the setting for morning assembly, indoor sports activities and is the main dining hall. The eastern end of the hall contains a large opening in the wall, a serving hatch to the kitchen. The school is proud to have an on site cook who prepares the children's meals daily from locally

Figure 34: School assembly hall

sourced fresh ingredients. The west end of the hall is described as the stage. It is set out for the daily assembly in an arrangement much like that of a church. There is a small table with the bible, hymn books and a candle in the centre. There is a piano to the side to accompany the morning worship and a backdrop of a religious collage made by the children. On the north wall is a large climbing apparatus that can swing into the space for physical education lessons and on the south a series of store cupboards. As with the classroom environments the hall is also slightly hindered by the problem of lack of storage. The stage is a series of movable blocks which cannot be fully utilised due to the obstruction of the storage trolleys. Every classroom has a role playing area and the desire to put on performances on a larger stage was evident from both the children and teachers.

6.1.2 The Classrooms

Common to each classroom was the quantity of used wall space. Every wall is covered in either examples of the children's work or a form of interactive learning (see figure 35).

Figure 35: Classroom 2 – Wall coverage with interactive displays and reading corner

Interactive walls are an important feature of each classroom; they cover the fundamentals of learning such as number, colour, pattern and language. The school changes the interactive walls depending on themes for the month, the games become geographic, religion based or linked to a historic period etc. The school teaches through a style of independent learning. The children in the younger two classes have a freedom to choose activities for a large portion of the day. The oldest year 5and 6 children are also given a certain freedom. However, they have a closer curriculum to follow in preparation for secondary school education. The interactive walls are an integral part to this style of teaching; they are another façade for the children to experiment with. The children can choose which game to play, which interaction to participate in whilst all the time under the observation of the skilled teachers. The observation of the teachers is perhaps the most vital part of a style of education based on independent learning. The teachers have to maintain a passive supervision over the whole class, monitoring the patterns of activity the children are involved in whilst encouraging the array of activities with which to participate. To aid the supervision of classrooms 1 and 2 there is an open hatch between the classrooms at an adult eye level.

The eye level of children especially at the early infant level differs greatly to that of an adult therefore consideration to the perspective and proportion of the classrooms is

very important. Beyond the ergonomics of the children's furniture within the classroom, the height of bookcases, partitions etc. can aid in the supervision of separate zones. In class 1 the children are provided with an enclosure behind a low bookshelf but are easily visible from the height of an adult. The classroom's reading nook uses a curtain to lower the entrance height to that of a child, again creating a reading 'den' like environment however an opening on the adjacent wall set at a viewing height for an adult allows supervision (see figure 36). There is a fine balance which has to be considered during the design phase of a school between creating zones within a classroom that can give the children a sense of privacy whilst maintaining a passive supervision.

Each classroom within the school has its own IT kiosk (see figure 37). The classrooms are small and are already having to accommodate numerous learning zones. Through interviews, it was agreed by teacher and children alike that a separate

Figure 36: Class room 1 – role play/reading 'den'

Figure 37: Classroom 3 - IT kiosk

IT lab would be much preferred. IT appears to be the one thing that is difficult or unnecessary to accommodate within the fragmented space of the classroom. Issues of untidiness and clutter between zones, specific tuition requirements and simple scale of the IT kiosk interestingly made it the first thing the school would change.

From the authors own observations and discussions with the staff, all the classrooms have major issues with storage. Shelving is effectively used as partitions between some classroom zones and the carpet areas contain large seating/storage steps. However the classrooms are cluttered with the amount of equipment this education

level requires (see figure 38). An interesting interaction that the children participate in each day is upon arrival to the school the children take their own register. They remove a small photo of themselves from a blank wall and place it onto a graphic of a homely looking school. The children are encouraged to develop a sense of ownership over the classroom, yet the environment suffers slightly from its lack of storage options. It is more difficult to teach a sense of responsibility to a child in cluttered surroundings.

Figure 38: Clutter of storage

Another common issue raised by staff members was the spreading of untidiness between classrooms zones. The children participate in numerous untidy activities which are easily spread. A separation or containment of zones was considered necessary from an early design stage to counteract the user problem. During the authors discussion with the teachers the connection between zones within the school was also mentioned with regards to the thresholds to the outside. Class 1 has the only direct access to the outside through a glass sliding door. Due to several factors such as the climate of the country and once again the spreading of mess between zones the connection to the outside is far from ideal. The school is very keen to have direct connections to the outdoors from all classrooms, however the threshold needs to be carefully handled. Classrooms 2 and 3 contain large ribbon windows that stretch almost the length of the north façade (see figure 39). From the eye level perspective of a child there is a strong relationship through these widows to the school field beyond. Due to the slope and height of the field in relation to the classroom widows, there is a sense of continuation of the landscape into the classroom space. Sadly, with no access, this connection is not directly made. The school would relish the opportunity to spill out of the classroom into the landscape to educate outdoors where possible.

Figure 39: Class room 3 – window connection with landscape

Figure40: Adventure playground with willow stick shelter

6.1.3 Outdoor Space

The School has four main types of outdoor space, the hard surfaced netball court to the front of the school, a large playing field, an enclosed garden for Class 1 children and a small nature garden. The main field is quite a varied space, it contains an adventure playground and a shelter made from bent willow sticks (see figure 40). The structure was a school initiative which involved the children in class 3 and it is now a play shelter. The field contains a small football pitch, with a running track down one of the longest sides. The perimeter of the field is outlined by numerous large trees. The trees are valuable creators of 'place' within the school grounds. Slightly hidden from the teachers under the shelter of the canopy, they are the favoured socialising spots for the children. The adventure playground is also a very popular element in the space. Sprawled along the eastern edge of the field are numerous timber structures that can be used in a variety of ways as settings for games. What is clear from the teacher's comments is that the most favoured spaces of the field are those with a sense of location or place. Unless there is a football match the open field is predominantly empty. The arrangement of smaller zones within an outdoor space is clearly as important as those inside the classroom.

The nature garden is used by all the classes in the school. It contains a small pond, a log circle and a large bird table. The garden is a popular space with many of the children however, it can only be used under supervision. The garden is mainly used in summer as a teaching aid about nature and the environment providing an opportunity to take the children out of the classroom and experience things first hand.

Figure 41: Class room 1 – Outdoor play space

Figure 42: Classroom 1- Outdoor interactive games

The enclosed garden for Class 1 children consists of a small hard surfaced area along the edge of the school building and a fenced off portion of the field. Within the area are a few sheds containing games and movable structures for outdoor play (see figure 41). As with the classrooms the fence of the hard surfaced area has an interactive word game across it for the children to play with (see figure 42). The school felt it necessary to provide the younger children with their own area. Firstly they require more supervision but it also prevents the younger children from being overwhelmed by the older children on shared facilities.

The hard surfaced netball area to the front of the school is predominantly for sports and when the field is too wet to use. It is an awkward trapezium shape in which a full netball pitch cannot be accommodated however it contains two netball posts for play time activities. It is a very traditional stale space, enclosed by a four foot iron fence. As with the nature garden, it is a space the staff would like to improve, to increase the potential of the varied outdoor learning environments surrounding the school.

The school has no outdoor covered space. There is no external play space sheltered from the elements and nowhere for parents to wait comfortably for their children at the end of the day. An external covered space could be in the form of a small pavilion within the school grounds or integrated into the thresholds of the classrooms, however the value of such a zone is understood and on the development list for the school.

6.1.4 Community Involvement

The school has a good relationship with the local farmers and encourages healthy eating of local produce. The school regularly involves the parents and the community in school activities. Last year for example the school held a ‘dig and plant day’. Children and parents planted fruit trees and blackberry hedges which took very well and this year they harvested the fruits.

The school has limited parking however it is easily accessible by foot for everyone in the village. The school has its own minibus to collect any children from outside the two mile catchment area. Encouraging children to walk to school promotes interaction between parents building friendships in the community.

The school is in close proximity to St. Peter’s church and the community hall on the fringe of the village centre. Llanbedr has strong connections with the church and holds seasonal events in the church. There is a safe, sense of community existence to the whole village which is idyllically situated amongst the green fields and mountains of the area.

6.1.5 Conclusion

The children of Class 3 described the library space as their favourite space within the school (see figure 43). It is a small area located in the bend of the corridor on route through to the hall. A pleasant space with a small table and chairs arrangement, some storage seating and two walls of floor to ceiling book shelving which is all illuminated by a roof light. The teachers supported the children’s views commenting that many ask to go and work in the space. It has a slightly more secluded feel to that of the zones within the classroom, a calming light quality which I believe bestows a sense of maturity within the children when they are given permission to work there. The scale of the school restricts the repetition of spaces such as this however it highlights the importance of variation of ‘place’ within the learning environment.

Llanbedr primary school has shortcomings due to the age and form of the building as it attempts to adjust to changing learning methods. However it is full of traditional culture, rural character and strong community integration. It is a local school built to accommodate the children of the village, an example of a school as the heart of the community.

Figure 43: Shared Library Space

6.2. Edwardsville Primary School

Edwardsville is an amalgamation of smaller schools in the Merthyr area which opened in 2005 and now educates around 360 children. The school mainly serves children from the town of Treharris and the surrounding villages. It is located on the fringe of the village of Edwardsville, nestled into the edge of woodland on a valley hillside (see figure 44). The school building originally erected in the early 1970's is typical of the time period. A poorly insulated steel frame and flat roof 'shed' with brick and glass infill. The school has had double glazing throughout, however, it is still reliant on excessive heating to maintain a habitable environment through the colder months. The shortcomings of the structure are offset by the surrounding landscape of the school, its external education spaces and the practice of sustainable education.

Figure 44: Edwardsville Primary School aerial view highlighting site

Figure 45: Edwardsville Primary School - eco-historical sculpture park entrance walk

The schools mission statement is "Excellence in a quality C.H.I.L.D.environment; ***C***aring, ***H***appy ***I***ndividuals, ***L***earning and ***D***eveloping together for our future". In November 2007 they received the International Eco-Schools 'Green-Flag' status and have had official 'Healthy Schools' status for the past two years. The school had also been the runner up for the Welsh Heritage Award in 2005, 2006 and 2008. However their highest accolade to date was the award for Wales' Primary Eco-school of the Year in 2008.

6.2.1 Organisation of the School

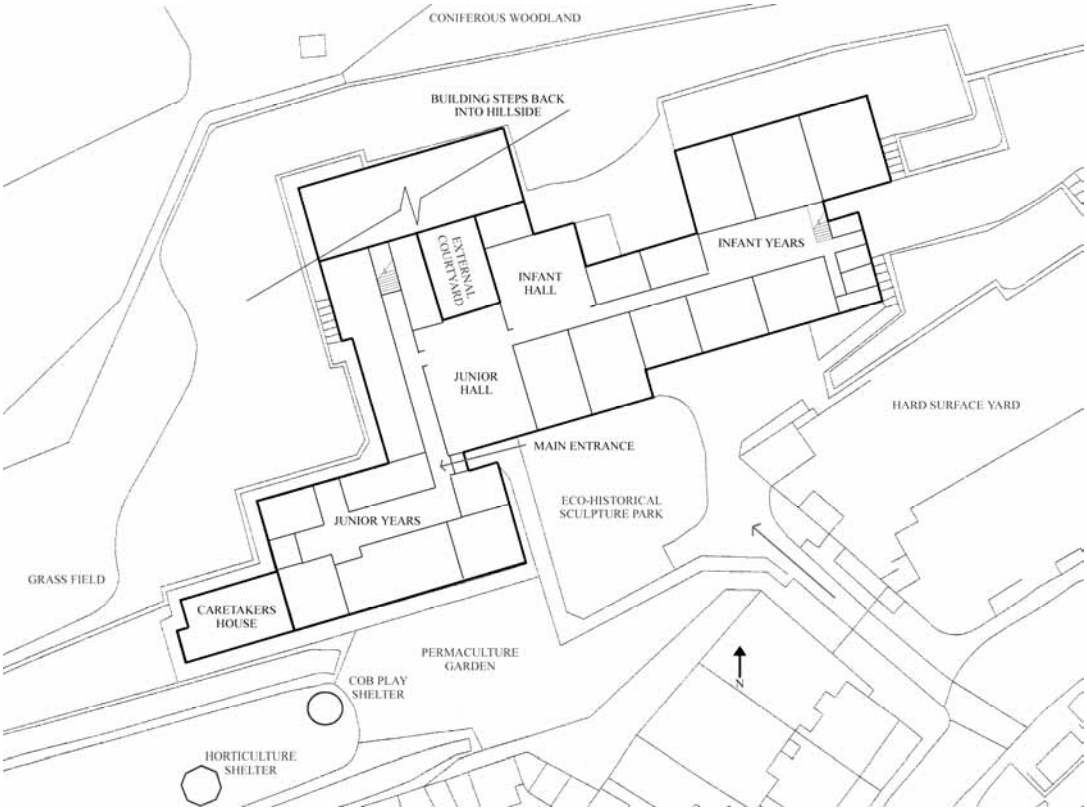

Figure 46: Organisational plan

The main entrance to the school is set back off the roadside through a security gate. The large areas of concrete playing yard are adjacent to the road and used out of hours by the local children as well as during the school day. The school has a caretaker who lives on site and is responsible for the security and daily maintenance of the building. The front garden of the school has been transformed into an eco-historical sculpture park (see figure 45). The stages of planting beds contain plants

originating from different stages of history. The garden provides a welcoming entrance and is also used for teaching. The garden ends at the school porch with a sculptural element. A large steel coal mining tram contains the final flower bed and is an evocative symbol of the culture and industrial history of the area (see figure 47).

The entrance consists of a series of double doors with a window to the main administration office. Visitors must sign in and be acknowledged before entrance to the school is permitted. The school also has security cameras observing the school gates with a live feed to the office. The entrance lobby is a cheerful display space highlighting the achievements and current activities of the school. The first display opposite the entrance emphasizes the schools commitment to the Eco-Schools program, a clear indication of their educational philosophy (see figure 48). The lobby also contains a stand alone traditional flip top wooden desk. It is a traditional icon and a charming insight into the function of the institution.

Figure 47: Main entrance to Edwardsville Primary School – Steel coal truck from the eco-historical sculpture park and the covered entrance

Figure 48: Eco-Schools display

From the entrance lobby the school is arranged into two halves, one section for the children in the infant years (aged 4-7) and the other for the juniors (aged 8-11). Each has a main hall located in the centre of the school with weekly whole school assembly taking place in the larger junior's hall (see figure 49). The on-site kitchen also serves the larger hall and provides meals for three smaller primary schools in the area. The two halves of the school are arranged differently due to the existing form of the

building however both have been adapted to provide flexible space and suit the multiple learning environments of the two different age groups of the children.

Figure 49: Junior main hall

Figure 50: Central IT zone in the junior section of the school - passive supervision through large areas of glazing from the adjacent classrooms

6.2.2 The Classrooms

The classrooms for the junior section of the school are arranged in a cluster surrounding a central IT zone (see figure 50). Every classroom has direct access into this shared space and large windows from each class provide passive supervision for the teachers whilst aiding the distribution of light. This space shares no façade with the exterior of the building however, roof lights also bring sunlight down into the room. The internal windows maintain a sound barrier yet provide an element of transparency through the junior section and a sense of community across the zones. The classrooms have no direct connection with external landscape and due to several rooms having north and west orientations, the spaces rely on electrical lighting for large portions of the day. The classrooms were all tightly filled with groups of varying table and chair arrangements on a carpeted surface. A small tiled floor area with a sink and a more relaxed reading corner were the only other clear zone variations within each room. The success of the teaching environment of the junior section cannot be evaluated through analysis of merely one classroom. The different zones within the junior cluster as a whole and the regular use of the outdoor teaching spaces provide a variety of environment that a single classroom cannot. The children all have access to the IT kiosks in the central space; they have a larger shared library with an inviting reading corner (see figure 51), a large hall for more physical activity and numerous educational external spaces.

Figure 51: (Left) Plan of junior learning cluster_Library reading corner (Above)

The section of the school that contains the infant classrooms is arranged in a more traditional linear format. Access is provided through a central corridor running east to west with classrooms perpendicular either side. Due to the environmental performance of the building and the orientation, this arrangement provides a series of classrooms that have poor light quality and low average temperatures on the north of the corridor. The teachers described to the author how the form of the building and its position on the hillside also creates a 'frost pocket' externally from two of the classrooms (see figure 52). Cold air sinks down the hill side and collects along the building. The step in the façade prevents the air from continuing its path dissipating down the hillside. On the south of the corridor the classrooms have a tendency to overheat in the warmer months. As with the junior section the original form of the building has dictated the classroom arrangement however the school has taken full advantage of the shared circulation spaces to provide a variety in teaching zones.

Figure 52: North façade of the school – external space is a 'frost pocket' to classrooms trapping cool air that sinks down the hillside

Figure 53: Central circulation spine to infant section of the school used for multiple activites

The corridor between the infant classrooms contains a series of seated areas, storage zones, library shelves, display walls and role play areas all shared by the infant community (see figure 53). The classroom spaces are more varied then the junior section in which lessons are more structured. There are a greater number of material changes on the floors highlighting activity areas, more internal partitions and storage walls isolating zones and varying styles of furniture designed for particular activities. A number of the infant classrooms also have a direct access to the outdoor play space (see figure 54). It is a portion of the grounds kept private for the younger children. It contains a sand pit, a shallow pool for outdoor activities and numerous seating arrangements.

Despite being restricted by the building, its low environmental performance and general poor connection to the surrounding landscape the school has created a flexible learning environment. Working with the form of the building and controlling the excess space between the classrooms the school has accommodated a variety of learning and teaching methods quite successfully.

Figure 54: Typical infant classroom highlighting the varied floor finishes, separated zones and direct access to the external landscape

Figure 55: Cob play shelter with developing permiculture garden beyond

6.2.3 Outdoor Space

Edwardsville Primary School is situated on the fringe of a large Forestry Commission coniferous woodland. The school takes full advantage of its natural surroundings holding regular excursions into the woodland. The school grounds consist of a variety of external educational play spaces including a hard surfaced yard and an area of open

grass as traditionally found. As previously mentioned the front garden of the school has been transformed into an eco-historical sculpture park which is used in a variety of lessons however the most successful addition to the school and certainly its signature element is the Cob House (see figure 55).

Over the last year the school has built a cob play shelter within the school grounds. The cob structure has stone foundations, a lime render finish painted with natural paints and a sedum roof from which water is collected to water the garden. A small section of the cob structure has not been rendered to reveal a sample of the material beneath for education purposes (see figure 56). The shelter has numerous seating alcoves sculpted into the walls and a log circle in the centre. The walls are also patterned with coloured bottles set into the structure producing a mosaic of coloured light (see figure 57). The floor finish consists of crushed shells from the beaches of south Wales.

Figure 56: Section of cob shelter without the lime render finish to highlight material beneath and an internal view highlighting log circle and seating alcoves

Figure 57: Mosaic of recycled coloured bottles set into the cob structure

It is a round house built using materials and methods that were predominantly used over 200years ago in Wales however still found across the world. It is used to educate about Welsh history as well as present day issues about local sources, poorer world communities and connections to the earth. The project had the children involved in the construction process and is now used as an educational tool as well as a site for play. A new addition to the Cob House is the permaculture garden. Originally displayed at the RHS (Royal Horticulture Society) garden show in Cardiff, the garden was a gift to the school in April 2009 to accompany the Cob House Project.

Permaculture is a way of working with nature in a sustainable seasonal way rather than using agro-chemical methods common to the last fifty years. The garden contains many perennial vegetables, apples and pear trees as well as numerous edible flowers. The food the garden produces is used by the children in cookery classes to educate through experience the processes of a sustainable food source.

At the time of the authors visit the school was also in the process of building a horticulture shelter and polytunnel. The horticulture shelter is an octagonal timber structure with a green turf roof (see figure 58). Along with the new facilities the school have employed a gardener to manage the gardens and work with the teachers to expand education through horticulture.

Figure 58: Horticulture shelter: under development at time of the authors visit

6.2.4 Community Involvement

Edwardsville primary school has a strict recycling policy. Paper, card, aluminium, ink cartridges and glass are all recycled daily at the school. The school provides recycling facilities for the local community, including a series of compost bins. Neighbouring the school is a community swimming pool of which it takes full advantage. The school has links with the local library, church, the rugby team and choir, supporting and encouraging the children to join. The school regularly holds evening classes for adults in the area to come along and learn new skills.

At the time of the authors visit the school was in the process of gaining funding for two new projects. Firstly a new community building to be erected on the school grounds, a straw bale construction eco-centre. The centre will provide a space for

adult evening classes outside of the main school building. It will be a space to receive visitors from other schools to educate about the environment, sustainable futures and global citizenship. The school is also in the process of transforming the children's playgrounds with a sustainable playground equipment project. The aim of equipment is to instil long term positive attitudes towards the outdoors and the natural environment by providing exciting and stimulating settings for regular physical outdoor play. Both projects will involve community volunteers to raise community participation in the life of the school and develop a sense of ownership over the structures and school grounds.

6.2.5 Conclusion

Edwardsville Primary School contains no sustainable technologies. The building receives no electricity from renewable sources, recycles none of its waste water and received a D in its recent SAP (Standard Assessment Procedure) energy performance calculation. The school is anything but a beacon of sustainable design; however it was the Eco-school of Wales for 2008. The school is rewarded for its integration of sustainable education and endeavour to educate outside the classroom about the culture and environment of its surroundings. The children and teachers of Edwardsville have integrated a culture of sustainable life within the whole school and there is a sense of community across the grounds. Fun initiatives such as the energy watch scheme allow the children to monitor the habits of the teachers and their daily practice too. For example, a teacher gains a poor rated badge if they leave the lights on in their office.

The existing structures and gardens within the school grounds are not merely decoration but daily tools used in the school life and play of the children. The future plans continue this philosophy of the school, not simply providing additional equipment for the children of Edwardsville but extending to the wider community.

6.3. Case Study: Rogerstone Primary School

Rogerstone primary school was destroyed by fire in 2002. In March 2007 Rhodri Morgan, the First Minister for Wales officially opened the new primary school labelled 'Newport's flagship eco-school'. The school has been described as a standard barer for the promotion of sustainable building methods in South Wales. The design intention was to use minimal resources during construction and be cost effective to maintain.

Figure 59: Rogerstone Primary School

The building contains a range of sustainable technologies and passive methods of energy conservation. The roof of the whole school is covered in a sedum plant. The 'green' roof reduces rainwater runoff, aids the thermal and sound insulation and encourages biodiversity. The roof system collects rainwater and through a series of down pipes stores the excess in two giant harvesting tanks under the school grounds. The water is recycled and used to flush the toilets of the school. The glazed roof of the main circulation 'street' contains sections covered with photovoltaics. These solar panels collect energy from the suns rays transforming it into electricity which the school sells back to the national grid. The classrooms are designed to maximise natural light gains with passive ventilation systems and the electrical lighting is controlled by sensors which automatically switch off when parts of the school are not in use.

The school designed by Newport City Council was funded through the Welsh Assembly Government's School Buildings Improvement Grant. It is located in an

undulating suburb of Newport and accommodates more than 560 pupils. The majority of the children who attend are from Rogerstone and a bus service collects a number of children from the neighbouring village of Afon. Afon is the site of the old Rogerstone Power Station which now contains more than one thousand homes. After the fire at the old school there was a debate over relocating amongst the new developments in the village. The school remained on the site in Rogerstone and now caters for the larger, wider community. Rogerstone Primary school is located in the heart of the urban spread of the neighbourhood but also borders the central community playing fields and a small woodland (see figure 60).

Figure 60: Rogerstone Primary School aerial view highlighting site

Rogerstone School's vision is to develop in its pupils the ability to learn independently, to develop 'life-long' learners. They claim to provide a stimulating and challenging environment, to provide a curriculum that recognizes the way in which children learn. The School has achieved its first Eco-Schools 'green flag' award since opening in 2007 and is well on its way to its second.

6.3.1 Organisation of the School

The public face of Rogerstone Primary School is somewhat bleak. A series of car parks, two modern security barriers and a succession of large fences welcome visitors. The grand scale of the school grounds and the sports facilities to the front of the building removes any premise of a local village school and portrays an image more of community college. The building is predominantly one storey with the double height school hall protruding from the centre of the complex (see figure 62).

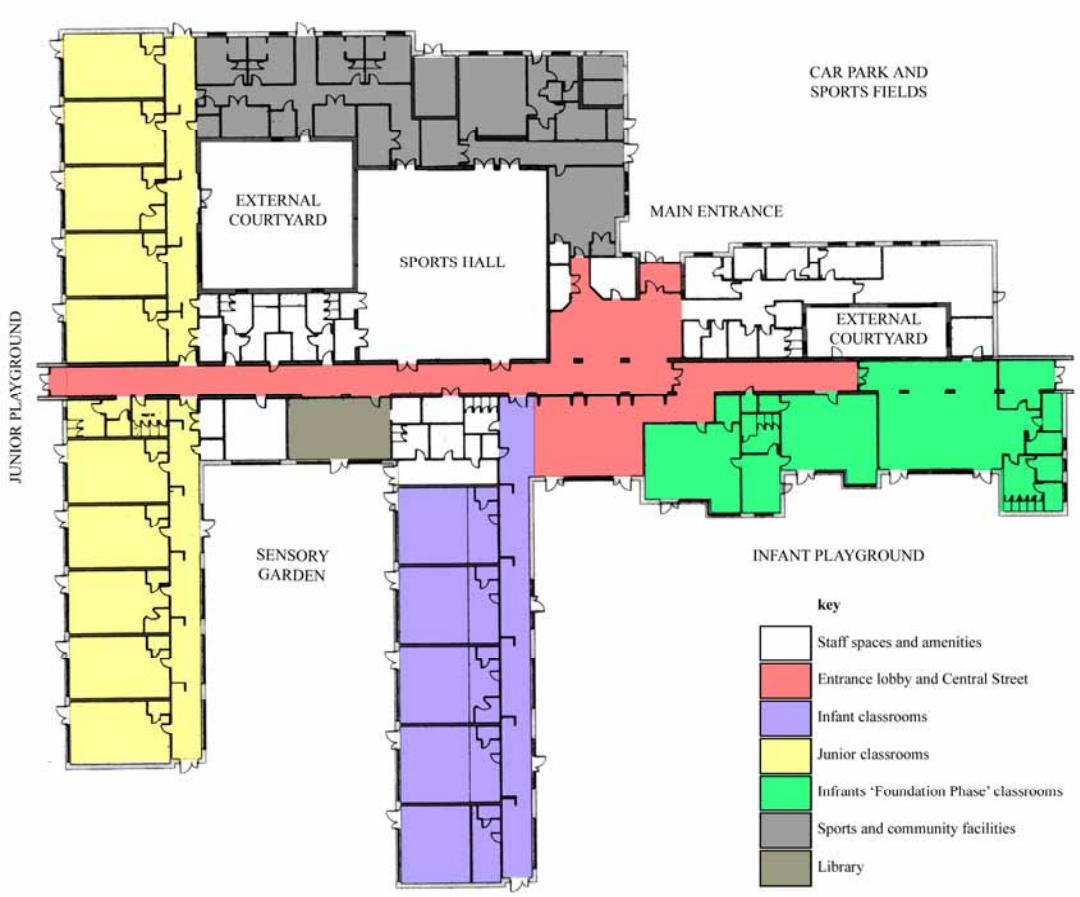

Figure 61: Organisation plan

The entrance of the school is slightly concealed beneath the large continuous overhanging eaves of the front façade. A colourful circular mosaic decorates the adjacent wall as you enter through a double door system into an entrance lobby. Visitors have to pass a security window to the reception office and declare their entrance. The lobby contains a seating area for visitors, a display board of the schools achievements and a television monitor playing short videos of the current school activities (see figure 63). This intimate zone is a single storey in height; visitors are drawn through the space by the natural daylight illuminating in the main internal 'street' beyond. The street is approximately three storeys in height with a single pitched glass roof (see figure 64).

Figure 62: Front facade to Rogerstone School - predominantly single storey with school hall protuding from the centre

Figure 63: Entrance lobby – image highlighting the glow of natural light from the street and the school mosaic

The School is on a predominantly north south axis to maximise the solar gains into the space. The street is the main circulation space running the length of the building between both the infant and junior sections. It provides direct access into the hall and the infant's foundation phase classrooms. Perpendicular to the street are branches of classrooms for the older infant and junior sections of the school. The classrooms are all aligned in a traditional series arrangement off a single corridor.

Figure 64: Internal 'street'

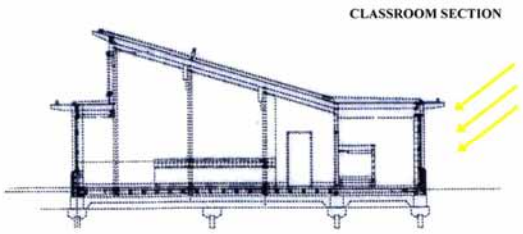

Figure 65: Typical section through classroom

6.3.2 The Classrooms

The school was designed to a low energy specification with environmental performance at the forefront. It is the observation of the author that the classrooms were therefore designed in section as a priority to maximise passive solar and ventilation gains. In plan, the arrangement of the classroom is very simple, parallel rows of walls perpendicular to a shared corridor space. The shared corridor space is on the southern façade and contains floor to ceiling glazing. The large amount of

glazing in this space allows the natural light to warm the air creating a buffer to the classrooms. In section, the main classroom space has a large single pitch roof with the highest point opposite the warm circulation corridor (see figure 65). This increase in height draws the warm air through and up into the classroom spaces. In the lowest corner of each of the classrooms is a large ventilation duct which protrudes through the roof of the building. The duct helps to passively circulate the air providing an escape route from the classroom. If the rooms begin to overheat an array of windows automatically open allowing the warm air to escape at the pitch of the roof. This stack ventilation effect draws cooler air in at the lower working level through the large ventilation duct.

Each classroom has direct access to the outdoor spaces and is predominantly naturally lit. The junior classrooms are all repetitive rectangular rooms with little flexibility in their form. The variation of learning space however is provided through the direct access and regular use of the corridor zones and the outdoor environment. The corridors are of a certain width to allow ease of movement through the space whilst providing a sequence of stages for role play (see figure 66). The classrooms environment consists of a distribution of table and chair arrangements ergonomically suited to the age of the children, a small IT kiosk, a reading corner and numerous interactive displays produced by the children.

Figure 66: Corridor zone in the junior section: articulated space with a wall of southern glazing and several role-play areas

Figure 67: Foundation phase play spaces

Figure 68: Varied zones of the foundation phase classroom

Figure 69: Foundation phase reading corner

The infants section of the school building comprises of two main zones. The older children are accommodated in a branch of classrooms similar to the juniors. The education spaces for the younger children in the foundation phase run parallel to the main 'street' and are less regular in their form. The spaces for the foundation phase are a continuous network of zones in which the children, to a certain degree, have freedom to explore (see figures 67-69). The children have access to various outdoor spaces, a courtyard, and the sequence of play areas within the circulation zones as well as the classroom environment. The children are not therefore confined to the four walls of a classroom space but then cannot leave the safety of the foundation phase community as a whole.

The sequence of spaces within the foundation phase classrooms are varied and stimulating. The contrasts between the zones such as the three storey circulation corridor bathed in light and cluttered with role play activity; the intimate softly furnished book reading corner; the dimly lit cloakroom decorated like a solar system and the beach themed open air courtyard all add to an extremely exciting, creative environment in which the children can learn and develop naturally through play.

6.3.3 Outdoor Environment

Rogerstone Primary School contains a varied range of external spaces within its school grounds and benefits from its location within a green pocket in the Newport suburbs. The philosophy of education at the school relies heavily on its 'outdoor classrooms' using them daily and through all weather conditions.

Figure 70: Covered threshold between foundation phase classrooms and outdoor play space

Figure 71: Foundation phase outdoor play space environment

The children in the infant and junior sections have their own outdoor spaces designed around their play and educational needs. The infant's playground consists of a sculpted landscape scattered with intriguing obstacles and shelters. It has a strong connection with the internal spaces through a covered threshold and a large glazed opening façade (see figure 70). The external landscape contains a diverse range of material finishes and surfaces for the children to investigate. It contains a climbing frame including a slide, swings and a series of sandpits and water ponds (see figure 71). Chalk boards decorate several walls encouraging the children to draw and play through creative thought. The garden also contains a imaginative teletubbies[57] mound. A tunnel sculpted into the ground, (based on the world of a popular children's television programme) adds an element of fairy tale to the setting (see figure 72).

Figure 72: 'Teletubbies' sculptured landscape in the foundation phase outdoor play space

Figure 73: Sensory garden between infant and junior branches of the school

Both the infant and junior sections of the school have direct access to the sensory garden (see figure 73). This is located between the two branch classroom zones within the school. The garden is essentially an allotment monitored by the children

[57] The Teletubbies – Early Learning television programme from children's BBC

for growing a range of herbs and vegetables and used to educate about plants and food. The garden contains a pond and bog area for monitoring animal habitats and a bird feeding station. A new addition to the garden is the chicken coop. The children share the responsibility of the upkeep of several chickens. The eggs produced by the chickens and the vegetables grown in the garden are used in the cooking classes within the school. The garden also contains a log circle used as a base for the forest schools programme and an area of meadow land. The children are encouraged to use all the areas of the grounds to provide variety in their environment and connect them with the natural world. The junior outdoor environment consists of an adventure play area nestled amongst areas of lawn (see figure 74). The structures are constructed from a selection of large timbers and ropes above a rubber floor finish. The children also have a large tarmac yard for ball games and access to a multi-purpose 'game court'.

The school grounds border a small woodland owned by the local council and monitored by the Forestry Commission. The school in agreement with the council takes full advantage of the wood using it regularly in the Forest Schools Programme. *"The Forest School experience promotes sensory child-led outdoor play, encouraging and stimulating curiosity and absorption."* [58] They have planted numerous small trees themselves and explored nature trails across the area. The outdoor environment of the school introduces the principles of sustainability and conservation through enjoyable and playful activities and plays an extremely important role in the daily lives of the children.

Figure 74: Junior outdoor space with adventure playground structures and sports fields beyond

[58] Forest Schools Wales, *Ethos and History*: < http://www.forestschoolwales.org.uk/ysgol-goedwigforest-school/forest-school-ethos-history/> [First accessed November 2010]

6.3.4 Community Involvement

Rogerstone Primary School was designed by the Newport City Council therefore community involvement was an early design consideration. The School is open from 7.00am to 9.30pm every day to cater for early morning children and staff through to after school clubs and evening classes. The popular evening classes are run by the school with any economic profit benefiting the school. The architectural plan of the school includes easily accessible flexible rooms for holding evening classes and seminars without the need to keep the whole school open. This wing of the building also contains easy access to the hall for larger activities as well as changing rooms for the sports clubs (see figure 75). The school hall is also used by the village of Rogerstone as a church. A local vicar leads a regular service for communal worship. Rows of seating are arranged across the room and an altar is positioned on the low stage. The Church in Wales is a member of the Anglican Communion and holds services according to these traditions.

The school grounds are equipped with large grass playing fields which are regularly used by local sports teams as well as the school. Adjacent to the school building is the multi-purpose 'game court' (see figure 76) and a full size floodlit artificial turf football pitch used by both the children in the school day and the wider community. The school building houses the changing rooms which have their own external entrance to the courts. Facilities on this scale are intended for community use and would never be designed solely for young children. It has an array of external sports surfaces of which a community sports centre would be proud.

Figure 75: Children performing on the stage of the school hall

Figure 76: Outdoor multi use games area – regularly used by the children of the school and the wider community

Parents of children in the infant section of the school are encouraged to collect their children from the rear of the building. They have to leave their cars and walk around to the outdoor play area. Here the children can be supervised for a while longer at the end of the school day. It is a procedure intended to involve parents, for children to exhibit their daily activities and create an interaction between the families of the community.

6.3.5 Conclusion

Rogerstone School is a strong example of sustainable architecture from an environmental performance standpoint. The technologies are working correctly, the building is minimising its energy use and maintaining a habitable working environment. The success of theses sustainable technologies and their contribution to the environment however is not celebrated or involved in the culture of the school. There is a small electronic monitor (see figure 77) in the school lobby monitoring the level of energy being acquired by the solar panels and hence saved at that instant but that is the extent of the contact the children have. According to the staff of Rogerstone it has been a challenge to work towards the Eco-schools 'green flag' which focuses on the children's efforts to improve the schools environmental credentials when there is little to monitor or improve. Windows open automatically, there are no radiators and lights automatically switch themselves off. These are standard daily activities which the children do not have to consider in contrast to Edwardsville Primary School.

Figure 77: Electronic reader monitoring the level of energy acquired by the schools photovoltaic's and the equivalent carbon emissions saved

The sustainable technologies within the school offsets the slight lack of architectural charm within the building. If the school was to showcase a main signature element, architecturally, the main internal ‘street’ is an inspiring route. Each class has their own board to display achievements or present their completed work; it is bathed in natural light and the solar panels highlight the schools sustainable technologies. It is the opinion of the author however that the grand space is lacking moments of ‘place’ and ‘destination’ resulting in what is fundamentally, a circulation space only.

The school utilizes its impressive grounds and outdoor environment and contains a variety of internal flexible spaces. These areas cater for multiple learning methods and can be used successfully by the wider community outside of school hours. The school is an extremely positive step towards sustainable school design for the future from which a great deal can be learnt and expanded upon.

6.4. Nant-y-Cwm Steiner School

Nant-y-Cwm is the only Steiner primary school in Wales to educate up to GCSE level. There are several Steiner kindergartens teaching up to the age of seven however at Nant-y-Cwm children receive an education following the educational philosophy of Rudolf Steiner up to the age of fourteen. The pedagogy, also known as Waldorf education emphasizes the role of imagination in learning. The children follow a curriculum, without testing, that parallels their own spiritual and creative development.

Figure 78: Nant-y-Cwm main school building

Figure 79: Nant-y-Cwm kindergarten

Figure 80: Nant-y-Cwm Steiner School aerial view highlighting site

The main school building was originally the Llancefn Board School (see figure 78), it was built in 1875-76 and served a spread of local villages. Nant-y-Cwm Steiner School was founded within the building in 1979 by a group of like minded parents. In 1982 the building was re-modelled by architect Christopher Day for the Steiner charity with a volunteer workforce. The original large classrooms were divided into smaller irregular rooms with soft corners, asymmetrical windows and doors, varying

floor levels and warm natural tones and materials. In 1989 Christopher Day returned to design a Kindergarten for the school (see figure 79). The earth shelter is specifically designed to accommodate the Steiner education system for the early years. The school is nestled in a wooded valley in rural Pembrokeshire alongside the Eastern Cleddau River, an idyllic spot for outdoor play and learning (see figure 80). The school currently educates 37 children aged four to fourteen split over a kindergarten and three different aged classes. It is the belief of the teachers that the mixing of ages within a class provides the younger children with role models and the older children with an early level of responsibility. The school also runs a parent toddler group for children up to the age of three. The three older classes share the range of classroom spaces within the main school building and the main school grounds. The kindergarten and the mother toddler group occupy the earth shelter building and adjacent grounds across the road separate from the rest of the school.

6.4.1 Kindergarten

The mother toddler group for children aged up to three is the first stage of a full Steiner education. At this level the parents are fully involved in the learning process of the child. The idea behind the class is that parents can find support for each other whilst the children learn through observation, imitation and repetition. The children are not instructed to get involved in any activity within this class, however the parents must participate in them all. The children are relaxed; learn independently through play, imitation and by following the example set by the parents. This method continues through to the Kindergarten level from the ages of four to six. At this stage there is much less participation from the parents and the class is led by the teachers. A large proportion of the day is occupied by a supervised creative playtime using toys and crafts made from natural materials. The children are read stories, sing songs, undertake crafts and cook based on the seasons and the forthcoming year's festivals. In good weather the children are given the freedom to explore and play outside, there are no work books and no testing of any kind. The children are never set a task with which there is an element of a possible failure. For example there is no 'Blue Peter task,' they will not be given a set of materials and shown the finished product with which they must try and emulate. There is an appreciation that the end product will

never be as good as the teachers, or for example the 'one made earlier' on Blue Peter the children's television programme. They are encouraged to use their imagination, experiment and make what they wish from the set of given materials, therefore learning the processes without any pressures of expectation.

6.4.2 Immersion Teaching

Each of the three classes within the main school keeps the same 'parent' teacher that moves with them throughout the course of their education. The curriculum of the school strictly follows the Steiner style of immersion teaching. Following progression from the kindergarten stage each subject is taught for three to four weeks before moving on to a different topic. According to the Steiner system the subject choice coincides with the mental and physical development of the children. For example the early years of a child's life are full of imagination and play therefore the children are immersed in fairytales and stories. As the children develop a curiosity for process and the way things work, they will be educated about Ancient Greece and slowly through the years to the World Wars and current events. With regards to geography, nature and habitat the children start with their local environment. Learn about the local creepy-crawlies and as they get older, Britain, Europe, the Rainforests etc. and eventually the Solar System in the eldest grade. The subject position within the curriculum is intended to parallel the natural state of development of the particular age group of children. This however does raise certain questions regarding the mixed ability and rate of emotional and mental development within a group of children.

6.4.3 Organisation of the School

The school is divided on two sites by the entrance road with the kindergarten and main school building on either side. Aesthetically the main building has the same form, materiality and façade of many traditional 19th century British schools. Atypically from the first steps through the formal porch entrance there is an unavoidable intrigue to the spaces beyond. In contrast to the conventional stone or brick, cold, stale hallway of a Victorian built school you have entered into a home.

The space is warm, decorated with soft natural tones and materials. On the adjacent wall outside the first classroom is a large box shelf, hand made from irregular cuts of worn timber undoubtedly from a local source (see figure 82). The shelves are for shoes, which would also hold the authors own before journeying into the classrooms.

Figure 81: Nant-y-Cwm main school building - ground floor classroom

Figure 82: Entrance hall with shoe shelves

Figure 83: Nant-y-Cwm main school building - first floor classroom

Figure 84: Reading nook amongst roof eaves

The main building has two levels with one large classroom on the ground floor and two on the first floor. Each classroom is unique; the position within the building, the window arrangement and orientation, the shape and size of the doors and storage, the colours of the finishes and the decoration all add to the individual character of the rooms. The classrooms have very specific forms providing flexibility for numerous teaching methods and activities. The furniture is all movable, with the exception of the inbuilt storage. During the authors visit one such classroom was set up in a traditional desk to blackboard style arrangement (see figure 83), however within

minutes the room was transformed into a shop for the children's lessons on currency. Each classroom has also taken full potential from every alcove, low ceiling height, floor step window ledge etc. to create varying moments of place. The architect, and teaching staff as inhabitants of the building, has used the existing structure and resulting form of the awkward angles and dimensions for reading nooks, individual study spots and storage (see figure 84). They are a vital addition to aid the flexibility of learning methods and overall charm of the rooms. There is an overwhelming sense of ownership within each classroom, an underlying feeling of residence. After every activity the children tidy the materials away and rearrange the furniture for the next activity. This is not a feeling that is restricted to the children's predominant classroom. For messier activities the children have an art room and do use other rooms within the building with the same care and appreciation which appears to be reflected across the school. The children stay with the same teacher for the whole of their education which I believe adds to the sense of ownership, like a third parent in a home away from home.

The circulation spaces between the rooms are equally as individual and full of character. The walls are rendered as if by hand with no angled edges or sharp corners. They are decorated with small shelves and unique objects much like a home, each ending with an irregular shaped window and door arrangement (see figure 85). The whole building is extremely tactile, full of colour and texture. It is interesting to walk around as an adult; the curiosity can only be magnified for a child.

Figure 85: Circulation spaces and internal thresholds of the main building

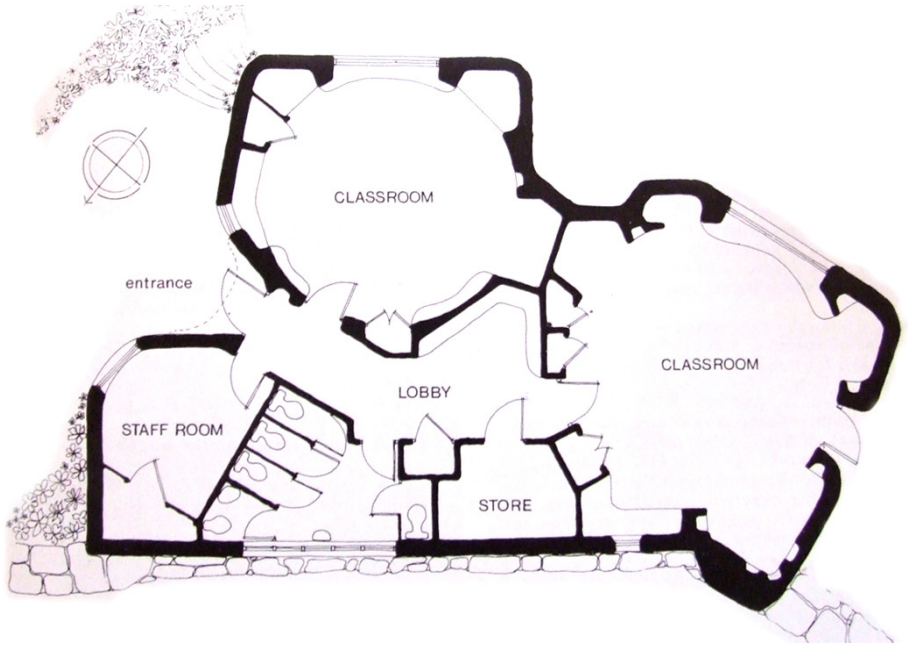

Figure 86: Plan of Nant-y-Cwm kindergarten designed by Christopher Day

The Kindergarten built across the small road a mere twenty yards from the main school building is the signature feature element of the school. The rammed earth building was built solely to support an education based on the Steiner principles. The sculptural organic form backs onto an existing stone wall that lines the road and is covered by a green roof of meadow grasses. The staff office and bathrooms occupy the western side of the building along the existing wall whilst the two classroom spaces face out to the rest of the grounds down to the Eastern Cleddau River (see figure 86). As with the interior of the main building the doors and windows are all irregular in shape void of perpendicular angles where possible.

6.4.4 Outdoor Environment

The grounds of the school contain elements similar to that of the traditional school. The existing concrete yard from the original school building remains for games and play requiring a hard surface. The rest of the grounds are less well kept and overgrown with no obvious boundaries (see figure 87). There is an area of maintained grass with the remainder of the site comprising a of varied landscape free for exploration and adventure. A secondary small area has been cleared where the children and parent volunteers have built an outdoor pizza oven from stone and

rammed earth (see figure 88) and a straw hut. The structures built using traditional building methods heavily involved the children and are regularly used in everyday school life.

Figure 87: School grounds of the main building

Figure 88: Outdoor clay pizza oven

The grounds of the Kindergarten are split over two levels and have been given more consideration then that of the main school. At the building level there is a plateau of brick paving, it is fenced and contains a small shelter (see figure 89). A series of meandering timber steps lead down to the main grounds and the edge of the river. The garden contains a large sand pit of irregular form, a small rowing boat used as a seedling bed and a few long timber ramps and benches for play (see figure 90).

Figure 89: Outdoor play shelter for the kindergarten

Figure 90: Steps down to lower kindergarten garden

The grass is of varying length with areas of meadow flowers, stones and allotment planting. The children are encouraged to construct any structures and plant any flora within the site. As with the main school grounds, in good weather the children have a freedom to explore and play in the environment.

6.4.5 Conclusion

The school educates a small number of children; it is in a very rural environment and has little association with the immediate local neighbourhood. The parents of the children in the school however are extremely involved and form their own community. They all share in the philosophy and the methods of teaching according to the Steiner principles. The method heavily involves parental involvement especially at kindergarten level.

It is the ambition of the Welsh Assembly Government for Wales to be a learning country populated by 'lifelong learners'. In 2002 the Welsh Assembly Government diverged from the common primary education level with England and removed the key stage 1 exams for children aged 5-7. Education in Wales at this newly named 'Foundation Phase' is now based on a more 'Steiner', independent learning style approach. The pedagogy requires specifically designed spaces and toys at different age levels and a strong connection to nature. Jane Hutt, the Minister for Education and lifelong learning visited Nant-y-Cwm in May 2009 to learn more of the methods and teaching philosophy.

7. PRIMARY SCHOOL DESIGN FOR WILLIAMSTOWN

This chapter presents the author's own design response for a primary school on the outskirts of Williamstown in the Rhondda Valley. The design process developed with the research programme. Investigative design accompanied the timeline of research into the case studies and subject literature review before a more comprehensive design for the school was realised based on the gathered knowledge. The chapter is ordered into key elements within the school design. Each element is structured in two parts. Firstly, the findings from the case studies together with the subject literature are discussed thematically, and secondly, the design conclusion of each element within the school based on that research. The spaces developed are concepts extracted from the research that interrogate the potential of bespoke school design and should not be viewed necessarily as practical design proposals. As a practical design there are several key factors that would require additional consideration.

It is recognised that the design for each classroom cluster would need to consider service distribution, proximity of WC's and an accurate analysis of passive ventilation and lighting strategies were they to be considered as viable solutions. These factors can have significant implications to the final aesthetic and atmosphere of the created spaces. The authors sprawling design increases project cost from an external wall to floor ratio but also distribution of services across the site. These are all practicalities which were deliberately avoided during the process of the research. An interesting extension to this thesis would be to develop the design to a planning application stage, to evaluate the economic and practical potential of such a bespoke scheme.

This section is accompanied by a volume of drawings in Document Two of the dissertation. Please refer to the document for the full versions of the drawings discussed.

7.1. Rhondda Research (The Rhondda Valley)

A design process starts with an understanding of site and context. An understanding not simply of site parameters, climate and the surrounding physical morphology but one of local culture, community and social habits; a grasp of the history of a place, its architectural vernacular, surrounding landmarks, industries and flora and fauna. The importance of initial site knowledge is magnified with reference to sustainable school design. In order for architects and designers to produce site specific schools a knowledge base of the schools local community is fundamental. Sustainable design seeks to improve the well-being of our communities and the individuals that live within them as well as global problem of climate change. A new build primary school should contribute effectively towards a community's sustainable future and support a social cohesion. The fundamental research for a designer in pursuit of these aims is to understand the people and the landscape they are designing for.

Figure 91: The Rhondda Valley

The Rhondda Valley is an area of Wales with a long history and a rich culture. It is a region of natural beauty formed by glacial movement during the Ice Age. The gradual movement of glaciers gouged out deep valleys into the landscape which were further increased by flowing rivers and streams down the valley slopes. This erosion of the landscape has left the two river valleys of the Rhondda today, the larger Rhondda Fawr Valley (*mawr*-large) and the smaller Rhondda Fach Valley (*bach*-small). Due to

the steep sided nature of the slopes and narrow plateaus, the form of the land has dictated the arrangement of settlements on the valleys throughout history. Today they are home to just over seventy-two thousand people.

Before the industrial revolution and the age of the coal mines began, there were no major roads or railway lines and the Rhondda Valley was quite an isolated place. People survived on the natural resources the landscape provided. The main industry for centuries was farming. The rural trade laid the first boundaries on the land and is responsible for the patchwork of fields, hedgerows and woodlands that are still visible today.

In 1843 the Taff Vale Railway opened, linking the Rhondda and its valuable resources to the rest of the world. The southern coalfield in Wales running across the Valleys was the largest continuous coalfield in Britain. The sinking of the coal pits triggered an enormous change to the environment of the Valleys as thousands of people moved to the region for work. By 1893 seventy-five collieries had opened on the coalfield, stone was quarried for building homes and trees and farmland were cleared for pit heads and industrial sites. What was once rolling green fields of idyllic farmland had rapidly become black hillsides of coal spoil.

Due to the rapid growth of the mining communities the population of the Rhondda peaked in 1924 with over 167,900 inhabitants, however, as quickly as the industry rose in prosperity the mining industry collapsed, leaving much unemployment and hardship. In a period of less than 30 years all the collieries of Wales closed and following the miners strike of 1984-85, only two small pits re-opened.

In the Rhondda today the slag heaps have mostly gone, the hillsides are grass green rather than coal dust black. The colliery sites have been bulldozed and sealed or become tourist attractions. In recent decades social and economic depression and poor education has cast a shadow of gloom across the once-thriving communities. Following the closure of the mines the strong cultural ties of the social community that expressed itself outside the industry, the trade unions and labour clubs, male voice choirs, local music and welsh language have also sadly diminished.

The Rhondda was symbolised by coal, but there is now a generation of children that have no personal knowledge of the mining industry of the area. The idea that there is going to be a return to full industrial employment is not feasible. The area needs new life and stimulation, people may travel away to work on a daily basis but they have to feel like they are still returning home to a community, to a safe, warm and maintained town. With better transport links the Rhondda doesn't have to provide work for every resident any more, however, can there be a return to the values and culture that once created the thriving communities that lived together in the valleys?

7.2. Design Intentions

In the forward to the Learning Curve publication, Jane Hutt identified *"well designed schools that incorporate both environmental and functional excellence"* as an underlying aim. The first key design question was therefore, "what is the function of the school?" The schools fundamental purpose is to provide an education following a prescribed curriculum, enabling its students to develop towards a level of academic achievement. However it is an hypothesis of the author that the school can also be an environment to support a cultural and social change within a community.

The aim of this design is to highlight the potential within a school to be a community resource, a place within a society to return to traditional community values and support a changing culture. This is the theoretical position of the author and the underlying concept for the school. The specific objectives of the design can be summarized as follows:

- To provide new facilities for community use; a library, sports hall, music centre, market square, event space, recycling facilities, allotments, community support and adult learning.

- A built environment in the vernacular of the area with strong connections to its local history.

- A modern school that uses the latest environmental technologies utilising local materials.

- Provide varied and flexible teaching environments that support child development through mixed and progressive teaching methods.

- Create a school that has a strong link to its surrounding landscape and an appreciation of its environment.

- Have strong connections with the local town and be easily accessible by the community.

7.3. Site Register

Figure 92: Willamstown aerial view highlighting the primary school site

As previously outlined in chapter four, the location of the site for the new school proposal is on the periphery of Williamstown, a district of Penygraig in Rhondda Cynon Taf. The site is on the western side of a valley slope with the large majority of the town to the north. The site has a fairly consistent slope down the valley, from west to east, with a large embankment lining the eastern edge alongside the A4119 road. The road runs parallel with the site and is the major access route into the town beyond from the M4 motorway. A large number of mature trees dominate the eastern edge of the site and form a natural barrier to the road. To the west of the site the gradient of the valley increases to its peak. The density of trees decreases as the landscape rises with green fields and the valley rock face stands proud on the ridge. A small tributary to the river Rhondda runs down the valley slope and meanders across the site. To the North are the Penrhiwfer AFC football pitch and a footpath that leads to the centre of the town. On the adjacent side of the valley across the A4119 are several warehouse factory units and a new housing estate. Both sides of the valley increase in urban density as you travel north through Penygraid centre into the larger town of Tonypandy.

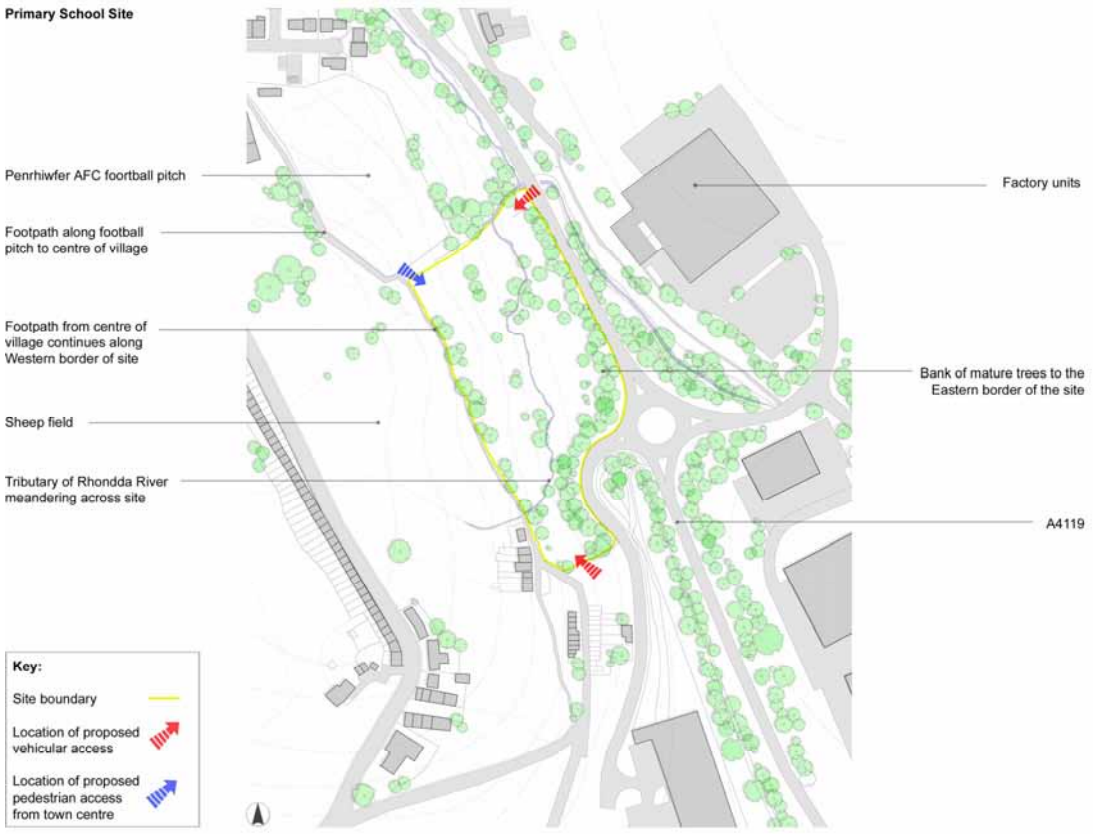

Figure 93: Willamstown primary school site

Penygraid and its district of Williamstown have all the traditional elements of the Rhondda community town; local shops, a church, public house, Labour Club and local sports teams. It is an area with a rich history with the Rhondda Heritage Park only a few miles away.

Figure 94: Framed views of landscape

Figure 95: Housing following the contours of the valley

The majority of the housing in the town was built from local quarried stone during the prosperous years of the coal industry. They are the traditional terraced housing of the colliers and their families. The streets and the rows of housing follow the contours of the valley, a charming characteristic of the area and an appreciation of the landscape. Due to the undulating nature of the streets the buildings form frames to the views of the landscape beyond, a continuous connection with the powerful and beautiful scenery of the area (see figures 94, 95).

7.4. Initial Site Strategy- Arrangement of Accommodation on the Site

(Please refer to the drawings in Volume 2 for a more detailed account of the design considerations for the school plan.)

The ‘Learning Curve’ competition design brief was to produce a primary school for 360 children on the site in Williamstown. The competition encouraged the design entries to consider the needs and activities of the children, the teachers and the wider community. The intension was to question the parameters of what a school can be,

can a school be a catalyst "*to regenerate failing communities"* (RSAW). The design should respond to issues of sustainability and other social factors. It is the goal of the Welsh Assembly Government to develop a nation of 'life-long learners'. Chapter 3 highlighted that cultural transfer can develop through early school life. Therefore what we teach, and how we teach today, will remain important to the generations of tomorrow. The architecture of the school must support this ideal and respond to the needs of the people it serves. The authors design strategy embraced the idea of the school as a community facility, looking to enrich the design with the strengths of the visited case studies.

The driving themes of the design submitted by the author and his colleagues are outlined in chapter 4. The design was an imaginative and playful response which raised numerous practical issues regarding the underlying operation of the school. Following the period of research outlined in this document the author returned to the design to respond to the challenges raised.

One of the considered successful aspects of the proposal by the author and his colleagues was the response to the site. This was an element maintained and used as an initial strategy to develop the design further. As with the existing urban grain of the Rhondda communities, the morphology of the buildings is sensitive to the topography and the ecology of the site. The arrangement of accommodation responds to the mature vegetation and the primary route through the school weaves across the site mimicking the path of the stream.

There are three main routes of access to the school site. The first is from the A4119 road. Access off the road is provided to the north of the site to the main entrance The second is the pedestrian route along the wide footpath to the main entrance. The path runs from the centre of the town along the edge of the community football field to the north-west corner of the school (see figure 93). The third is to the south of the school to the library community evening facility which can be accessed by both car and on foot.

Entry to the school begins with a series of community rooms. A welcoming exhibition space of the children's work and community events provides an enclosed space for parents and visitors to wait, socialise and communicate with each other and the

school. The main staff administration and office spaces line the entrance gateway and provide a level of security to the main access route into the school. The entrance to each of the visited case studies followed this trend. Offices adjacent create a security barrier and allow staff to monitor visitors and children entering or leaving the school grounds. A location for parents to congregate and socialise which also provides a display space for the school were successful welcoming entrances at both Rogerstone and Edwardsville. Nany-y-Cwm provided a community room for parents which during the authors visit also provided a sociable base to meet parents and staff alike. The staff at Llanbedr commented a sheltered entrance for parents would be a welcomed addition.

Figure 96: Ground floor organisation plan of authors design for Williamstown Primary School

To the north of the site, adjacent to the entrance, is also the main school sports hall and hard surfaced sports court. As found at Rogerstone, the sporting facilities shared with the community are posited on the periphery of the school to be used outside the workings of the school day.

The education accommodation on the site is ordered with the shared school facilities to the east of the main route and the teaching spaces to the west. The teaching spaces run in year group with the youngest children in the reception to the north closest to the entrance and the eldest children to the south. Each age group of children has their own school block along the main covered route through the school ending with the library space to the south. The shared dining hall, arts and music studio and assembly hall form a central enclosed external space to the east of the main route in the form of a traditional town square.

The general arrangement of accommodation on the site follows that of the competition entry. It was a successful solution emulating the traditional nature of a town. This form of organisation was a common trend from the literature and the visited case studies. A grouping of the teaching spaces maintains a degree of privacy allowing the larger halls and community spaces freedom to be used in isolation. As found at the Van Eyck's Nagale School, the shifting of the classrooms relative to each other creates a flow of 'in-between space' of changing scale suitable for varied activity. The author has applied this theory to the external spaces as well as the organisation of the individual classroom blocks.

The organisation of the plan follows the theory discussed in chapter 3 behind the modern 'community' school. This concept of the school is more like that of a city. A city is made up of smaller districts, territories of different people, each with its own amenities and green spaces. The children have ownership over a small region to care for and call their own.

The author focused his design intent on the specific organisation, physical morphology and operation of the teaching and community spaces within the plan. Based on the stated aims (derived from the program of research carried out), the following sections outline the authors design responses to some of the key spaces within the school.

7.5. The Walkway - Main route through the School *'The Tram Line'*

Research Conclusions: The main walkway or spine to a school is more than merely a corridor for getting from A to B. The most walked path within an institution should promote social interaction and interest. The main spine of Rogerstone lacked destination and life, however, the success of the early Montessori school by Hertzberger was the varied nature of the circulation space and the moments of 'place' created. This was achieved through the zoned and staggered threshold to the teaching spaces. *"The threshold of a built facility is just as important for social contacts as thick walls are for privacy."* (Hertzberger 1998, p35)

Design response: The main route through the school forms a plateau in the valley hillside. The walkway weaves back-and-fore across the stream, bisecting the site, whilst providing bridges and connections to each of the teaching blocks (see figure 97). The route meanders through several pinch points between the buildings changing angle at every location to minimise the exposure to the strong winds of the Valley. The walkway acts as a viewing gallery to the immediate school and the surrounding landscape. The changes in angle of the path provide a shifting viewpoint to varying destinations across the site whist framing key moments. Varying width, stepped and ramped exits and the circular amphitheatre carved into the plateau create numerous moments for taking a seat, socialising or participating in a game.

Each classroom cluster serviced by the walkway contains a welcoming entry consisting of a performance or exhibition space. Visitors can enter the community, experience the atmosphere, observe and continue without disturbing the learning environment. These threshold spaces, like branches from a tree trunk, provide the spine to the individual learning communities from the main walkway.

Figure 97: The main walkway and thresholds to the learning communities

7.6. Reception Class (Children Aged 3-5) *'The Home'*

Research Conclusions: During the early learning years children can participate, experiment and learn with the teachers through play under a passive supervision without the pressure of testing or expectation. The unique 'Foundation Phase' in Wales shares this underlying philosophy with the Steiner education system. Children at the early foundation age, commonly play in small groups of two or three, have short attention spans and require a varied classroom environment to keep them stimulated. The 'Foundation Phase' in Wales is based on a principle of independent learning and a freedom of play. As discussed in chapter 3, a child learns during an epistemic behavioural period through an activity which involves exploration and

experimentation. Therefore an environment that supports self exploration, variety and intrigue will improve the child's development as well as the teacher's ability to teach. This is supported by the Steiner education methods at Nant-y-Cwm through the process of participation and interpretation as opposed to scripted games. Children at this young age have wide imaginations and the classroom environment should stimulate and encourage this.

The reception class in all the visited case studies is situated close to the main entrance. Parents can collect their children form the shorter school day or participate in the activities of the class without disturbing the children of the rest of the school.

The children in the foundation phase of all the visited case studies required the largest amount of teaching equipment. The teachers at Llanbedr highlighted the necessity of storage space to a reception class to avoid clutter. Maintaining a tidy classroom actively encourages the children to keep it that way through a sense of ownership.

The importance of the outdoor classroom is recognised at this age level with all the case studies. The reception class at each of the visited schools has a direct connection with the external landscape.

Design response: The reception class is nestled behind the school offices and sports hall in the north-west corner of the site. A visitor to the school, walking through the gateway of the offices would see a glimpse of the curves of the reception class beyond. The reception class's form, materiality and location on the site are a response to the research from the case studies visited and the direction of education at this level in Wales.

The reception class is close to the main entrance, here it is under greater supervision from the main office and parents can collect their children on a shorter school day without disturbing the rest of the school. It has its own external play area so the younger children are not intimidated by the older children in the main areas of the school grounds.

The design of the class developed towards the philosophy of the Steiner kindergarten as it successfully supports the favoured direction of education in Wales at this level. It is the first environment the children enter into at the start of their school lives. This

needs to be an inviting, warm, playful space, full of imagination and security. The building has a central core, with the staff spaces and a large storage room to the north in the more practical working orthogonal spaces. The classrooms are the organic shaped spaces to the south, with direct connections to the outdoors. There are two main zones of play space, with a third kitchen / wet area - a tiled zone for messier activities. In this zone the central worktop has two different levels of floor either side, bringing the children and the teachers to a shared surface height. The classroom is designed with an array of alcoves off the central classroom space to accommodate the more intimate participation of a small group of children playing together. It is through this focused activity that children develop the early human skills of peer interaction, sharing and communication.

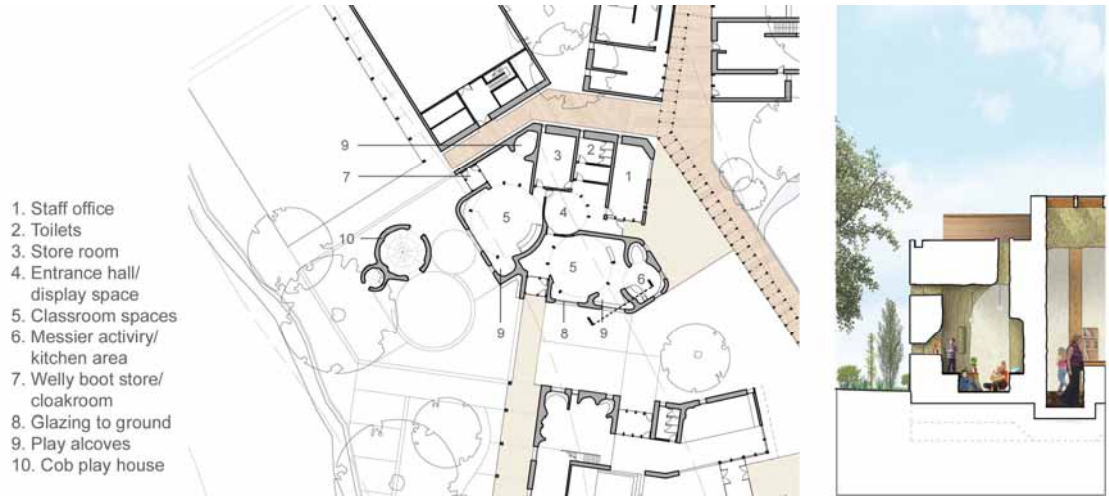

Figure 98: Reception class plan and inhabited section

The building design is predominantly constructed from rammed earth, cob and timber. Natural, local materials, warm to the touch with a longstanding connection to the area. Rounded rooms create inclusive, fairytale and cave like environments full of nooks to explore. Rammed earth echoes the traditional cob building material used in Wales, as highlighted both at Nant-y-Cwm and the cob play shelter at Edwardsville School. It is a material that can be moulded to create imaginative environments for the children; it is soft, warm and tactile whilst structurally sound. Windows have been carefully positioned within the classroom to control light and shadow and create moments of place. In certain locations slots of glazing extend down to ground level to connect the internal spaces with the external environment.

7.7. Class 1 (Children Aged 5-7) *'The Playhouse'*

Research Conclusions: The children in Class 1 are aged 5-7 years old and are in the final two years of the 'Foundation Phase'. The Foundation Phase is intended to improve development of every child's personal, social, emotional, physical and intellectual well being so as to develop the 'whole child'. The curriculum focuses on creative, expressive and observational skills to encourage the children's development as individuals with different ways of responding to experiences. The Foundation Phase also promotes activities in the outdoors where they have first-hand experience of solving real life problems whilst learning about conservation and sustainability.

Between the ages of 5-7 children become increasingly inquisitive. They contain interest in a task for longer and begin to recognise and identify with the seasons, light and dark, stories, jokes, colour, texture and materials. It is a period of rapid cognitive development and the learning environment should support the process.

Equipment for role play featured heavily in the foundation phase classroom zones in all the visited case studies. Whether in the form of a tent in the corner of the room in Llanbedr, or a series of zones in the communal corridors of Edwardsville, role play is an important activity to be encouraged. The children of Rogerstone regularly hold performances on the temporary stage in the school hall. *"In Play, (role-play) the child assumes a role-becomes another - and sees himself from that standpoint."* [59] Through role-play children go through the process of self-objectification. It is an important stage of development. By taking on characters, assuming the attitudes and behaviour of others a child learns to see themselves as a character with qualities and begins to find their own personality.

Design response: Class 1 is the second building along the western edge of the central walkway and forms the fourth side to the main central square. The design for class 1 responds to the goals for the Foundation Phase by creating a varied space equipped to provide a mixed and creative educational experience.

[59] Adler, Patricia A. and Peter Adler, eds., *Sociological studies of child development: volume 1* (London; Connecticut: JAI Press Ltd., 1986)p39

Figure 99: Class 1 plan and inhabited section

The design for Class 1 is arranged over numerous subtle level changes to differentiate zones of activity. The building construction contains a spine of rammed earth wall to the north which adds thermal mass. Here the library space and intimate alcoves of the spine should provide an element of familiarity to the classroom, easing the transition from the Reception Class. Other zones include a role play area, a wet/painting zone, carpet area, computer room and the more traditional shared table space for group activities. There are also numerous outdoor surface changes and regions of planting and a vegetable garden. The level changes across the class culminate in a central stage area for the children to hold performances.

The classroom has strong connections with the external landscape with the southern wall almost completely glazed. The facade is designed to maximise solar gains in the winter whilst controlling the high summer sun. The various roof lights on the building and the south façade are designed to highlight the textures of the rammed earth wall, to create changing shadows and varying regions of light and dark within the teaching space. The classroom is a network of activities with the children passively supervised and encouraged to rotate through the different zones on different days. As with the case studies visited the children will have a certain freedom of choice to participate in various activities. The classroom environment will support the offered activities whilst also being a tool to aid their cognitive development.

7.8. Class 2 (Children Aged 7-9) *'The Factory'*

Research Conclusions: Class 2 is for children aged 7-9. At this age of a child's natural cognitive development they become interested in how things work, develop an understanding of pattern, number and sequence. It is at this age that a more specific curriculum is followed and testing is introduced. Certain levels of mathematics, language and science have to be taught with every child being assessed.

The classroom design for the junior section at Rogerstone and Edwardsville cannot be analysed individually. In both case studies the classroom is part of the larger junior learning community. It is as part of this network of zones that its success as a varied learning environment is established. Llanbedr is a smaller school with less opportunity for flexibility. The children however seek the same variation of space. At Llanbedr, the teachers commented the children ask to work in the library corner within the circulation corridor. They relish the responsibility to work on their own under passive supervision.

Design Response: Class 2 is the environmental technology monitoring station. The building is the third pavilion along the western edge of the central walkway. It is constructed from a series of repetitive steel framed structures analogous with the industrial units of the area. The building faces due south with the roof structure containing an array of photovoltaics angled to the optimum degree for solar gains. The roof structure acts as a canopy with a series of north facing roof lights providing a consistent level of light over the open plan classroom levels below. The walls to the ground floor are predominantly glazed creating strong connections with the external teaching spaces. A concept of the valley landscape progressing under the roof canopy which acts as a simple shelter on a continuous plateau.

Figure 100: Roof canopy concept

Class 2 is designed with sustainability and environmental performance at its core. It is a flexible education space and is responsible for the monitoring and control of the

central systems of the school. The building is naturally ventilated, harvests rainwater from its roof and is naturally lit during the school day. The internal exposed structure reveals the simple geometries of construction and the tectonic language. The children can track the energy use of the building and the basic structural forces. The classroom zones are open plan with movable screens to organise the space as required. As discussed in chapter 3, Hertzberger describes the interaction between user and form as the key to flexible space. Designers should *"organise material in such a way that its potential is fully exploited."* (Hertzberger 1998, p150) If a form is designed for a particular function it will inherently be better suited for that function. Class 2 is a sustainable educational teaching aid with four flexible classroom zones, a shared central library space and IT room. The building itself is a learning tool, surrounding the children with number/ colour/ texture/ pattern and geometry.

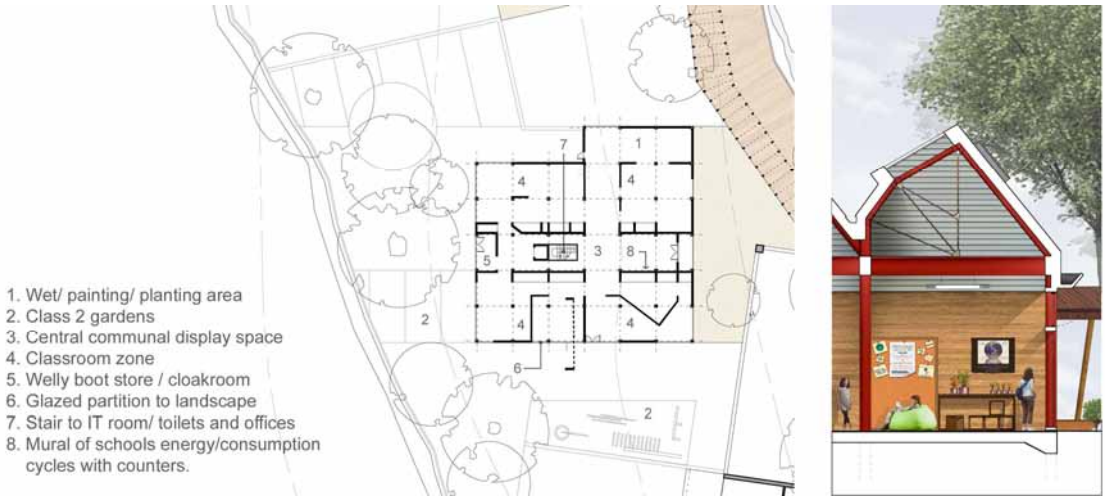

Figure 101: Class 2 plan and inhabited section

Whilst the whole school is designed with sustainability as an underlying concept, Class 2 is a showcase for the technologies, an advert for hi-tech renewable energy systems. The structure is an evocative symbol of industry past and present. Repetitive, pitched roof framed units echo the structures that once sheltered the coal spoil of the valley slopes, now redesigned to provide a learning environment and maintained by renewable sources for future generations.

7.9. Class 3 (Children Aged 9-11) *'The Terrace'*

Research Conclusions: Class 3 is designed for children aged 9-11. These are the final two years of the child's time at primary school. The children have to follow a more comprehensive curriculum before assessment and the move to secondary education level.

As highlighted in chapter 3.3, a broader knowledge can be grasped through lecture style education with children of this age. They develop cooperation and social skills and begin to realise the worth in learning from their peers. The children of Class 3 are being prepared for the transition to secondary school. They require a traditional defined classroom space however the flexibility for multiple teaching methods.

As with class 2 the success of the learning environment stretches beyond the four walls of the classroom to the community of which it is part.

Design Response: The building is split into four defined teaching classrooms. The classrooms form the central spine to the building with a more secluded shared teaching terrace to the west and an exhibition breakout space to the east. The central entrance to the building has a second level with a shared IT room.

Figure 102: Class 3 plan and inhabited section

The design of the shared teaching terrace provides an opportunity for smaller group work, individual study, messier activities, larger class activities and integration with the other children of the same age from the different classes. The level changes of the

space create thresholds and different zones whilst still maintaining the option of a larger lecture style learning space within the classroom.

The exhibition breakout space to the entrance of the building provides the children with a hierarchy of zones. If they are given permission to work here where it is less supervised they are given a sense of trust and responsibility from the teachers. It is also a presentation space. Following the completion of work in the classroom a sense of achievement and pride in their efforts can be realised when it is displayed in a 'special place'. Based on the gathered knowledge from the case study investigations, zones such as this are a valuable resource in the goal to producing life long learners. Children can develop a passion for learning and achievement.

The building is located towards the south of the site and is the final classroom pavilion before the community library. The landscape has a greater gradient at this end of the site and the buildings internal and external levels adhere to the contours. With a maintained internal ceiling height, the interlocking pitched roofs of the classrooms echoes the rows of terraced housing on the valley slopes. The building is predominantly a timber structure with a central rammed earth wall to provide thermal mass and be congruent with the earlier teaching spaces.

Classroom spaces such as these for children aged 9 and above require a consistent level of daylight. Environments with a focused activity on work such as this should control direct sunlight levels and provide consistent levels of natural daylight. The building is orientated west to east with large roof eaves to control the sun at its lowest orientations on the glazed facades. The classroom should maintain a high level of daylight without the nuisance of the direct southerly sun.

7.10. The Library

Research Conclusions: The Welsh Assembly Government promotes a culture of life long learners. The government is encouraging the blurring of school boundaries, offering more opportunity to learn outside school and the school to offer community services within. This is not a new concept, in the 1930's British architect Maxwell Fry designed his vision for integrated community learning in the form of the Impington

Village Collage discussed in chapter 3.1. The Welsh Assembly Government states that its objectives with regards to welsh heritage are to; "*create 21st century libraries museums and archives, and widen access to arts and culture."*[60]

Rogerstone is the most recently established of the primary school case studies and the only school that currently opens its doors regularly outside of school hours. It was designed with several community rooms that are used to run evening classes. The school benefits economically from the classes whilst strengthening its connection with members of the community. The Library space within Rogerstone is only used by the children of the school, however, as it is not specifically located within one learning community it encourages peer interaction between children of different ages.

Design Response: The last building along the central walkway to the south of the site is a new library facility for the school and the wider community. The building is positioned on the perimeter of the school grounds so that it can be managed outside of school hours with controlled access.

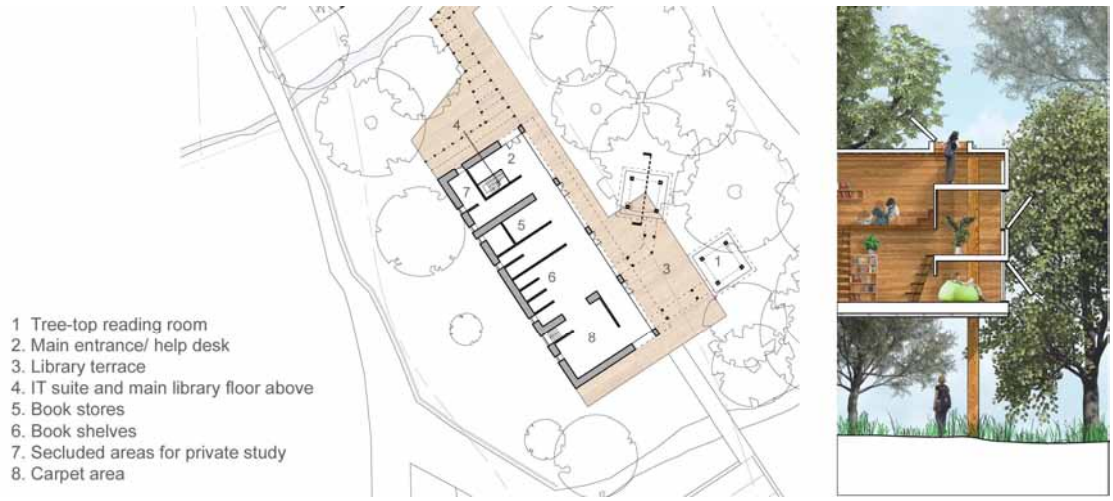

Figure 103: Library plan and inhabited section

The Library is nestled amongst the mature trees in the southern corner of the site. The building cuts into the gradient of the valley slope with a large rammed earth retaining wall. The main features of the library design are the large roof plane and the tree top reading rooms. The roof above the central library space parallels the topography

[60] Welsh Assembly Government: *Heritage* http://wales.gov.uk/about/civilservice/departments/sustainablefutures/heritage/?lang=en [First accessed November 2010]

before reflecting the canopy of the trees to the north-east façade. The canopy of the trees and the angle of the roof plane create a gateway to the entrance of the school community beyond. The expanse of glazing to this façade connects the interior of the building with the surrounding woodland and externally reflects its environment. The roof plane appears to hover above the levels of the library floor, guiding the eyes of its visitor up the valley slopes to the cliff face summit.

The tree top reading rooms are a development from the reading towers of the 'Learning Curve' design entry submitted by the author and his colleagues. They were a conceptual image of the childhood tree house as a learning environment. Following discussions with teachers and children at the visited case studies it was a concept well received. The tree top reading rooms connect the children with nature, providing secret reading nooks or a safe play environment that can also be used for teaching purposes. The timber structures are safely accessed from the first level of the library however internally contain several levels ergonomically designed for children to explore. The various openings in the structures provide different view points and connections with the surrounding environment. The tree-top reading rooms and the library facilities are intended as a base from which to run forest schools initiatives.

The new facility will service the wider community. Within the library are secluded areas for private study, IT facilities and meeting rooms for adult learning. The tree top reading rooms also provide a supervised play area for children who accompany adults using the facility on evenings and weekends.

7.11. The Town Square

Research Conclusions: All the case studies endeavour to create moments of 'place' within the classroom and the school grounds. The small reading nooks in the eaves of the classroom roofs of Nant-y-Cwm to the willow stick play shelter at Llanbedr. All are inhabitable zones with opportunities to rest, play, learn, explore, hide or socialise. It's the moments of 'place' and attention to detail that are so important in creating a varied learning environment. A favourite of the author's is the cob play shelter at Edwardsville. It is a strong example of architecture informing the education process.

The vernacular design is used to educate the children about their history whilst providing a setting for play, experimentation and investigation. The shelter highlights the important design consideration of the smallest detail. A simple chain swing used for play is decorated by the children weaving flowers up the links in patterns of colour and size. The swing also acts as the down pipe to direct water from the cob-play shelters roof demonstrating the adhesive properties of water. *"What identifies the place is therefore not its physical limits but, the symbolic and cultural meaning that can be identified as a particular 'place in space'."*[61]At the other end of the scale the shared community buildings must not become sterile environments, merely shells for activity, but extensions of the culture. The case studies visited all hold morning assembly, sing hymns and folk songs and uphold cultural events of the calendar, the authors design is intended to go beyond the hour of morning assembly and support the very ethos of the chosen way of life. *"All buildings, all places teach, this raises the question: what are we teaching children all the time we are not teaching them? What will their everyday environment teach? (Christopher day* 2007, p147)

Design Response: To the east of the main school walkway are the shared community orientated facilities. Nestled into the more mature trees of the eastern border of the site they form a boundary to the main road. The dining pavilion, the cultural centre and the main school hall create a central square and focal point for the school community.

The prominent building on the square is the school hall. The hall is the communal centre for school; it is a stage for morning assembly and school performances. The building is designed in the traditional form of the community hall. Two pitched walls to the front and rear of the building protrude above a truss roof structure providing one large internal volume. The entrance to the hall consists of a series of folding screens. These can be completely opened up to provide one continuous flow of space between the hall and the external central square.

[61] Fog Olwig, Karen and Eva gullov, eds. *Children's Places: cross-cultural perspectives* (London; New York: Routledge, 2003)p199

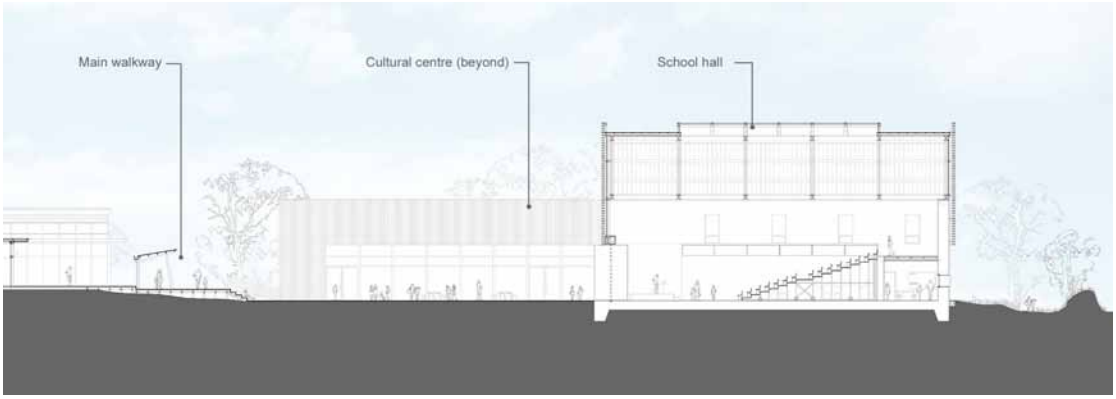

Figure 104: Section through town square

The dining pavilion to the south of the central square forms an island in the main school playground. The building contains a solid rammed earth wall core supporting a light timber pavilion. The core links the first floor level kitchen to the servery at ground level. Food harvested from the allotments within the gardens of each of the learning communities is prepared on site in the kitchens. It is the intension that children of different year groups can be involved in the preparation of particular meals and serve them to the other children of the school. The timber pavilion provides an enclosed space for the children and staff to eat and socialise. It is designed to open its façade to the playground providing a large sheltered area continuous with the wider school landscape.

The cultural centre is a community facility used by the children during the school day. The building contains a series of music practice rooms enclosed within the large rammed earth walls on the ground floor. A series of artist's studios on the first floor provide a balcony above a central performance atrium space. The artists' studios and music practice rooms can be used by local and travelling artists and musicians. They are used to promote welsh language, music and culture within the community. The artists and musicians would, where possible, be invited to involve the children of the school, to teach and inspire with their projects. The centre also contains an office to provide support for small business enterprise within the area. The office is the headquarters for community events and the weekly Market held on the central square.

7.12. School Grounds -'the Wilderness'

Research Conclusions: One of the noted similarities between the case studies, and a joint venture in Primary School design across Wales, is the consideration of the design of the outdoor environments and an understanding of their importance. Development of school grounds and the use of the outdoor classroom are high on the educational improvement agenda. The grass and tarmac deserts of traditional primary school grounds are widely agreed to be sterile learning and play environments. The connection between the landscape and the classroom are an important design element as highlighted with the new build schools such as Rogerstone. A basic understanding of the cycles of life, the natural world around, and an appreciation of nature and the environment are underlying necessities in a sustainable culture. These are goals of the Welsh Assembly Government and clearly evident in all the visited case studies.
"Ecological design brings us back to the wider living community, waking us again to the patterns of wind and rain, the sources of food, and the life-cycles of our materials. It illuminates the very flows that sustain us."[62]
Design Response: The school is designed to integrate with the existing landscape and vegetation and provide a variety of different external play and teaching environments. The arrangement of the classroom pavilions scattered amongst a stimulating changing environment is aimed at delivering a range of experiences to the children of the community. The central walkway is the major plateaux linking the zones whilst itself providing a deck for activity. To the east of the walkway are the hard surfaced external playgrounds. A series of steps and a circular amphitheatre connect the areas with the walkway. The steps provide numerous seating opportunities and the amphitheatre an external focused teaching space. The playground is divided by the dining pavilion to reduce wind speeds across it whilst also creating a variety of zones. In the north east corner of the site is an outdoor multi-use games area. This fenced hard surfaced court is used for the larger sporting activities. This community facility is positioned in the north east corner of the site for easy access from the town and is shared with the local sports teams.

The bank of mature trees to the east of the site forms a natural boundary to the road, however it also provides a small stretch of woodland for the children to explore. A

[62] Van der Ryn, Sim, *Ecological Design* (Washington, D.C. : Island Press, 2007)p186

nature trail runs along the fringe of the woodland starting in the canopy of the trees in the library tree-top reading rooms.

The stream meandering with the walkway leads to a pond at the lowest point of the site. The pond adjacent to the main entrance is also a visual statement about the nature of the school. The water brings a different habitat to the site from that of the woodland. It is another area for the children to explore and care for. The pond becomes the destination of the nature trail as the children can follow the path of the water or take the walk along the woodland edge.

To the west of the walkway amongst the classrooms are a series of more maintained gardens. As the landscape of the valley has dictated throughout history, the trees and woodlands follow the water source and grow predominantly in the seclusion of the valley gorge. The higher up the slopes the terrain becomes increasingly grassland and exposed rock. The site naturally follows this pattern on a smaller scale; the eastern edge contains the mature trees whilst the western border is more exposed. Between the classrooms in this region of the site are areas of grass and planting. Each classroom has an area of grass for play and a series of allotments and flower beds to maintain. The children supported by the staff and community volunteers on weekends maintain the gardens are harvest the rewards for use in the school.

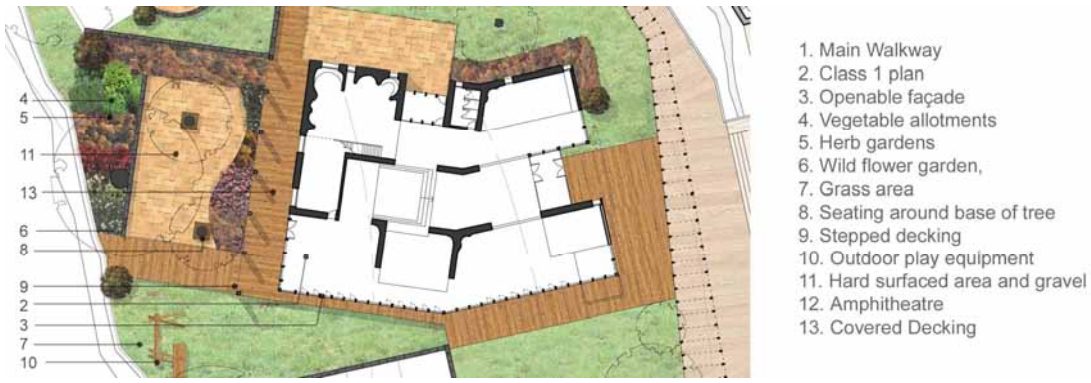

Figure 105: Garden arrangement for class 1

7.13. Community Connection and Flexibility

Research Conclusions: Flexibility within school design refers to many aspects; a change of spatial arrangement, a change of learning method or activity, a change of

building use for community involvement or future development. It is the challenge of designers to incorporate all these possibilities without producing an environment that is limited in its primary purpose. The case studies visited all achieved an element of flexibility in their own way. The widest contrast would be between Nant-y-Cwm and Rogerstone. Rogerstone was designed with modern teaching methods in mind. The primary planning arrangement is very simple to maximise passive heating/cooling strategies and reduce upfront costs. The rectilinear open plan classrooms are fragmented with varying floor finishes and movable partitions. Glass walls maintain supervision but add an element of separation producing a well used flexible learning environment with strong connections to its external landscape. There is also a lot to be learnt from Nant-y-Cwm. The classrooms themselves are much smaller than at Rogerstone however, the whole school is an exciting learning environment. Through imaginative and creative use of materiality, colour, light and texture the whole building is a place to be explored and experienced. From a change of use standpoint, both schools can offer a high degree of flexibility. Nant-y-cwm is already a conversion from a traditional Church of Wales School, whilst the cellular rectilinear nature of Rogerstone would lend itself to an office arrangement quite adequately.
Design Response: Each part of the school connects with the local community in its own way as discussed in the previous sections. Whether it's parents gathering in the welcoming entrance, community volunteers helping with the maintenance of the gardens, evening classes in the library or the use of the school centre for a town market. The school design is based on community cooperation.

The intension of the authors design for Williamstown Primary School is to provide an environment that supports the educational process and provides a stage for community interaction and inclusion. With these goals in mind each element of the design has a specific primary function. With the need for modern architecture to be flexible and have the capability for 'change of use' or extension, it is commonly found that primary function is diminished. The achievement of a functional building is in the design of the detail, the conclusion of the theory in the everyday ergonomic locations. The initial form, materiality and design of specific moments produce a functional building, however, the overall master plan can be extended or adapted with the capacity for change.

The pavilion style plan provides the opportunity for the school to downscale should the need arise. The sprawling morphology allows for a 'change of use' to particular pavilions whilst maintaining the security of the school. The open plan nature to the majority of the spaces also lends great flexibility to a change of use. A single pavilion can more easily be adopted by another user whilst the rest of the school continues unaffected. Not so easily achieved with the whole school under one roof. Should the need for expansion arise there are opportunities to develop both horizontally and vertically within each classroom community.

7.14. Sustainable Attributes

Research Conclusions: One of the most interesting results from the questionnaires taken at the Primary Schools was the response regarding the incorporation of the sustainable technologies – Question 2 (see appendix). Rogerstone was the only school with sustainable technologies integrated into the fabric of the building, however, according to the teachers, it struggled the most to achieve its Eco-schools Green Flag Award. Technologies that remove the control of the internal environment away from the children could negate the connection with the flows of temperature, and energy usage through the seasons. The other case studies actively involve the children in the monitoring of energy use, creating a connection between the simple switch of a light to the wider global environmental problems. Of course Rogerstone is using less energy, is more thermally efficient and a better performing sustainable building. However, from an education point of view I can conclude that maintaining a degree of user control strengthens the learning process for the children. Providing an interaction with the flows of energy and the systems that sustain us highlights the impact a single person can have.

Design Response: This research is not a specific study of the use of low carbon technologies however the design incorporates many modern environmental technologies. Where the technologies and passive strategies impact on the social and cultural theory behind the design they are valued to the research.

The school harvests rainwater for use in the lavatories and watering the plants. The large guttering to each of the school buildings leads the rainwater to the stream which flows through the site and collects it in the pond. The pond and adjacent underground tanks act as a reservoir before distributing the recycled water where needed. The cycle is always visible to the children highlighting the sequence of events.

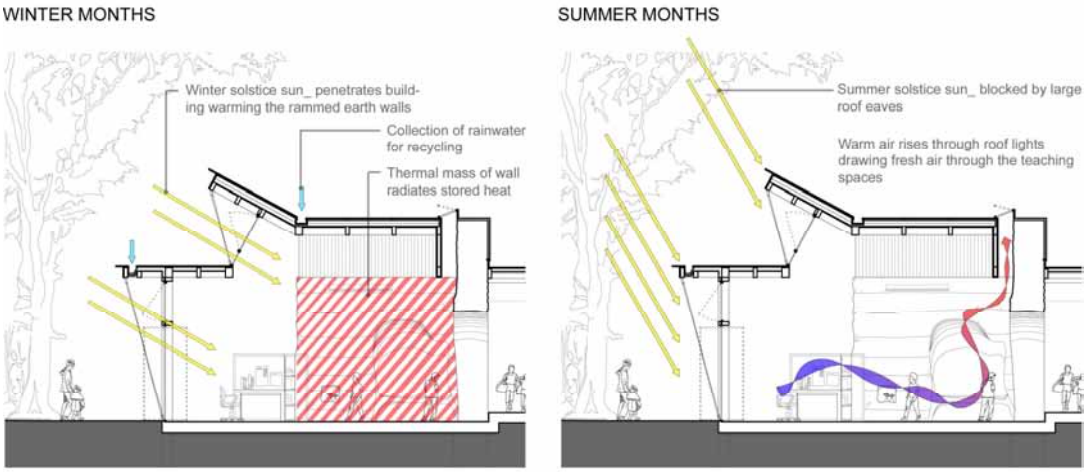

Figure 105: Passive lighting/ventilation strategy for class 1_ highlighting typical considerations for teaching spaces

Every building within the school is designed with local materials and passive energy principles. The buildings are intended to be naturally lit throughout the day and naturally ventilated. The traditional construction of the rammed earth walls aids the thermal mass of the classrooms and the array of glazing to each of the spaces maximises solar gains.

In the north eastern corner of the site are two large biogas anaerobic silos. The silos are used to produce electricity for the school. All organic waste produced by the school and surrounding homes is stored in the silos and following decomposition is used as compost on the schools allotments. The process of bacteria digesting the waste produces methane gas witch is used to produce electricity from a generator.

As outlined previously Class 2 is the technological hub of the school. It faces due south and supports the schools photovoltaic array. The class is the schools energy monitoring station. The building contains an environmental mural incorporating the dials and recorders of the various systems of the school. To instil a sense of competition and aid the children's understanding, every class will compete for the

lowest energy usage over a time period as measured by the dials. The amounts are converted into a carbon weight before being displayed on the Newton meters of the Pit Head. A regular competition to see whose weight hangs the highest. The Pit Head is a signature sculptural element of the school (see figure 106). It is an educational iconic symbol of the mining industry and also acts as a climbing frame for the children.

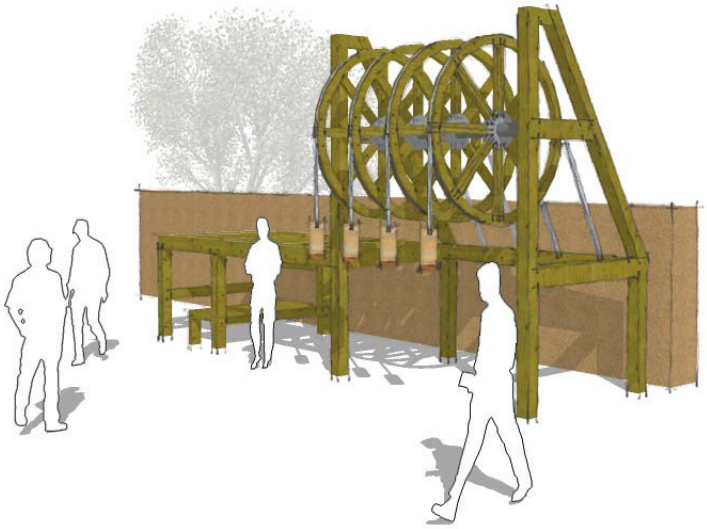

Figure 106: School signature sculptural element_ 'pit head' climbing frame

The design for Williamstown Primary School endeavours to go beyond the basic environmental sustainable attributes. These should be a given for any school design and improving legislation is directing this change. The design is intended to nurture a social sustainability. A cohesion within the culture of the community that has been lost since the days of the thriving mining era. A social sustainability can not be measured over a short period of time like the reduced energy bills from the installation of a photovoltaic array. The architecture can only provide an environment that supports social change. It may take a generation of children and families using, living, and learning in the school before real social sustainability can be observed.

8. CONCLUSION

It should be understood that budget, programme and legislation have major influences on a realised project, however, the design presented in this dissertation is based on theory derived from the research carried out. It is the author's intension to display an 'idealistic' design proposal of a primary school that highlights the potential that architectural design of schools can have over the social habits and culture of its users. The success or failure of the idealistic school is impossible to conclude in a practical sense. Firstly, because it is not realised, and secondly because cultural change can only be observed after a generation of children and families have been influenced by it. What can be assessed and concluded are the philosophical drivers behind the contemporary design precedents, the direction of primary school design in Wales and how the author's scheme responds to them.

8.1. Political Aspirations towards School Buildings in Wales

The concept for the future of school design in Wales supported by the author goes beyond that of the 'community school.' Many community schools have been built in the recent past. They are state-funded schools run by the local education authority with facilities for community use as well as the use of the pupils. The school design for Williamstown Primary School presented in this research has a connection to its place far greater than a shared facility. The architecture is reflective of the area yet contemporary and inspiring. The design is sensitive to the surrounding landscape, whilst connecting the children of the school to their environment. The goal of the Foundation Phase in Wales is to instil a desire for knowledge in children. To learn by 'doing,' through play, exploration and experimentation and hence provide a foundation for the rest of their lives. The early learning years are routed around cultural traditions, welsh language and the seasons, the authors proposal for Williamstown is designed to support these long term political aspirations.

In July of 2010 the Welsh Assembly Government announced: *"£144.8 million capital investment will seek to develop flagship projects for the new 21st Century Schools*

Programme with innovation in areas such as sustainability, design and investment in ICT." [63] Political objectives highlight the ongoing *"aim to boost the regeneration of Welsh communities through our rich and diverse heritage."*[64] These ambitions do not need to be pursued individually. The school concept presented can act as a cultural centre with the children themselves actively promoting a social change towards a rejuvenated sustainable community.

8.2. The Fragmented School Plan

A developing theme that emerged through the schools highlighted in chapter three was the fragmentation of space. The architects featured in the chapter entitled, 'significant contributions through history,' have all created their school designs based on an understanding of the way people use and perceive a space. There is a complexity to the plan that subconsciously created a layering of thresholds and a variety of habitable zones. The author's research into the way children learn has revealed that our cognitive, social and academic skills develop through a holistic approach to learning. Especially during the early years at 'Foundation' level, multiple teaching methods are now practiced in the daily running of the school across all the visited case studies.

Llanbedr and Edwardsville, the more dated of the case studies, were both designed around a traditional classroom-corridor arrangement. The research highlights that as teaching methods have developed towards a more holistic approach the schools have had to adapt the orthogonal classroom plan to try to accommodate the multiple teaching methods. Nant-y-Cwm in comparison was designed with the sole intension of creating a continuous learning environment. The 'permanence' of the schools atmosphere and the sense of history within the building have created a charming setting for education. The school is cherished by the staff, parents and children alike.

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[63] Welsh Assembly Government Article: *£144.8 million demonstrates continuing….,* July 2010: http://wales.gov.uk/newsroom/educationandskills/2010/100714schoolbuildings/;jsessionid=R4hjNFnGw8DyF5PNcH1r0c18ww9LTGFQvwptktGPnNNcbpLKs0Vx!-1787364033?lang=en [First accessed August 2010]

[64] Welsh Assembly Government: *Heritage* http://wales.gov.uk/about/civilservice/departments/sustainablefutures/heritage/?lang=en [First accessed November 2010]

The research into the case studies suggests a curriculum with increasing weight towards outdoor activities. Rogerstone and Nant-y-cwm both provide storage for wellington boots so even on a wet day the children are encouraged to use the external environments. Therefore the authors design response to disassemble a sole school building, integrating it with the landscape strengthens the connection between the children and their environment.

The research also suggests that the fragmented building form that has developed through this design process is often questioned from a child safety point of view due to the lack of physical building boundary. There is a higher opportunity for intruders to enter unnoticed, areas for bullying to occur etc. However, whilst scattered in physical plan arrangement the design intension is for the landscape to be part of the learning environment. They are not 'in-between' spaces surrounding the teaching pavilions but additional zones that make up the whole fragmented classroom plan. The author responded through design by providing a high ratio of glazing at low level with each of the classroom clusters to maximise the transparency of the boundaries and teacher supervision. The elements of the setting such as the woodland and embankment are also used as natural boundaries where possible.

The school design is intended to encourage a social change towards a cohesive community culture. In a rural environment the boundaries of the school will often be surrounded by public footpaths and areas of limited security coverage. This is the nature of the setting and the open strategy supported by the author. To enclose a rural school with too much security portrays a negative image to the community before the school has had a chance to operate.

8.3. The Direction of Primary School Design in Wales?

The case studies were chosen for their contrasting environmental achievements, style of education, history and varying school grounds. Each school is unique; however there are a series of common qualities found at them all; the use of the Welsh language is evident everywhere with regular cultural events upheld. The research

suggests through discussions with the teachers there is a real endeavour for community interaction and involvement and each school has a characteristic, signature element that gives the school an identity or strong connection with the local area. The author responded though design with the shared spaces around the school central square (described in chapter seven) and the pit head climbing frame. An iconic symbol rooted in the culture of the community whist also providing a sustainable teaching aid.

In the current economic environment, authorities are searching for cost effective solutions in all sectors of the building industry. Standardisation is far from a new concept and is already common place in the trade. Repetitive dimensions of building components, 'back of house' elements etc. are already standardised to minimise costs and programme length. The author does not criticise repetition on this scale as it is basic good building and business sense. When whole building standardisation is proposed, cost and programme however should not be the only considerations.

The research suggests standardisation is a viable option on a small scale, for example the construction or layout of the classrooms of Rogerstone could operate in a similar fashion at Edwardsville, they are both in South Wales after all and follow a very similar curriculum. However, the sense of history and existing sustainable culture of Edwardsville could be diminished by an unconsidered placing of classrooms replicated from another region. The case studies can be described as successful schools each for their own individual characteristics. There are elements of the schools that could be replicated to each of the sites; this is how the authors own design responds to the challenges raised, selecting common positives and attempting to improve negatives from the visited case studies. Yet the research suggests the favoured places within a school are those that have involved the users and are more cherished for their unique nature. The Kindergarten at Nant-y-Cwm or the Cob House at Edwardsville for example were both built with community involvement and cooperation.

Be that of the children, parents or a teacher of the school, the personal touch provides connection and a sense of pride at the visited case studies. Bespoke design is informed

through consultation with the community, it is not a school given to them, but created with them.

The new school building at Rogerstone is built with modern methods of construction and automatic sustainable technologies to minimise its long term carbon footprint. However, it has already been noted that it is more difficult to teach about energy usage when the control of it is removed. As designers we can learn from this, improve and balance a subsequent school design with the gathered knowledge and the needs of its community. To simply replicate the Rogerstone model, whilst a good school has highlighted flaws, would be an unconsidered and rushed model for development.

It is the view of the author that to resort to standardised design and a one size fits-all approach would simply be a step backwards, a case of history repeating itself. The poorly insulated, over glazed schools of the sixties and seventies were at the time seen as modern and affordable due to their repetitive industrial unit form and simple plan. We can take evidence from the past to inform design; however, it has to be interpreted to suit the needs of the future.

8.4. A New Primary School for Williamstown's Sustainable Future

This research has focused on Primary School design in Wales. In order to respond to the challenges raised through design, it was important to give the authors own 'idealistic' school a location, inhabitants and an environment. The school is therefore a proposal for this region alone and is a response to the broad visions and aspirations of the Welsh Assembly Government and the teachers and children from the case studies visited. The design developed through the application of the gathered knowledge from the research methodology undertaken. The concepts are not a practical, polished proposal for the site but a series of investigations into the potential of a bespoke learning environment.

The school design promotes community integration however the research suggests that the site could be considered to take the focus away from the town centre to the

school. The author followed the original Learning Curve brief yet ideally would have positioned the grounds closer to the centre to encourage the prosperity of the main high street along with that of the school. The author responded through design with the intension of adding to the opportunities for activity and integration, not to dominate and take focus from the rest of the town. If the school is thriving with community inclusion and event, than the rest of the town will ultimately share in that improvement.

One important factor towards the success of the 'bespoke school' is the role of the teacher. The school design should support a holistic leaning approach, however, if the teachers themselves do not know how to use the outdoor environments provided, or do not have an understanding of the community and history of the area in which they teach, it would negate the wider aspirations of the initial design. Therefore, it is important that whilst developing the standards of the physical leaning environments, the teachers also undergo the same training as the architects/designers to meet the ambitions of the Welsh Assembly Government. To achieve communities of life long learners with a social wellbeing, as designers, we have to identify with the people and the environment we are building a school for, in turn, the teachers need to understand how to use them to their full potential.

Children are now confined both at home and in school because of the perceived dangers of the modern world. Not so long ago, the schools predominant security issue was keeping the children within the school walls during the school day, as the surrounding landscape and the natural world were viewed as a playground. Today sadly the orientation has shifted to preventing intruders from entering. Therefore the school has to provide an environment to satisfy the inquisitive nature of children and the energy of play. Through design, the author responded to the research by challenging these perceptions in order to promote a shift towards a wider sustainable community. Nestling the buildings of Williamstown primary school within the landscape and sprawling the physical morphology, changes the very nature of the school as a single institution. The scheme is not intended as a model for school design everywhere and therefore cannot be analysed as such. The natural environment of every site, its proximity to major roads and town centres should all dictate the arrangement of buildings, its routes and boundaries. The author's concept is a design

interpretation of a solution to satisfy the existing debate of what a primary school in Wales can be. What can be concluded however is that for personalised bespoke design to be achieved; each individual school requires the same rigorous research and creative process.

It is naive to believe that we have found a solution for the perfect classroom that can be repeated inexpensively across the country. Technologies change and materials improve, ten years down the line today's low-cost standardised school could be out of date and an eyesore within a community.

It is the conclusion of the author that carefully considered, bespoke school design would not suffer the same fate. As with every school it will require maintenance, however the research supports that a school that is designed for a specific community that responds to its history, traditions and future aspirations will be more likely cherished and respected by the people it serves. At a time of financial crisis with limited funds, the solution to poor school environments should not be a handful of economical standardized new buildings. That is an unsustainable temporary solution. The school can be an extension of the community with blurred boundaries. It should display regional and local characteristics whilst supporting a holistic learning approach routed in the culture of the people it serves.

9. LIST OF ILLUSTRATIONS

Figure 1: Authors Own

Figure 2: Taken from: Malcolm Seaborne, *Schools in Wales 1500-1900 : a social and architectural history* (Denbigh : Gee and Son, 1992) p36

Figure 3: Taken from: Malcolm Seaborne, *Schools in Wales 1500-1900 : a social and architectural history* (Denbigh : Gee and Son, 1992) p183

Figure 4: Authors Own.

Figure 5, 6: Taken from: Catherine Burke, Ian Grosvenor, *School* (London : Reaktion Books, 2008) pp88 - 89

Figure 7, 8: Taken from: Frederich Mebes, Peter Blundell Jones, ed. *Hans Scharoun and urban structure,* (arq: Vol 1:autumn 1995) pp46 – 55

Figure 9 - 12: Taken from: Herman Hertzberger, *Space and learning : Lessons in architecture 3* (Rotterdam : 010 Publishers, 2008) Annotated by Author.

Figure 13 - 16: Taken from: Robert Waterhouse, 1972: Primary instruction, children and their primary schools. *Design journal*, 1st April. pp 48-52

Figure 17 - 23: Authors Own.

Figure 24 - 26: Images by Chris Wilkins, Phil Henshaw, Rob Thomas and Author

Figure 28 - 90: Authors Own.

Figure 91: Taken from geograph photograph website **–** <http://www.geograph.org.uk/photo/230670>

Figure 92-106: Authors Own.

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11.1. Letters to Case Study Primary Schools

Welsh School of Architecture
Head of School Phillip Jones BSc PhD FCIBSE CEng
Ysgol Bensaernïaeth Cymru
Pennaeth yr Ysgol Phillip Jones BSc PhD FCIBSE CEng

CARDIFF UNIVERSITY
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Cardiff University
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King Edward VII Avenue
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Prifysgol Caerdydd
Adeilad Bute
Rhodfa Brenin Edward VII
Caerdydd CF10 3NB
Cymru, Y Deyrnas Gyfunol

Mr C Davies
Cardiff Road
Edwardsville
Treharris
Merthyr Tydfil
CF46 5NE

02 July 2009

Dear Mr Davies,

I am a researcher from The Welsh School of Architecture in Cardiff University. My research is entitled 'cultivating a sustainable generation.' I have a focus on educating with buildings and the future of primary school design in Wales. My research has revealed your school as a success story of sustainable education. I would be most grateful for an opportunity to come visit you for a half hour interview to introduce my work and discuss further opportunities.

I am particularly interested in your schools connection to the local community; I am keen to find out about your methods for involving local culture in the teaching and life of the school. I am interested in the way you teach outside the classroom; the cob house you have built and how the school grounds are utilized as an outdoor classroom? I am also interested in your opinions on the design of the school. Does the architecture help or hinder in anyway the way you wish to teach, is it a flexible environment?

Last year my colleagues and I won a national design competition, held by the Royal society of Architects in Wales, to design a sustainable primary school in the Rhondda valley. The design was our romantic, playful idea of how a sustainable school could look and operate. I enclose the published brochure summarising this competition including our successful design. Through this research it is my intention to address the issues and direction of primary school design and education, concluding with a practical design of my own for a model school.

I understand the issues surrounding school visitors in today's society and have secured ethical approval from my university, evidence of which is enclosed. In order to inform my research, your insight and suggestions would be extremely beneficial; I would appreciate any time that you and your staff could spare me to assist with my research.

Look forward to hearing from you,
Yours sincerely

Gareth Roach
BSc. MArch. MPhil. (cand)
roachg@cardiff.ac.uk
07843084889

Welsh School of Architecture
Head of School Phillip Jones BSc PhD FCIBSE CEng
Ysgol Bensaernïaeth Cymru
Pennaeth yr Ysgol Phillip Jones BSc PhD FCIBSE CEng

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Cymru, Y Deyrnas Gyfunol

Mrs E. Miles
Rogerstone School
Ebenezer Drive
Highcross Estate
Rogerstone
NP10 9YX

02 July 2009

Dear Mrs Miles,

I am a researcher from The Welsh School of Architecture in Cardiff University. My research is entitled 'cultivating a sustainable generation.' I have a focus on educating with buildings and the future of primary school design in Wales. My research has revealed your school as a success story of sustainable education. I would be most grateful for an opportunity to come visit you for a half hour interview to introduce my work and discuss further opportunities.

I am particularity interested in your school vision: to help children develop the ability to learn independently whilst providing a stimulating and challenging environment. I am keen to find out more about this ambition and also how it is practiced. Your school is also a promoter of outdoor learning. I am interested in investigating the connection that the students have with the sensory garden and 'outdoor learning spaces.' How are these outdoor environments involved in the schools philosophy of developing children who can learn independently? I am particularly interested in finding out how the architecture of the school informs or hinders the way the school wishes to teach.

Last year my colleagues and I won a national design competition, held by the Royal society of Architects in Wales, to design a sustainable primary school in the Rhondda valley. The design was our romantic, playful idea of how a sustainable school could look and operate. I enclose the published brochure summarising this competition including our successful design. Through this research it is my intention to address the issues and direction of primary school design and education, concluding with a practical design of my own for a model school.

I understand the issues surrounding school visitors in today's society and have secured ethical approval from my university, evidence of which is enclosed. In order to inform my research, your insight and suggestions would be extremely beneficial; I would appreciate any time that you and your staff could spare me to assist with my research.

Look forward to hearing from you,
Yours sincerely

Gareth Roach
BSc. MArch. MPhil. (cand)
roachg@cardiff.ac.uk
07843084889

11.2. Ethics Approval Forms for Research Carried Out

PHASE 1 OF CASE STUDY VISITS

Ethics Approval form
Completed for correspondence with teaching staff

WELSH SCHOOL OF ARCHITECTURE
ETHICS APPROVAL FORM

WS2

Tick one box: ☐ STAFF project ☑ POSTGRAD project ☐ UNDERGRAD project

Title of project: CULTIVATING A SUSTAINABLE GENERATION FUTURE PRIMARY SCHOOL DESIGN

Name of researcher(s): CARETH ROACH

Name of supervisor (for student research): SUE WILLIAM

The purpose of this form is for you to think about ethics issues in your research. Please answer 'YES' 'NO' or 'NOT APPLICABLE' (N/A) to each of the following questions. A negative response does not automatically result in non-approval of the research, but should be explained in Box A.

	YES	NO	N/A
• Will you describe the research process to participants in advance, so that they are informed about what to expect?	☑	☐	☐
• Will you tell participants that their participation is voluntary?	☑	☐	☐
• Will you tell participants that they may withdraw from the research at any time and for any reason?	☑	☐	☐
• Will you obtain valid consent from participants? (specify how consent will be obtained in Box A)	☑	☐	☐
• If the research is observational, will you ask participants for their consent to being observed?	☑	☐	☐
• If the research involves photography or other audio-visual recording, will you ask participants for their consent to being photographed / recorded and for its use/publication?	☑	☐	☐
• With questionnaires, will you give participants the option of omitting questions they do not want to answer?	☐	☐	☑
• Will you tell participants that their data will be treated with full confidentiality and that, if published, will not be identifiable as theirs?	☑	☐	☐
• Will you allow the participants the option of anonymity for all or part of the information they give in an interview or documentary form?	☑	☐	☐
• Will your project involve deliberately misleading participants in any way?	☐	☑	☐
• Will you debrief participants at the end of their participation (i.e. give a brief explanation of the study)?	☑	☐	☐
• Is there any realistic risk of any participants experiencing either physical or psychological distress or discomfort? If 'yes', give details on a separate sheet and state what you will tell them to do if they should experience any problems (e.g. who they can contact for help).	☐	☑	☐

Do participants fall into any of the following special groups? If yes, clearly describe in **Box A** how you intend to handle ethical issues arising with research on these vulnerable groups.	YES	NO	N/A
• Children (under 16 years of age)	☐	☑	☐
• People with learning difficulties	☐	☑	☐
• Patients	☐	☑	☐
• People in custody	☐	☑	☐
• People engaged in illegal activities	☐	☑	☐
• Vulnerable elderly people	☐	☑	☐

• Does the research meet the requirements of the University's Health and Safety policies? ☑
(see http://www.cardiff.ac.uk/osheu/complete_risk_assessment/index.html)

You MUST Bring to the attention of the School Research Ethics Committee any issues with ethical implications not clearly covered by the above checklist

FOR STUDENT PROJECTS: THE SUPERVISOR MUST **INITIAL** ONE OF THE FOLLOWING STATEMENTS:

• The supervisor believes this research project has **negligible** ethical implications and the student can proceed with the research immediately.	
• The supervisor believes this research project has **some minor** ethical implications. **Box A** clearly describes the supervisor's recommendations to follow and/or issues that the student needs to address in order for the research to proceed.	✓
• The supervisor believes this project may have **significant** ethical implications and should be brought before the Ethics Committee. **Box A** clearly describes the ethical issues arising the research. The student SHOULD NOT proceed until the project has been approved by the School Research Ethics Committee.	

BOX A **The Project** (provide all the information listed below in a separate attachment)

1. Title of Project
2. Purpose of the project and its academic rationale
3. Brief description of methods and measurements
4. Participants: recruitment methods, number, age, gender, exclusion/inclusion criteria
5. Consent and participation information arrangements - please attached consent forms if they are to be used
6. A clear and concise statement of the ethical considerations raised by the project and how is dealt with them
7. Estimated start date and duration of project

All information must be submitted along with this form to the School Research Ethics Committee for consideration

Box B **Researcher Statement.** (In all cases **Box A** should clearly describe how you plan to deal with ethical issues in your research).

- I believe this research project has **negligible** ethical implications. ☐
- I believe this research project has **some minor** ethical implications. ☑
- I believe this project may have **significant** ethical implications. ☐

Signed _____ Print Name G. ROACH Date _____

Undergraduate or Postgraduate Researcher

Signed _____ Print Name J GWILLIAM Date 12·03·09.

Research Supervisor or Lead Researcher

STATEMENT OF ETHICAL APPROVAL

This project had been considered using agreed Departmental procedures and is now approved

Signed _____ Print Name WALTER PORTINCA Date 13/03/09

Chair, School Research Ethics Committee

PHASE 2 OF CASE STUDY VISITS

Ethics Approval form
Completed for correspondence with children

WELSH SCHOOL OF ARCHITECTURE
ETHICS APPROVAL FORM

WSA

Tick one box: ☐ STAFF project ☑ POSTGRAD project ☐ UNDERGRAD project

Title of project: CULTIVATING A SUSTAINABLE GENERATION FUTURE PRIMARY SCHOOL DESIGN

Name of researcher(s): GARETH ROACH

Name of supervisor (for student research): SOLIE GUILLIAM

The purpose of this form is for you to think about ethics issues in your research. Please answer 'YES' 'NO' or 'NOT APPLICABLE' (N/A) to each of the following questions. A negative response does not automatically result in non-approval of the research, but should be explained in Box A.

	YES	NO	N/A
• Will you describe the research process to participants in advance, so that they are informed about what to expect?	☐	☑	☐
• Will you tell participants that their participation is voluntary?	☐	☑	☐
• Will you tell participants that they may withdraw from the research at any time and for any reason?	☐	☑	☐
• Will you obtain valid consent from participants? (specify how consent will be obtained in Box A)	☐	☑	☐
• If the research is observational, will you ask participants for their consent to being observed?	☐	☑	☐
• If the research involves photography or other audio-visual recording, will you ask participants for their consent to being photographed / recorded and for its use/publication?	☑	☐	☐
• With questionnaires, will you give participants the option of omitting questions they do not want to answer?	☐	☐	☑
• Will you tell participants that their data will be treated with full confidentiality and that, if published, will not be identifiable as theirs?	☐	☑	☐
• Will you allow the participants the option of anonymity for all or part of the information they give in an interview or documentary form?	☑	☐	☐
• Will your project involve deliberately misleading participants in any way?	☐	☑	☐
• Will you debrief participants at the end of their participation (i.e. give a brief explanation of the study)?	☐	☑	☐
• Is there any realistic risk of any participants experiencing either physical or psychological distress or discomfort? If 'yes', give details on a separate sheet and state what you will tell them to do if they should experience any problems (e.g. who they can contact for help).	☐	☑	☐

Do participants fall into any of the following special groups? If yes, clearly describe in **Box A** how you intend to handle ethical issues arising with research on these vulnerable groups.

• Children (under 16 years of age)	☑	☐	☐
• People with learning difficulties	☐	☑	☐
• Patients	☐	☑	☐
• People in custody	☐	☑	☐
• People engaged in illegal activities	☐	☑	☐
• Vulnerable elderly people	☐	☑	☐

• Does the research meet the requirements of the University's Health and Safety policies? ☑
(see http://www.cardiff.ac.uk/osheu/complete_risk_assessment/index.html)

You MUST Bring to the attention of the School Research Ethics Committee any issues with ethical implications not clearly covered by the above checklist

FOR STUDENT PROJECTS: THE SUPERVISOR MUST **INITIAL** ONE OF THE FOLLOWING STATEMENTS:

• The supervisor believes this research project has **negligible** ethical implications and the student can proceed with the research immediately.	
• The supervisor believes this research project has **some minor** ethical implications. **Box A** clearly describes the supervisor's recommendations to follow and/or issues that the student needs to address in order for the research to proceed.	
• The supervisor believes this project may have **significant** ethical implications and should be brought before the Ethics Committee. **Box A** clearly describes the ethical issues arising the research. The student SHOULD NOT proceed until the project has been approved by the School Research Ethics Committee.	✓

BOX A **The Project** (provide all the information listed below in a separate attachment)

1. Title of Project
2. Purpose of the project and its academic rationale
3. Brief description of methods and measurements
4. Participants: recruitment methods, number, age, gender, exclusion/inclusion criteria
5. Consent and participation information arrangements - please attached consent forms if they are to be used
6. A clear and concise statement of the ethical considerations raised by the project and how is dealt with them
7. Estimated start date and duration of project

All information must be submitted along with this form to the School Research Ethics Committee for consideration

Box B **Researcher Statement.** (In all cases **Box A** should clearly describe how you plan to deal with ethical issues in your research).

- I believe this research project has **negligible** ethical implications. ☐
- I believe this research project has **some minor** ethical implications. ☐
- I believe this project may have **significant** ethical implications. ☑

Signed G.Roach Print Name G. ROACH Date

Undergraduate or Postgraduate Researcher

Signed J L Print Name J. GWILLIAM. Date 12.03.09

Research Supervisor or Lead Researcher

Comments: you have to ensure that you have written consent/permission from the school for the research, in particular the observation and discussion with children. Furthermore, you will have to explain to the children what the research is about (or the teachers) at the appropriate "level" for the children to understand

STATEMENT OF ETHICAL APPROVAL

This project had been considered using agreed Departmental procedures and is now approved

Signed Print Name WOUTER POORTINGA Date 13/03/09

Chair, School Research Ethics Committee

11.3. Structured Questions to Schools

The Welsh Assembly Government advocates an education based on life-long learning. A nation with the opportunity and ambition to learn at all ages. This starts at the foundation level in primary school with children developing the ability to learn independently. How does the classroom support an education based on independent learning?

What sustainable technologies have been incorporated into the design of the school?

- Which have you found most cost effective to the daily running of the school and easiest to maintain?
- Do the children have any involvement with the sustainable technologies; are they used in teaching?
- What day to day activities do the children participate in to help the environment?

My research has highlighted the multiple learning and teaching methods involved in the daily proceedings of a class. For example the traditional lecture style teaching where the teacher addresses a whole class, a quiet one on one reading corner, small group work or ICT all need to be accommodated within a learning space. How does the classroom design support/hinder the variation of learning methods and tasks undertaken within the spaces?

- In what way are the classrooms flexible to the needs of the teacher; are there areas where improvements could be made?
- Do pupil numbers, age or classroom dimensions impact on the preferred teaching methods of the school?

How much teaching takes place outside the classroom and for what kinds of activity? Do the school grounds support this style of education of learning in an outdoor classroom?

- Do the internal classrooms have a direct connection with the outside?
- Has consideration been given to the design of external spaces to encourage the learning process outside the classroom?

What are the functions of the communal spaces within the school, are they used as intended? For example, the corridors, the entrance hall, the main hall/yard, the school grounds.

- Are the spaces used by people other then the children, the wider community or visitors for example?
- How are the spaces used: display space, threshold/gallery to classrooms, lingering/meeting places, orientation within the school, passive supervision?
- Does the school hold evening classes, how does the school accommodate the change in function of the spaces?

How much involvement does the school have with the local community?

- Do the children benefit from any community facilities and vice-versa?
- How is the school used outside the hours of a typical short teaching day?

Does the school uphold cultural traditions? Is the history/culture of the area involved in the daily teaching/play of the children, in the design of the play spaces or perhaps in the architecture itself?

Does the school have a signature element?

Are there any areas from an architecture standpoint the school would like to change?

11.4. Observational research elements

- How is the classroom space arranged for multiple learning methods? (Individual/group reading, painting, cooking, role play, small group work, ICT.) Are there material, lighting changes between the zones? Do the classrooms have connections to the outdoors, an outdoor classroom?
- How are the outdoor spaces arranged, what are the favourite spaces the children use during breaks, why? How are the thresholds to the outside spaces controlled, monitored? Single doors or threshold zones?
- How are the communal spaces of the school arranged and used? Are the corridors shared by all, used as exhibition spaces, thresholds to the classrooms, do they contain lingering spaces, seating/storage, visual connections across the site?
- Is there a hierarchy to the school arrangement? Consider the transition through the school from the entrance to the main hall, the way you circulate past, or through the classrooms. Where are the offices located? Are they positioned for supervision of the children or private, quiet space?
- Is arrangement based on school security? Security for the children and of equipment.
- How do the teachers monitor a class, maintain a passive supervision over a group of children undertaking multiple activities? Location of teacher's desks, staff areas during breaks.
- What are the varying ergonomics of the furniture/forms across the school, in communal spaces as opposed to zones within a classroom? Is the eye-level/height/perspective of a child given consideration within the school?
- Where are the elements of 'place' and 'performance space' within the school?
- How flexible/adaptable are the zones with in the classroom/school? Is storage incorporated into the design, the forms or partitioning of zones?
- What are the lighting qualities, orientation, materiality, proportions of favoured zones with the school? Do the favoured spaces alter with age, gender?

When granted permission to talk to the children the discussions were in groups under the supervision of the teachers. The author questioned the children as users of the school. Typical questions included:

- What is your favourite place within the school, why do you like that particular place?
- Is there anything you would change about your classroom/school?
- Where is your favourite place to spend your outdoor break time?

The author questioned teachers about the common practice of the children and the popular spaces. He investigated the amount of education that takes place through experience; the level of independent learning and freedom the children are granted to choose activities and how the design of the school helps or hinders the way they wish to teach.

11.5. Llanbedr Questionnaire results:

1. The Welsh Assembly Government advocates an education based on life-long learning. A nation with the opportunity and ambition to learn at all ages. This starts at the foundation level in primary school with children developing the ability to learn independently. How does the classroom support an education based on independent learning?

It's a freedom of choice; there is a themed curriculum however the children can choose what area of the classroom to play in, and what to get involved with. It's a supervised freedom of choice as the teachers will outline 3 or 4 activities the children can do that day and then they can choose when and what to participate in.

2. What sustainable technologies have been incorporated into the design of the school?

- Which have you found most cost effective to the daily running of the school and easiest to maintain?
- Do the children have any involvement with the sustainable technologies; are they used in teaching?
- What day to day activities do the children participate in to help the environment?

We don't have any sustainable technologies.

We recycle in the school; every class is in charge of their own bins. We follow the eco-schools programme and the children learn about energy saving and the environment.

3. My research has highlighted the multiple learning and teaching methods involved in the daily proceedings of a class. For example the traditional lecture style teaching where the teacher addresses a whole class, a quiet one on one reading corner, small group work or ICT all need to be accommodated within a learning space. How does the classroom design support/hinder the variation of learning methods and tasks undertaken within the spaces?

- In what way are the classrooms flexible to the needs of the teacher; are there areas where improvements could be made?
- Do pupil numbers, age or classroom dimensions impact on the preferred teaching methods of the school?

The classrooms are very small however we separate the rooms into different areas. Every class has a carpet area for reading time. Each class has an IT kiosk and a sink area. The foundation phase and infants also have a role play tent and reading nook. We have a major problem with clutter in the classroom. A primary school class needs so much equipment which due to limited storage space we have to accommodate in the classrooms.

The teachers can change the layout of the classroom if they need to; however because of the amount of different activities taking place in each classroom which have to be accommodated at once, the classrooms usually remain as you see them.

The older children follow a more comprehensive curriculum and they sit in a more traditional table arrangement which takes up most of the class.

4. How much teaching takes place outside the classroom and for what kinds of activity? Do the school grounds support this style of education of learning in an outdoor classroom?

- Do the internal classrooms have a direct connection with the outside?
- Has consideration been given to the design of external spaces to encourage the learning process outside the classroom?

Only the foundation phase children have direct access to the outdoors. They also have their own garden space with play equipment more suited to their age so are not intimidated by the older children.

It would be nice to have a direct access from each of the classrooms into the field however with the limited space we have, doors to the field from the classroom would actually take away some of the much needed storage cupboards.

We have a nature garden which all the children use in lesson time. Sometimes in good weather we hold classes on the field or around the willow shelter.

The children all tend to play around the trees in the field at lunchtime or on the adventure play equipment, these are the busiest areas.

5. What are the functions of the communal spaces within the school, are they used as intended? For example, the corridors, the entrance hall, the main hall/yard, the school grounds.

- Are the spaces used by people other than the children, the wider community or visitors for example?
- How are the spaces used: display space, threshold/gallery to classrooms, lingering/meeting places, orientation within the school, passive supervision?
- Does the school hold evening classes, how does the school accommodate the change in function of the spaces?

The main corridor is not really wide enough for any activity as such; it is mainly used for displays and for waiting parents/visitors on wet days. Most parents wait outside the entrance door for their children, we could really do with a covered entrance here for the parents to shelter under.

The library space is a popular area; the children in the older class always ask to work there. The hall is used for morning assembly, as the dining hall (we have an on site cook), and for gym time. The hall is also quite cluttered and we rarely change the arrangement of the stage area due to the storage trolleys in front.

6. How much involvement does the school have with the local community?

- Do the children benefit from any community facilities and vice-versa?
- How is the school used outside the hours of a typical short teaching day?

We have always had links with the church, (St. Peters) and hold Christmas and Easter services etc. there. We occasionally hold events in the village hall and take the children to the local farm.

The school building isn't used outside of the school day however the local children still use the playing field and yard.

7. Does the school uphold cultural traditions? Is the history/culture of the area involved in the daily teaching/play of the children, in the design of the play spaces or perhaps in the architecture itself?

We are a bilingual school; we have regular morning worship in assembly. The children learn traditional songs and stories in Welsh and the children often act them out in the role play areas.

8. Does the school have a signature element?

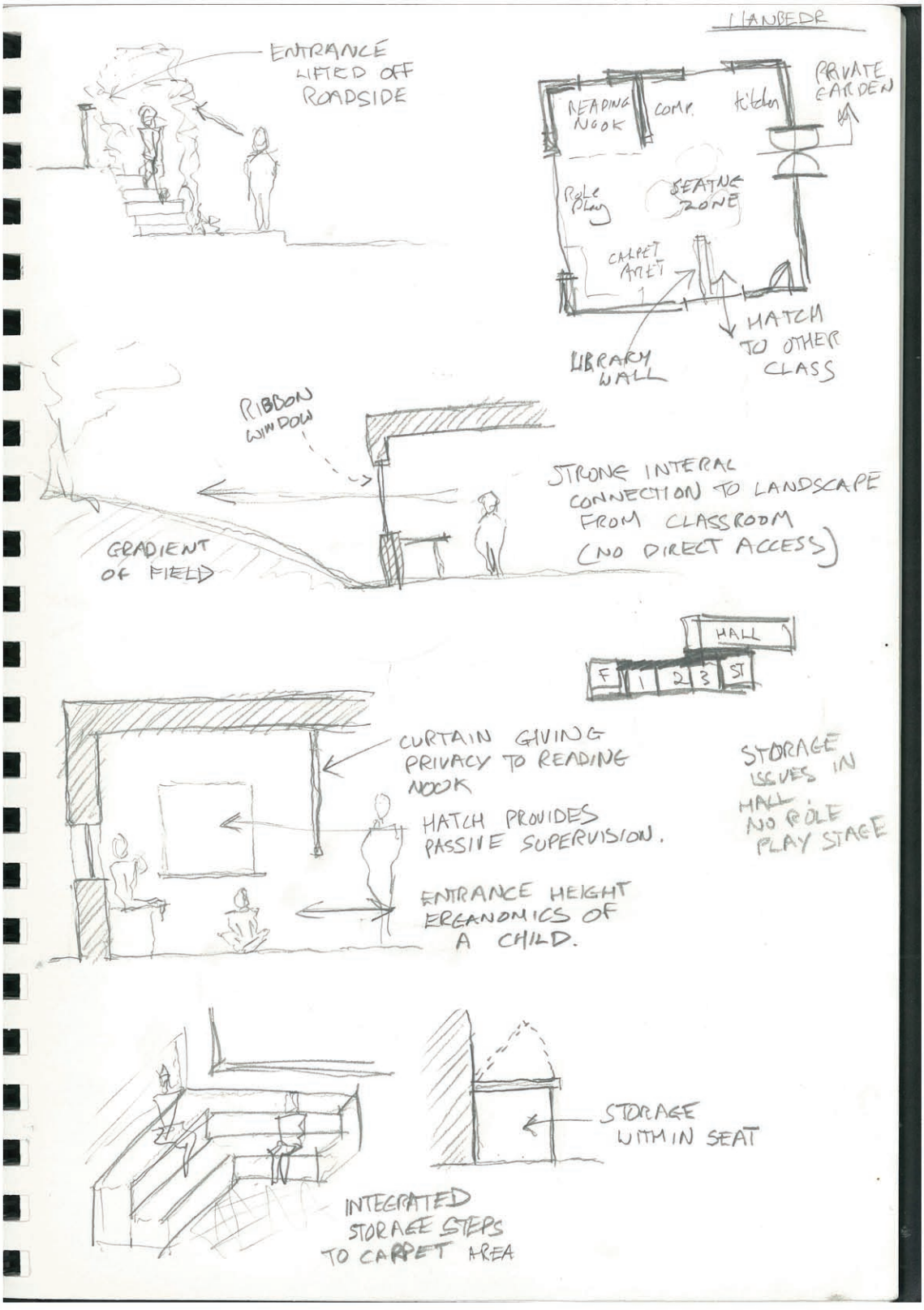
The old school hall is seen from the roadside and is the traditional front to the school.

9. Are there any areas from an architecture standpoint the school would like to change?

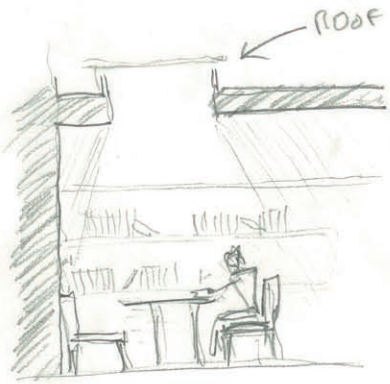
Many, we really need more storage space. As previously mentioned more connection from the classroom spaces to the field would be better.

An external covered space would also be very useful, somewhere for parents to gather outdoors as well as provide us with an external sheltered space for the children to use. It would be very useful both for when it is raining and in the summer to provide shade. A central cover for when we hold school fates and markets.

11.5.1 Llanbedr School Observational Research Notes



FAVOURITE SPACE



LIBRARY CORNER
(MOMENT OF PLACE)
WELL LIT / SOFT FURNISHINGS

IF GIVEN PERMISION TO WORK HERE - SENSE OF RESPONSIBILITY.

11.6. Edwardsville Questionnaire results:

1. The Welsh Assembly Government advocates an education based on life-long learning. A nation with the opportunity and ambition to learn at all ages. This starts at the foundation level in primary school with children developing the ability to learn independently. How does the classroom support an education based on independent learning?

The children can choose their activities every day. The amount of choice is controlled and alternated between activities but for the most the children have the freedom to play anywhere in the classroom and with anything. We zone the classrooms to a certain extent; however the teachers can still supervise all activities. Movable furniture of different shapes and sizes is used to segment the classroom.

Messier activities are more controlled and usually require a support teachers monitoring.

2. What sustainable technologies have been incorporated into the design of the school?

- Which have you found most cost effective to the daily running of the school and easiest to maintain?
- Do the children have any involvement with the sustainable technologies; are they used in teaching?
- What day to day activities do the children participate in to help the environment?

We do not have any sustainable technologies within the school, in recent years we have had the majority of windows replaced through out the school and improvements made to the central heating system of the school. We previously had no control over the timing of the heating system and wasted vast amounts of money and energy heating the school.

The children monitor the daily activities of the staff and vice versa. We call it 'energy watch' and the children can rate the teachers with stickers on their daily performance. For example are given a bad red sticker if they leave the lights on in their office.

Each class has representatives that attend the 'green committee' and relays ideas and information about the schools 'eco-watch' back to their class. All the children are encouraged to recycle both at home and whilst in school. We have a range of gardens and the children grow their own plants, they collect rainwater to water the plants and learn about the local wildlife through various animal watch stations.

3. My research has highlighted the multiple learning and teaching methods involved in the daily proceedings of a class. For example the traditional lecture style teaching where the teacher addresses a whole class, a quiet one on one reading corner, small group work or ICT all need to be accommodated within a learning space. How does the classroom design support/hinder the variation of learning methods and tasks undertaken within the spaces?

- In what way are the classrooms flexible to the needs of the teacher; are there areas where improvements could be made?
- Do pupil numbers, age or classroom dimensions impact on the preferred teaching methods of the school?

We are an old school therefore the classroom dimensions are fairly standard rectangular spaces which give the teacher good supervision over the whole class however make it more difficult to

separate the classroom into zones. With the younger children in the foundation phase this is more difficult to keep separate areas for activities.

The corridor spaces and central library and IT hub help provide flexibility to the classroom spaces. Different activities can occur outside the classroom walls however still under the watch of the teachers in the varied communal areas.

4. How much teaching takes place outside the classroom and for what kinds of activity? Do the school grounds support this style of education of learning in an outdoor classroom?

- Do the internal classrooms have a direct connection with the outside?
- Has consideration been given to the design of external spaces to encourage the learning process outside the classroom?

The infant classrooms have direct access to an outdoor play space. It is a tarmac hard surface area. It is only used in warmer months as it becomes a bit of a frost pocket between the main school building and the hillside.

The hard surfaced outdoor spaces are generally used for PE and lunchtime ball games and are within the walls of the traditional school boundary. With funding and volunteer help we have tried to develop the garden of the school into an outdoor educational experience as well as a safe place to play. The eco historical sculpture park, the cob play shelter and the permaculture garden were all built, planted and are maintained with the help of the children. The new horticulture shelter will be an exciting new addition when completed, and will be used by children of all ages.

Lessons are often taught outside in the various garden spaces, particularly in the warmer months. The children also have wellington boots and waterproof jackets for outdoor activities on wet or colder days.

5. What are the functions of the communal spaces within the school, are they used as intended? For example, the corridors, the entrance hall, the main hall/yard, the school grounds.

- Are the spaces used by people other than the children, the wider community or visitors for example?
- How are the spaces used: display space, threshold/gallery to classrooms, lingering/meeting places, orientation within the school, passive supervision?
- Does the school hold evening classes, how does the school accommodate the change in function of the spaces?

The entrance corridor is used by parents when waiting to see teachers or collect children. It displays the schools achievements and latest activities etc.

The halls are quite flexible, used for general assembly, dining, indoor sport activities and events.

The corridor space in the infant section is used daily by the classrooms surrounding it. It is really an extension of the classroom – contains role play, craft, reading areas. Display space shows the work of the children or themes of recent class activities.

The junior section has a central shared communal zone with a library room and the IT area. Used by in the teaching of all the classes and the children in their spare play time.

6. How much involvement does the school have with the local community?

- Do the children benefit from any community facilities and vice-versa?
- How is the school used outside the hours of a typical short teaching day?

A lot of the children play for the local sports teams. Go to the local church; we have held seasonal services there. We take the children to the local library to encourage them to use it out of school hours. We have a caretaker who lives on site who monitors the grounds and shuts the gates over weekends and late in the evenings, but the local children can still use the hard surface playground for football.

We do not allow access to the gardens outside of school hours as they have been vandalised before.

We open the school for evening classes when we are approached, however it is normally people from the local community and not the teachers of the school who hold the classes.

I am in the process of planning for an eco-centre community building on the school grounds. It will be a straw-bale eco-build. A place to hold evening classes, accommodate other schools trips to our school to learn about the local environment. A new classroom connected to the outdoor environments we are developing at the school.

7. Does the school uphold cultural traditions? Is the history/culture of the area involved in the daily teaching/play of the children, in the design of the play spaces or perhaps in the architecture itself?

Not in the architecture of the main school building.

The cob-play shelter is built out of local materials with a method used centuries ago in Wales however still all over the world. We use it as a tool to tell stories about both the local history and other parts of the world. The plants the children are growing are also used in the same way through lesson time.

We hold regular daily assembly and the children learn in both English and Welsh.

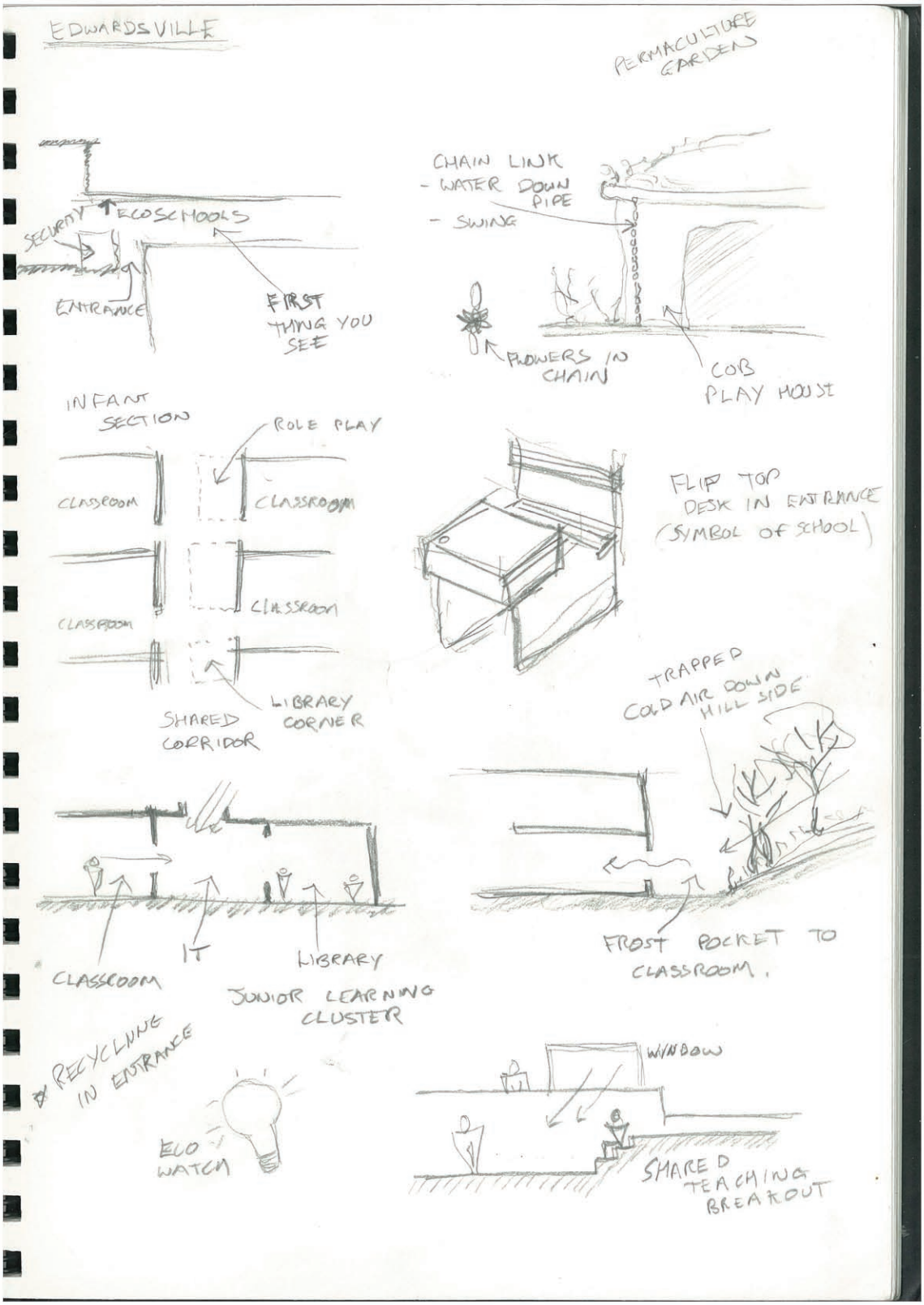
8. Does the school have a signature element?

The signature element would have to be our cob play shelter.

9. Are there any areas from an architecture standpoint the school would like to change?

The school building is very dated and of poor equivalent to modern building standards. The layout works quite well with two halls and separate areas for infant and junior children of the school however a new building would be lovely.

11.6.1 Edwardsville School Observational Research Notes



11.7. Rogerstone Questionnaire results:

1. The Welsh Assembly Government advocates an education based on life-long learning. A nation with the opportunity and ambition to learn at all ages. This starts at the foundation level in primary school with children developing the ability to learn independently. How does the classroom support an education based on independent learning?

At foundation level the children can use all areas of their part of the school; they can play in the various parts of the garden, in the classroom areas or go out into the supervised corridor space. The children all join in with scheduled group activities but for the rest of the day can choose what they would like to play with.

2.What sustainable technologies have been incorporated into the design of the school?

- Which have you found most cost effective to the daily running of the school and easiest to maintain?
- Do the children have any involvement with the sustainable technologies; are they used in teaching?
- What day to day activities do the children participate in to help the environment?

We have photovoltaic panels on the roof; these provide electricity for the national grid which reduces our annual costs and overall building energy consumption. The classroom spaces are all naturally ventilated and have movement sensors to control the use of the electrical lighting. The school was built to maximise the amount of natural light.

The green roof: The roof of the whole school is covered in a sedum plant which helps slow rain water run off and insulates the building. We collect the rainwater in two giant tanks and use it to flush the toilets and water the gardens of the school. The green roof is very east to maintain. It requires little attention and you can walk all over it to fix any problems. The Photovoltaics are a strong symbol however they only contribute a small portion of the overall electricity needs of the school.

We don't really use the technologies in teaching however the electric reader in the entrance monitors the energy levels of the photovoltaics.

All the older children of the school have access to the sensory garden and here each class will grow vegetables and learn how to care for their local environment.

The children also grow their own plants in the classroom, we use the harvested rainwater to water the plants.

The children in Year 2 have recently been learning about endangered animals.

We have an Eco-club of which children dip-in and out of. The club create their own eco-newsletter for the school.

The year 3 children recently visited our local water recycling service, Wastesavers, to learn more about the work they do in the local community.

The reception class recently visited the wetlands centre to learn more about out local environment and the animals that live in our back garden.

3. My research has highlighted the multiple learning and teaching methods involved in the daily proceedings of a class. For example the traditional lecture style teaching where the teacher addresses a whole class, a quiet one on one reading corner, small group work or ICT all need to be accommodated within a learning space. How does the classroom design support/hinder the variation of learning methods and tasks undertaken within the spaces?

- In what way are the classrooms flexible to the needs of the teacher; are there areas where improvements could be made?
- Do pupil numbers, age or classroom dimensions impact on the preferred teaching methods of the school?

The classroom spaces are all very flexible, the foundation phase and infant section in particular can spill out into the shared corridor and central street spaces. I suppose the junior classrooms are very much a traditional classroom layout hoverer they have access to the shared zones and halls, outdoor spaces too which gives them variety of environment.

4. How much teaching takes place outside the classroom and for what kinds of activity? Do the school grounds support this style of education of learning in an outdoor classroom?

- Do the internal classrooms have a direct connection with the outside?
- Has consideration been given to the design of external spaces to encourage the learning process outside the classroom?

The children are always outside. Unless there is severely bad weather we encourage them to use the playground areas as much as possible. The children all have wet weather clothing.

Every classroom has direct access to the outdoors.

The garden spaces are all designed with education in mind. The sensory garden is used in lesson time as is the small woodland to the rear of the school. We help maintain the wood, planting wild flowers and trees with the children. We have a bird feeding station, a wildlife pond, and we have planed a herb garden and fruit garden with the children.

5. What are the functions of the communal spaces within the school, are they used as intended? For example, the corridors, the entrance hall, the main hall/yard, the school grounds.

- Are the spaces used by people other than the children, the wider community or visitors for example?
- How are the spaces used: display space, threshold/gallery to classrooms, lingering/meeting places, orientation within the school, passive supervision?
- Does the school hold evening classes, how does the school accommodate the change in function of the spaces?

The circulation spaces are always full of activity; the main street contains a display board for each class and the corridors are basically extensions to the classrooms. The corridors are great spaces, they are wide enough to be used as play spaces whilst still not cluttering the walkway. They are single sided for the most and have direct views to other parts of the school and links to the outdoors.

We have a designated community room used to hold evening classes and accommodate visitors.

6. How much involvement does the school have with the local community?

- Do the children benefit from any community facilities and vice-versa?
- How is the school used outside the hours of a typical short teaching day?

The hall is used as a church on Sunday with a service for the local community.

The school is open from 7.00 to 9.30 every day to cater for early morning children through to evening events, clubs and classes. The sports pitches and changing rooms are also open to be used by clubs and the wider community. A great local facility

7. Does the school uphold cultural traditions? Is the history/culture of the area involved in the daily teaching/play of the children, in the design of the play spaces or perhaps in the architecture itself?

Since the school has opened every year 6 class helps design a mural to be painted onto a wall in the hall, 'their legacy.' The images are reflections of the children, images of their community, culture and history. We have an assembly every day and the children learn in both English and Welsh.

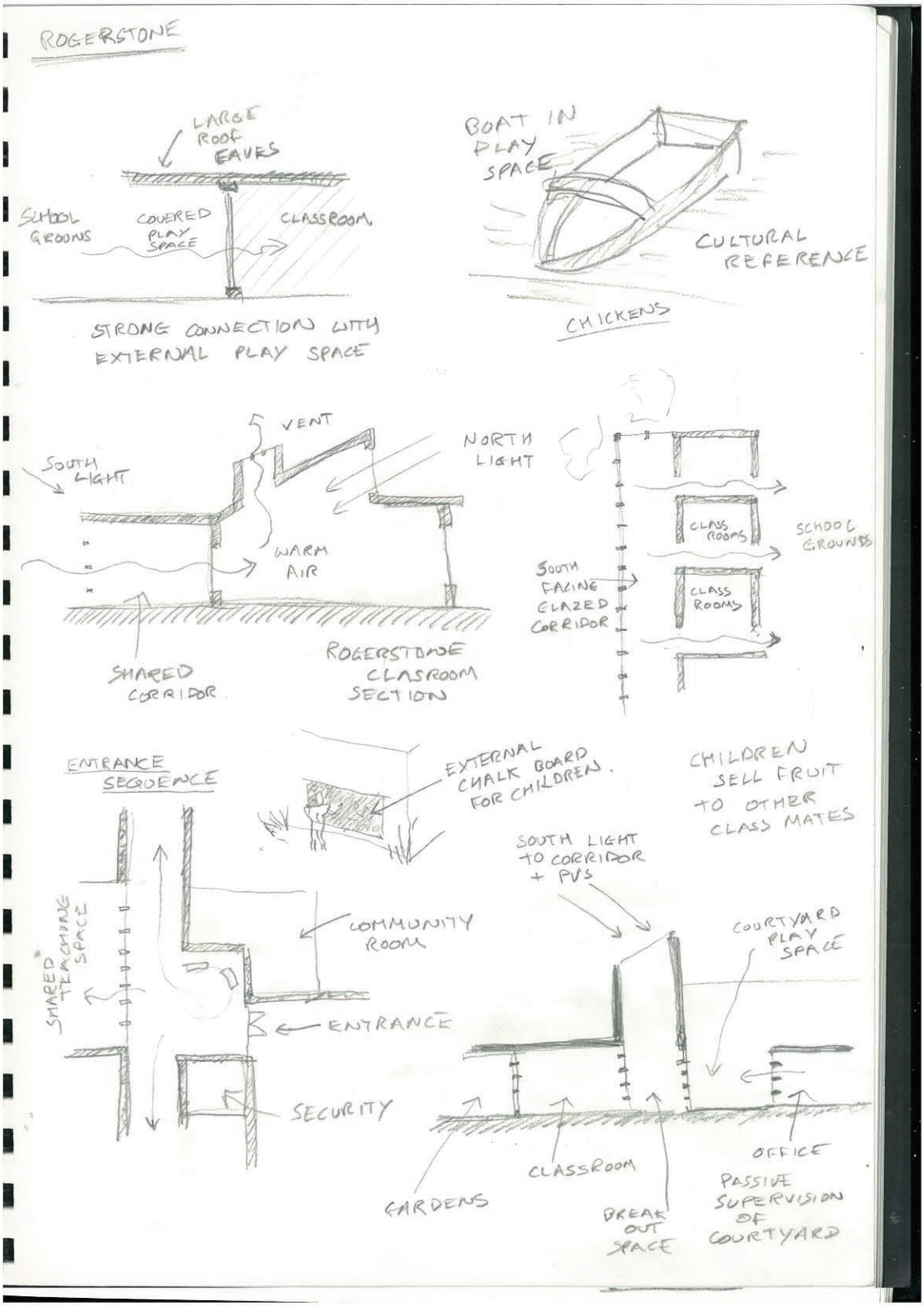
8. Does the school have a signature element?

The green roof is always commented on by visitors and is probably the most noticed feature. The teletubbies mound also gets a lot of nice remarks.

9. Are there any areas from an architecture standpoint the school would like to change?

Only that we have found it a challenge to get the green flag award as it is difficult to get the children involved in daily small energy saving tasks. So perhaps more control over the technologies.

11.7.1 Rogerstone School Observational Research Notes



11.8. Nant-y-Cwm Questionnaire results:

1. The Welsh Assembly Government advocates an education based on life-long learning. A nation with the opportunity and ambition to learn at all ages. This starts at the foundation level in primary school with children developing the ability to learn independently. How does the classroom support an education based on independent learning?

The whole school is classroom; the children each have a room to call home, a base with their teacher however they can use all the other parts of the school to mix with older and younger children outside of lesson hours. The older children are role models to younger children and the older children gain a sense of responsibility teaching and looking after those younger than themselves. Every teacher uses their classroom in different ways, the furniture is always moving around for the next game or activity.

2. What sustainable technologies have been incorporated into the design of the school?

- Which have you found most cost effective to the daily running of the school and easiest to maintain?
- Do the children have any involvement with the sustainable technologies; are they used in teaching?
- What day to day activities do the children participate in to help the environment?

We don't have any modern sustainable technologies, however the children learn about the environment, and a respect for their surroundings. We collect rainwater, recycle, the children grow a lot of their own food.

3. My research has highlighted the multiple learning and teaching methods involved in the daily proceedings of a class. For example the traditional lecture style teaching where the teacher addresses a whole class, a quiet one on one reading corner, small group work or ICT all need to be accommodated within a learning space. How does the classroom design support/hinder the variation of learning methods and tasks undertaken within the spaces?

- In what way are the classrooms flexible to the needs of the teacher; are there areas where improvements could be made?
- Do pupil numbers, age or classroom dimensions impact on the preferred teaching methods of the school?

The classrooms are very flexible; the teachers adapt the rooms with the help of the children whenever needed.

Currently have 37 children at the school so the classrooms certainly are not overcrowded at the moment.

4. How much teaching takes place outside the classroom and for what kinds of activity? Do the school grounds support this style of education of learning in an outdoor classroom?

- Do the internal classrooms have a direct connection with the outside?
- Has consideration been given to the design of external spaces to encourage the learning process outside the classroom?

The children can leave the classroom and play outside whenever they want to. In the kindergarten the doors are always open for the children to explore and play outside, however

the children are encouraged to get involved in the activities the rest of the class are participating in.

The kindergarten has direct access to the outdoors and its own designated outdoor play space.

5. What are the functions of the communal spaces within the school, are they used as intended? For example, the corridors, the entrance hall, the main hall/yard, the school grounds.

- Are the spaces used by people other than the children, the wider community or visitors for example?
- How are the spaces used: display space, threshold/gallery to classrooms, lingering/meeting places, orientation within the school, passive supervision?
- Does the school hold evening classes, how does the school accommodate the change in function of the spaces?

The whole school is a home to the children. The corridors are used as you would find at home, book shelves, pictures etc.

We have a staff/parent room.

Parents, particularly in the kindergarten are heavily involved with the school and participate in activities.

6. How much involvement does the school have with the local community?

- Do the children benefit from any community facilities and vice-versa?
- How is the school used outside the hours of a typical short teaching day?

The parents of the children form the community surrounding the school.
Predominantly young local families and they all take an active interest in the school life.

Some of the children are members of clubs outside of the school in the local community.

7. Does the school uphold cultural traditions? Is the history/culture of the area involved in the daily teaching/play of the children, in the design of the play spaces or perhaps in the architecture itself?

The school follows the Steiner education system therefore all the toys the children play with are made from local natural materials and the architecture itself is of a traditional nature. We follow the cultural traditions of the seasons and the children learn about Welsh heritage.

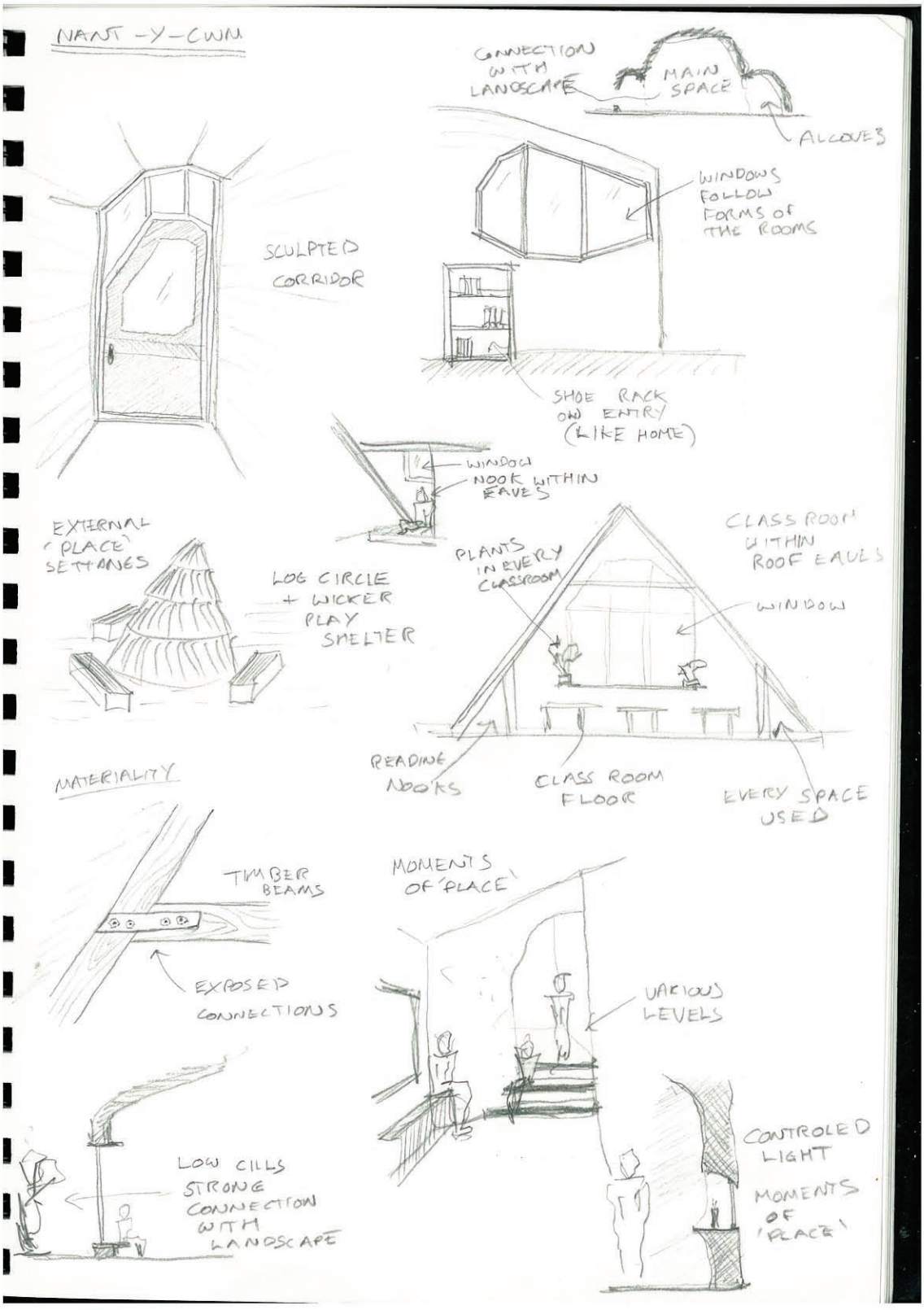
8. Does the school have a signature element?

The kindergarten is undoubtedly the landmark of the school and gets a lot of interest from architecture students.

9. Are there any areas from an architecture standpoint the school would like to change?

We are very pleased with the new kindergarten it's a wonderful building. We have a few draft issues with the main building; there is always repair work to be done but I wouldn't change it.

11.8.1 Nant-y-Cwm Steiner School Observational Research Notes



11.9. Use of Photograph - Permission Letters from Parents

I give my consent for my children Tirion & Llinos Brackenbury to be photographed and used in connection with any relevant work of Gareth Rodeh

Signed

JLA Brackenbury MOTHER.

Ditto above re: Harry Roberts-Hamer

Signed

N.T. ROBERTS-HAMER MOTHER.

Edwardsville Primary School

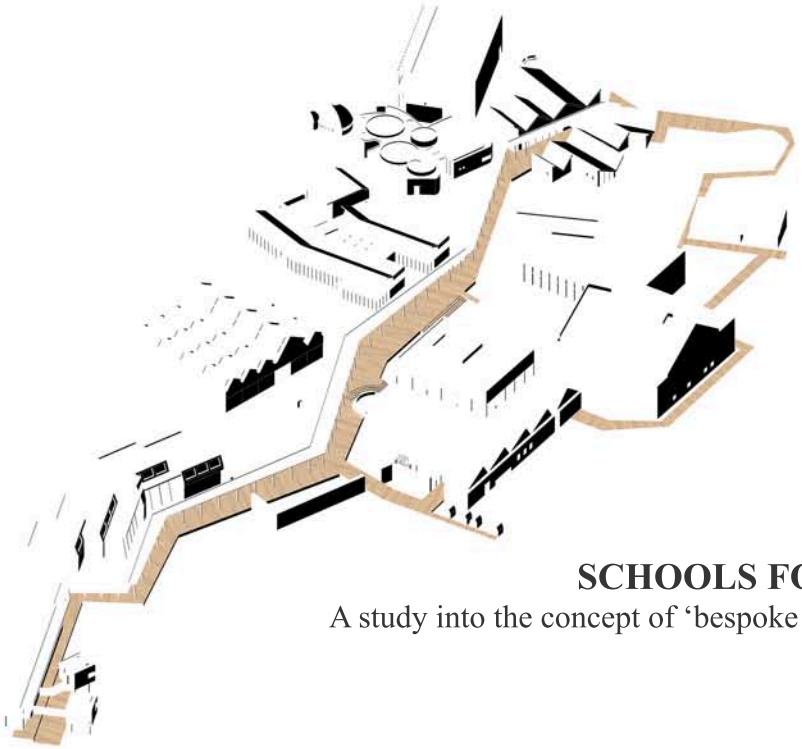
Headteacher: Mr C. Davies
Deputy: Mr J. Rigby
Cardiff Road
Edwardsville
Treharris
Merthyr Tydfil
CF 46 5NE
Tel/fax: 01443 410662
Email: office@edwardsville.merthyr.sch.uk
www.edwardsville.merthyr.sch.uk

To whom it may concern,

I hereby give permission for Gareth Roach to use the photos taken by him on his visit to Edwardsville Primary School on 5 Oct 09.

Regards,

Jonathan Rigby.



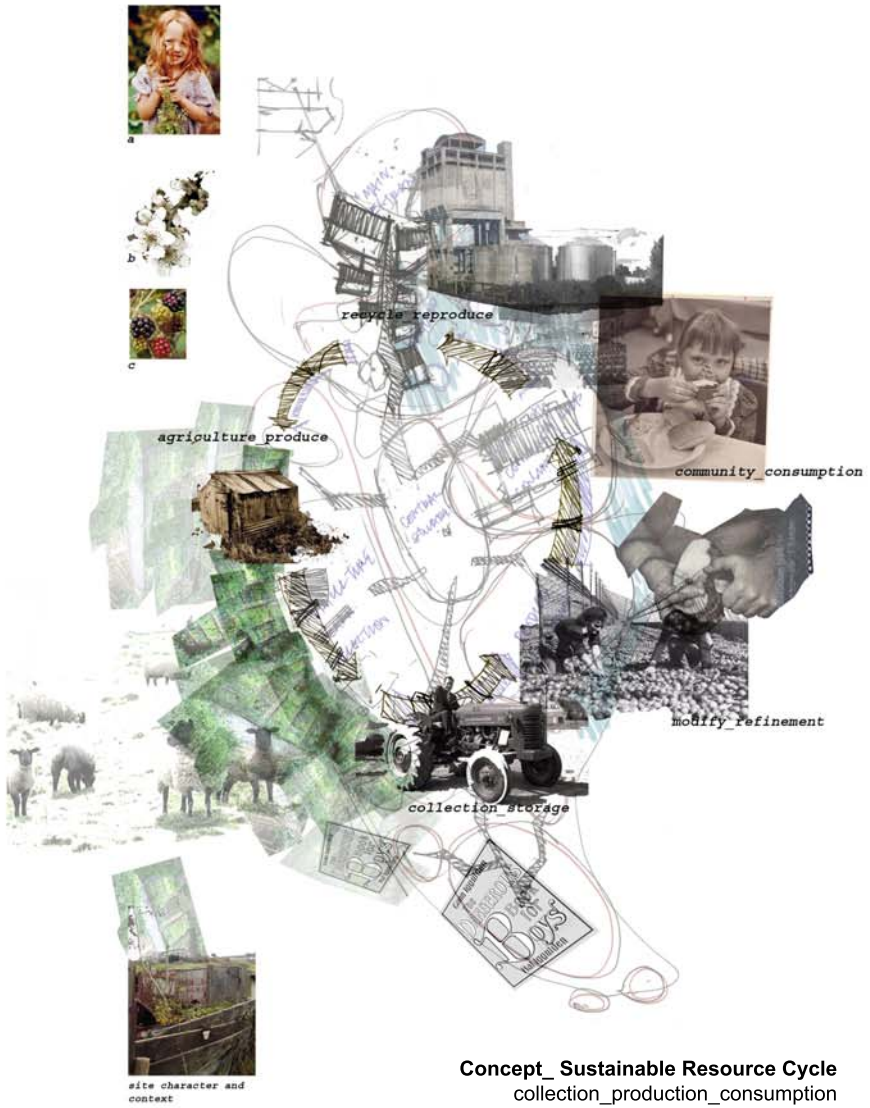
SCHOOLS FOR SUSTAINABLE FUTURES

A study into the concept of ‘bespoke primary school’ design in South Wales

VOLUME II

Gareth Roach
BSc. MArch.

This thesis is being submitted in partial fulfilment of the requirements
for the degree of Master of Philosophy.



Concept_ Sustainable Resource Cycle
collection_production_consumption

CULTIVATING A SUSTAINABLE GENERATION

The following pages introduce the design entry from the author and his colleagues to the Learning Curve 'Designing Schools in Wales' competition.

Sustainable learning environments are only as effective as the interrelationships of two factors: the building design and the culture of the community (as 'users' of the building). A fuel efficient car can be designed but it will still need to be driven in a fuel efficient way; driving at 50mph uses less fuel than at 70mph. Architects can lead the way with a sustainable physical environment but it is the occupants of a building and residents of a community that have to create the sustainable social environment to complete the recipe for a sustainable future.

The concept behind the morphology of the site was to respond to the existing topography and ecology. The primary route weaves across the side of the valley mimicking the natural path of the existing stream whilst the physical interventions respond to the existing mature vegetation of the site. In addition to an appreciation of the value and potential of the existing landscape the arrangement of the buildings evoke a traditional townscape**.**

This sustainable learning environment involves the children in the cycle of community sustainable living. They monitor their own energy and water consumption; they grow their own food and recycle their waste. Every school year has allotment space for cultivating food and rearing small livestock. They deliver the food to the kitchens and are involved in the preparation of meals. The children recycle their own synthetic and organic waste and use the resulting compost on their allotments.

The social centre of the initiative is defined by a ring of community orientated buildings which will create a vibrant environment similar to a lively town square. The physical heart will be used by everyone from community volunteers who aid with the maintenance and cultivation of the allotments, the young and old through to the local farmers market on a Sunday afternoon. In addition to these activities and by way of linking to the community, the scheme proposes an exciting new venture to integrate art and music into the working of the school and to celebrate the traditional culture and heritage of the valley.

Concept_town morphology
Organic community

Ground Floor Plan

1. Approach
2. Staff car park
3. Welcome reception /staff offices
4. "manawyddan"_nursery school
5. "branwen"_year 1
6. "culhwch"_year 2
7. "taliesen"_year 3
8. "peredur"_year 4
9. "rhonabwy"_year 5
10. "mathonwy"_year 6
11. Library
12. Reading rooms
13. Dining pavilion
14. Main hall
15. Arts and music studio
16. Recycling facility
17. Main Walkway
18. Town Square

Classroom Entry Detail
Allotment, glazed facade and children's storage wall beyond

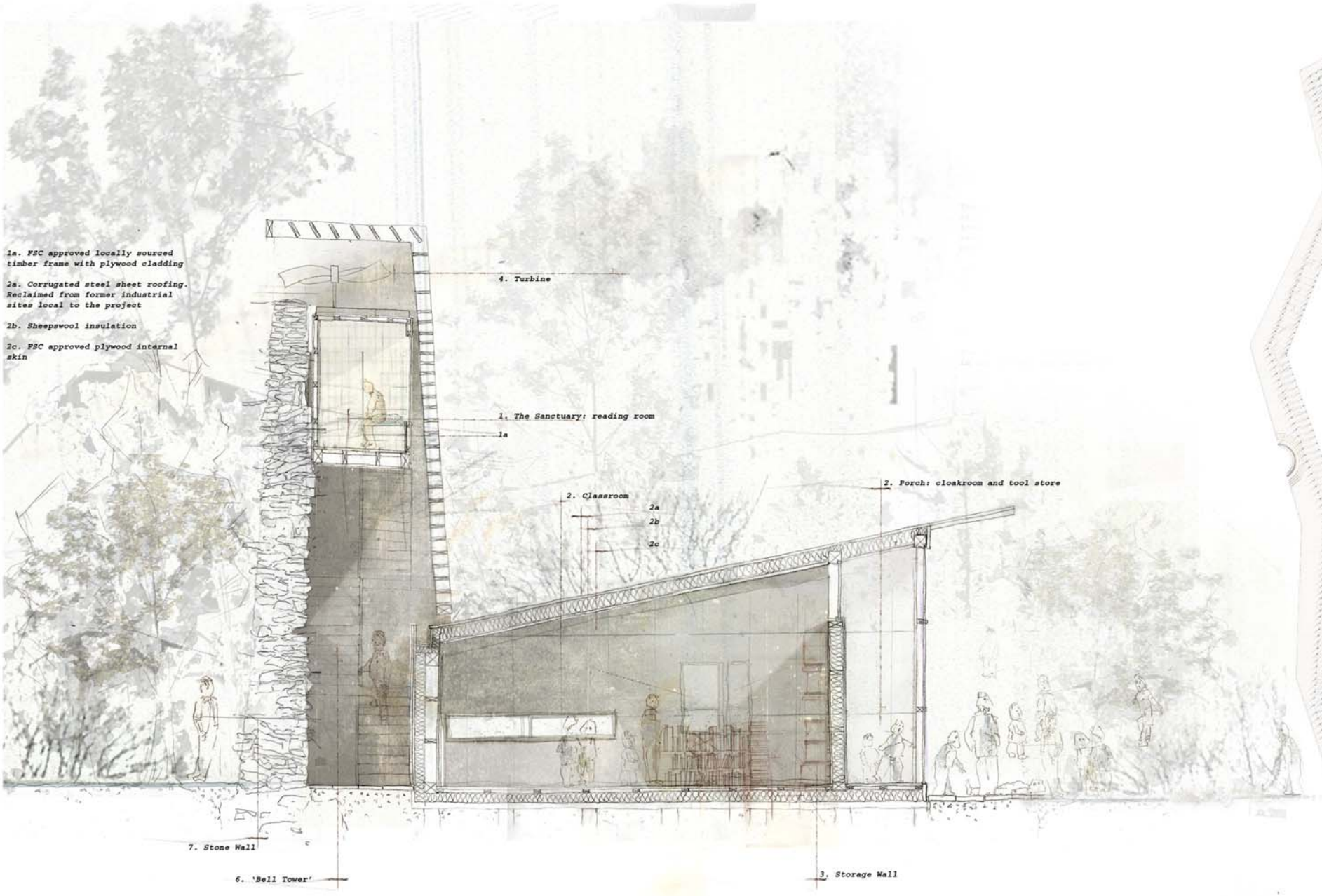
Roof Plan

'Town Square'- Social centre

Site Section a:a

East Elevation

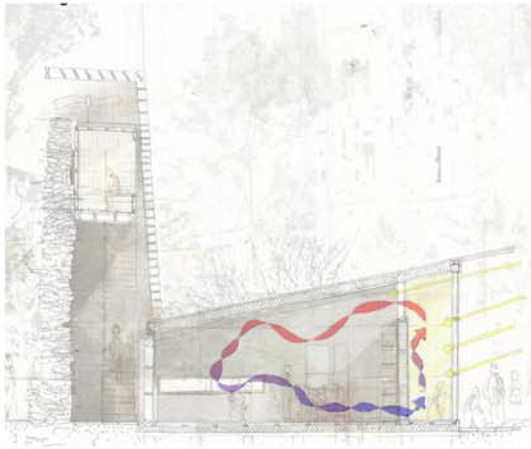
Indicative Classroom Section



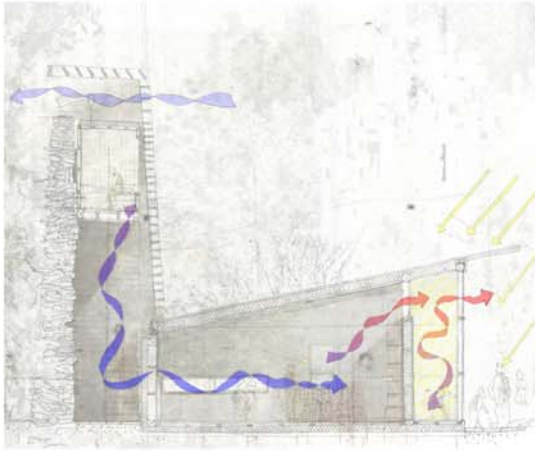
Ground Floor Plan_Cluster

Tree-Top Reading Rooms
Reading rooms among the tree-tops with views through the canopy across the valley

Environmental Stratergy



The classrooms are designed with a passive environmental strategy to maximise environmental gains. The classrooms are heavily insulated with a large stone wall at the rear of the building with a high thermal mass.
Through the concept of a trombe wall on the south façade the classrooms harness the benefits of direct solar radiation. In cooler months the warm air in the glass porch is circulated through the classroom via convection.



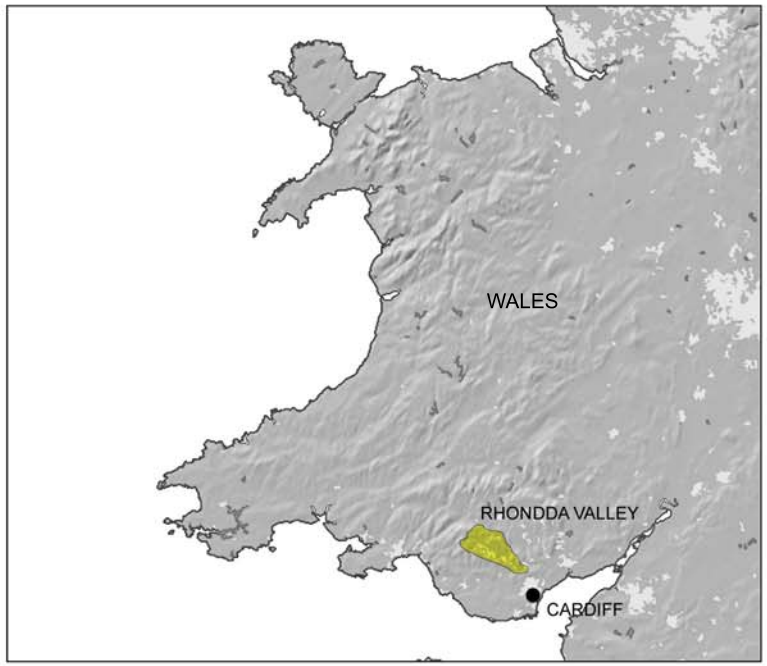
In warmer months the porch acts as a buffer to the sun allowing the classroom to be cooled through natural stack ventilation behind. The classrooms harvest rainwater from their roofs for use in toilets and on the allotments. The geography and conditions of the valley site are conducive for the production of renewable wind energy. The bell towers which give legibility to the site also act as a ventilating chimney to the classroom and means of energy production via the wind turbine at their top.

The Learning Curve design entry was kept to a very imaginative and playful level. The design team believed it was appropriate to draw a scheme that was inspiring and fun for young children, which also educated them about their cultural routes, their futures and the way they live each day. It was this attitude and approach that the judges applauded. *"With visionary staff and a willing community, schools like this can transform the way we learn in Wales and play a part in the rejuvenation of our communities"*(RSAW comments). The concept of the school was seen as perhaps a romantic vision of the way a we could one day live and learn in our communities.

In conjunction with the course of research in Volume 1 of this dissertation, the author returned to the site to develop the scheme based on the gathered knowledge. Expanding on the strengths of the original conceptual endeavours, the following design diary stages the site specific research and the exploratory investigations of the learning environment through to an idealistic bespoke school design for the site.

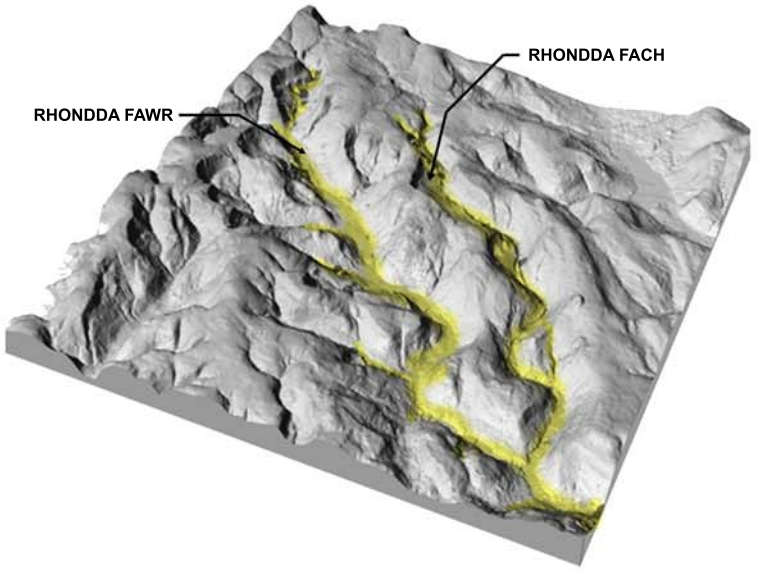
Location

The Rhondda Valley is one of the South Wales Valleys in the borough of Rhondda Cynon Taf. The valley starts about 15 miles north of the city of Cardiff and stretches towards the Breacon Beacons National Park.



Formation of the Land

The landscape of the Rhondda was formed by glacial action during the Ice Age. Slow moving glaciers gouged out the deep valleys that exist today. With the retreat of the ice sheet, around 8000 BC, the valleys were further modified by stream and river action.This erosion of the landscape has left the two river valleys of the Rhondda today, the larger Rhondda Fawr Valley (mawr-large) and the smaller Rhondda Fach Valley (bach-small). Due to the steep sided nature of the slopes and narrow plateaus, the form of the land has dictated the arrangement of settlements on the valleys throughout history. Today they are home to just over seventy-two thousand people.



600 BC

Iron Age

Sites made up of groups of ruinous drystone roundhouses and enclosures that are thought to have been early sheep farming communities.

Remains of a group of earthwork buildings in the Rhondda indicate the presence of the Roman Army during the 1st century AD. It was thought to be a military site or marching camp.

16th / 17th CENTURY

Growth of the farmland

Crops were grown in the lower part of the Rhondda on narrow meadows adjoining the riversides. During the Napoleonic Wars scarce supplies forced the cultivation of the upland areas.

In the first half of the 17th century a rising cost of consumable goods and a series of bad harvests brought about economic changes in the Rhondda. Those with enough wealth were able to seize on opportunities created by these unsettled conditions and set about enlarging and enclosing farm lands removing areas of forest. The enclosure of freehold lands that began in the later Middle Ages now gained momentum and farms that were once owned by individual farmers were now owned by small groups of wealthy landowners.

12th / 13th CENTURY

Medieval Period

Unlike the communal dwellings of the Iron Age, the remains of the medieval buildings discovered in the area follow a pattern similar to modern farmsteads; with separate holdings spaced out around the hillsides.

The evidence of Medieval Welsh farmers comes from the remains of their buildings. The foundations of platform houses having been discovered sporadically throughout both valleys The Rhondda also has the remains of two Medieval castles - Castell Nos and Ynysygrug

19th / 20th CENTURY

Industrial Rhondda

The southern coalfield of Wales is the largest continuous coalfield in Britain. The Taff Vale Railway line built in 1841 opened the land to the rest of britain and would dominate the transportation of coal throughout the Rhondda's industrial history.

By 1893 there were more than 75 collieries within the Rhondda Valleys. In February 1917 coal mining came under government control and demand increased as the war intensified, ensuring a market for sufficient supplies of coal. During the early to mid 19th century the Rhondda Valleys were inhabited by small farming settlements with a population of around a thousand. The population of the valleys peaked in 1924 at over 167,900 inhabitants following the rapid growth of the mining communities.

Industrial Rhondda

Thousands of Rhondda terraced houses were built to accommodate the increased population. The stone for these houses was quarried from the hillsides where the houses were being built.

19th / 20th CENTURY

Cultural Ties

In recent history, Rhondda and the Valleys were best known for their strong masculine cultural ties within the social community that expressed itself outside industry in the form of male voice choirs, rugby union, trade unions and public house life.

These cultural ties are weakened today. Whilst rugby in Wales is as popular as ever, the regionalisation of the teams has slightly lost the tradition of the local clubs.

Rhondda Today

The Rhondda today bears little relation to the busy place it once was, with all the hustle and bustle of the mining days. There is much unemployment, and the work locally pays small wages. Many travel to work to e.g. Cardiff, where better wages are on offer. More of the younger generations have left the valleys to seek work elsewhere, many never to return. Lots of the little village and town shops run by the same families for generations have now disappeared, and more and more Rhondda folk have to travel to the larger stores on the perimeter of the valleys. Sadly, the Rhondda Valley today is in many ways a failing community.

2000+

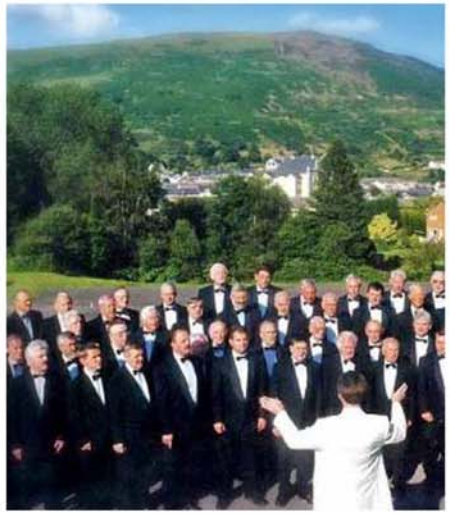
1950's.....

Close of the Mines

From 15,000 miners in 1947, Rhondda had just a single pit within the valleys producing coal in 1984.

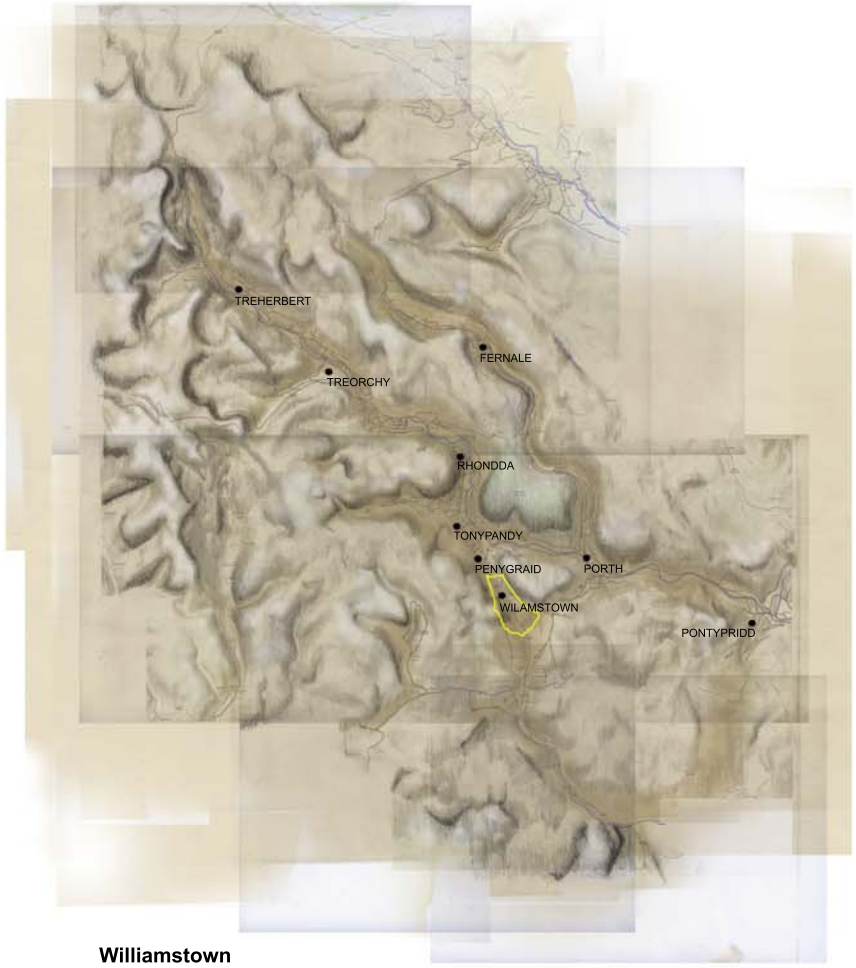
There are many reasons for the collapse of the mining industry within the Rhondda, but most are connected to the fact that oil superseded coal as the fuel of choice in the Western economies and the fact that the expectations of the British worker moved from manual to manufacturing and then to white collar work.

Music



Music and the male voice choir in Wales were traditionally found in the busy Baptist Chapels across the valleys. However today, most of the Chapels are as silent as the mines. Fewer than 3% of the Welsh people now attend. This remnant keeps alive an important part of the valleys history, a dissenting gospel, and many of the grand Welsh hymns for which the region is renowned.

The justly acclaimed male voice choirs of Wales remain. Every community or town has its own choir. Their music continues to be one of the great defining cultural institutions of Wales; opera choruses, Welsh hymns, folk songs and show music.



Williamstown

Williamstown is a village located at the Southern end of the Rhondda Fawr Valley. It is a district of Penygraig in Rhondda Cynon Taf. Founded in the 1870's the village lies at the foot of Mynydd Dinas. A small tributary to the river Rhondda runs down the valley slopes through the village.

Primary School Site

The location of the site for the new school proposal is on the periphery of Williamstown. The site is on the western side of a valley slope with the large majority of the town to the North.

The site has a fairly consistent slope down the valley, from west to east, with a large embankment lining the eastern edge alongside the A4119 road. The road runs parallel with the site and is the major access route into the town beyond from the M4 motorway. A large number of mature trees dominate the eastern edge of the site and form a natural barrier to the road. To the west of the site the gradient of the valley increases to its peak.

1.

2.

3.

4.

5.

Site Views

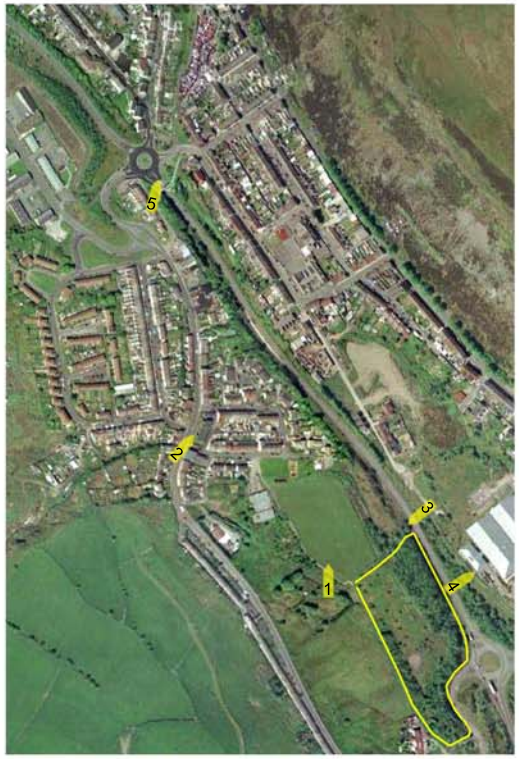
1_ View across Penrhiwfer AFC football pitch

2_ Williamstown Community Church

3_ Tributry of Rhondda River

4_ View across Eastern valley slope

5_ View North across Williamstown and Penygraid



1.

2.

3.

4.

5.

Site Views

1_ Valley peak

2_ Williamstown High Street

3_ A4119-bank of mature trees to the east border of the site

4_ Penygraig Labour Club

5_ A few miles from Williamstown is the Rhondda Heritage Museum. The museum is housed in the former Lewis Merthyr Colliery Pithead buildings. The museum tells the story of the 'black gold' from the valleys, it is a valuable resource educating new generations about their Welsh history. The museum contains the majority of the old structures of the pit head, a strong visual link to the past industry that made the Rhondda the thriving community it once was.

Primary School Site

Primary Route Across Site

As discussed in Volume 1 of this research, one of the considered successful aspects of the ‘Learning Curve’ entry was the response to site. The primary route through the school weaves across the site mimicking the path of the stream.

Left: The main route through the school forms a plateau in the valley hillside. The walkway weaves back-and-fore across the stream, bisecting the site.

Below: The walkway is a timber deck exposed to the elements. It is partly covered to provide shelter when negotiating the school in bad weather. The large gutters of the canopy collect rain water and direct it towards the pond formed at the lowest point of the site. Both the stream and the gutters meander across the site delivering water to the pond and adjacent storage tanks which will be recycled for use in the toilets.

The changes in angle of the path provide a shifting viewpoint to varying destinations across the site, the built forms will frame key moments and provide a barrier to the strong valley winds.

Walkway Section

Zoning of Accommodation on Site

As with the existing urban grain of the Rhondda communities, the morphology of the buildings is sensitive to the topography and the ecology of the site. The arrangement of accommodation responds to the mature vegetation and the contours of the site.

The general arrangement of accommodation on the site follows that of the competition entry. It was a successful solution emulating the traditional nature of a town. However the author focused his design intent on the specific organisation, physical morphology and operation of the teaching and community spaces within the plan.

Left: The zoning plan highlights the arrangement of the primary accommodation elements on the site.

Main entrance_ vehicular access/parking and staff office

School sports hall and hard surfaced sports court, linked with community football pitch to the north of the site

Primary Route

School shared facilities, hall, dining pavilion and cultural centre form the sides to the schools central square

Shared school playground /central square

Mature trees and steep bank form a natural barrier to the road

The teaching spaces run in year group with the youngest children in the reception to the North closest to the entrance and the eldest children to the south. Each age group of children has their own school block / learning community along the main route through the school ending with the library space to the south.

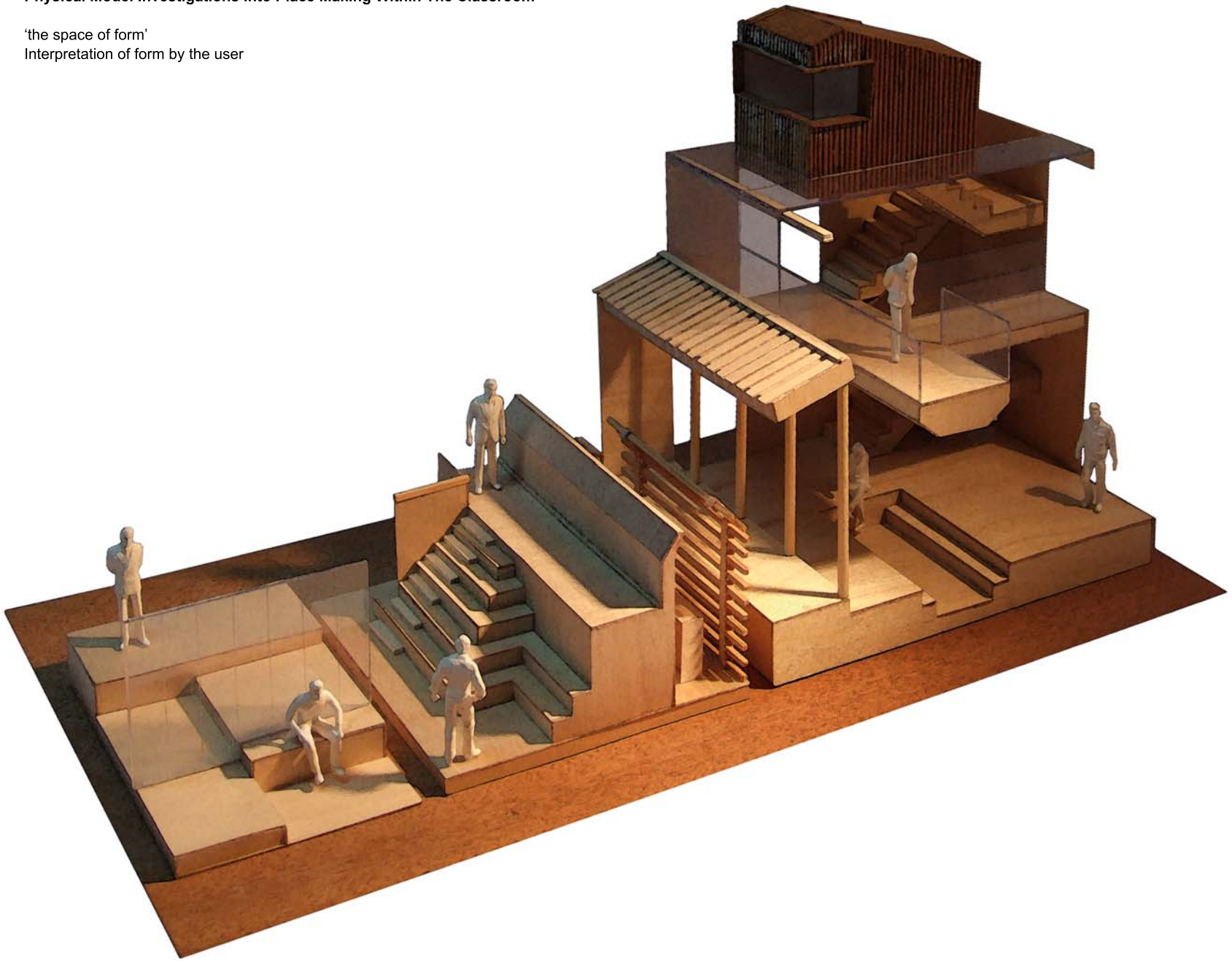
Each learning community has a private garden to take ownership of, enjoy and maintain

Library

Vehicular access/parking

Physical Model Investigations Into Place Making Within The Classroom

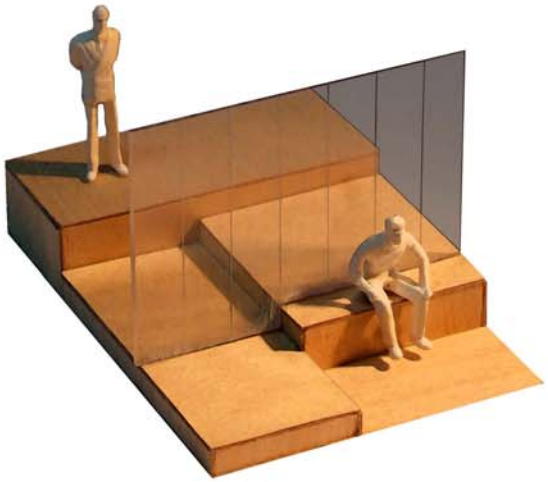
‘the space of form’
Interpretation of form by the user



Physical Model Investigations Into Place Making Within The Classroom

The Classroom Floor

1.



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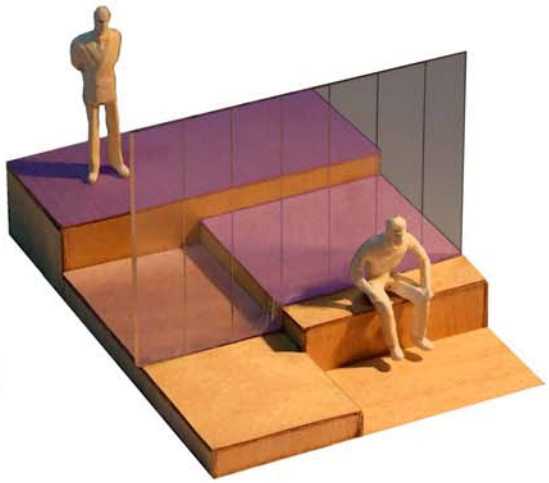

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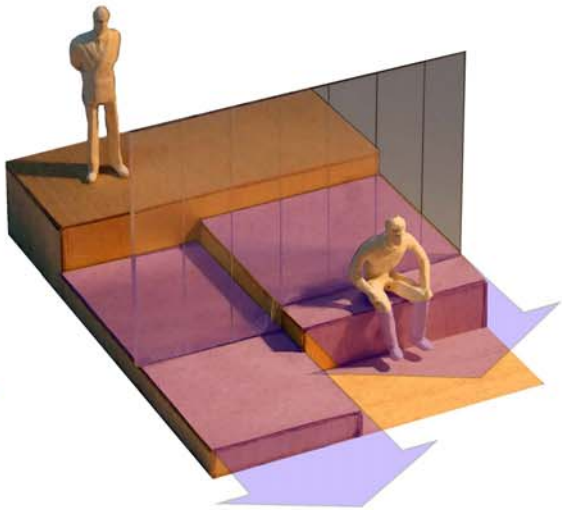


1. Articulated space of the classroom floor_create moments of place

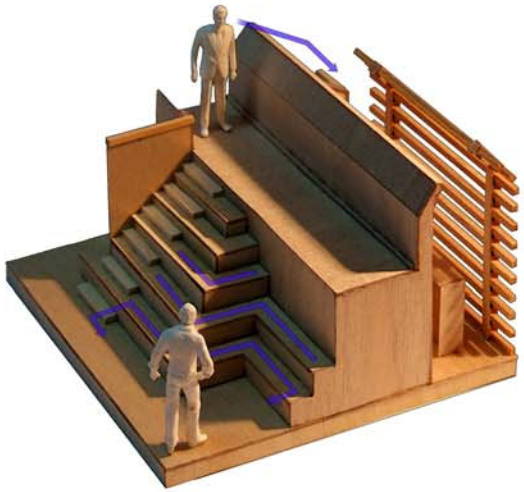
2. Place making_level changes provide zoning within the classroom, varying contained floor finishes suitable to a particular activity.

3. Transparency of threshold_visible connectivity as planes continue through façade. A connection with the external landscape.

Physical Model Investigations Into Place Making Within The Classroom

Design for multiple learning methods
A holistic education

1.



2.

3.

1. Lecture/group style learning_Large group interaction.
A passive supervision.

2. Place for one-on-one conversation_Small group activity.

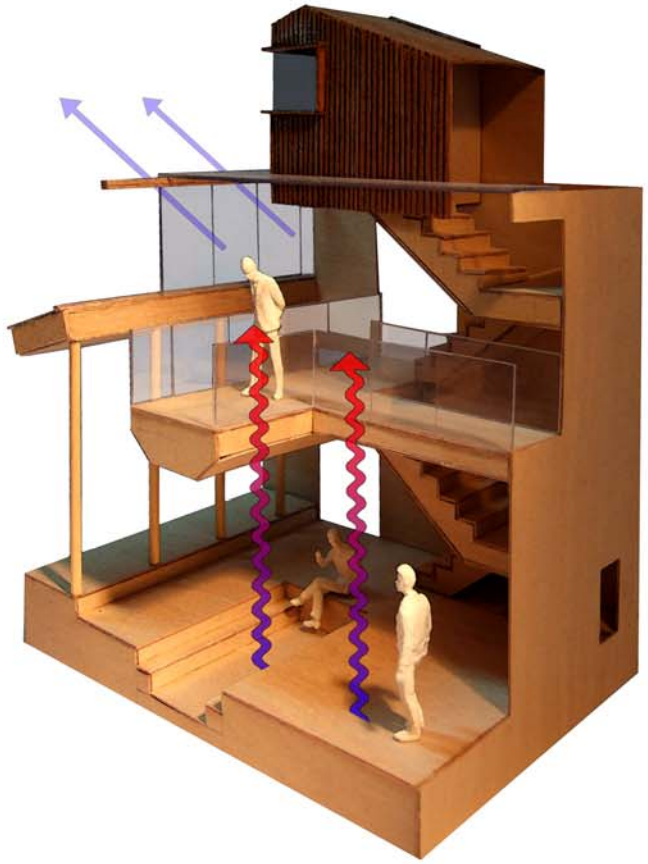
3. Individual quiet space / reading nooks _
Varying transparency of connection.

Physical Model Investigations Into Place Making Within The Classroom

Vertical Integration / Separation

1.

2.



1. Open ground floor_ greater flexibility of space, change of use

Colonnade / level changes help define space

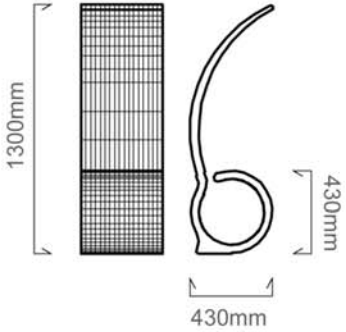
2. Connections to site_views to canopy of the trees / sky_ passive solar gains
Atria_ lends to passive ventilation / thermal strategies

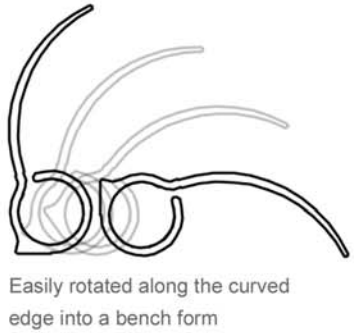
Levels of interaction_ open ground floor of activity / walkways of circulation
and pssive supervision / private tree top reading rooms, private study space

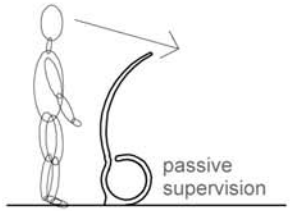
'Chair Form'_ flexible place making with furniture
Investigation into furniture for flexible yet functional use
Interpretation by user

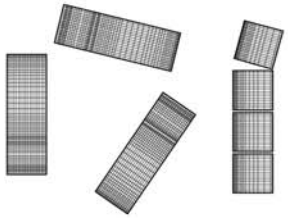
The chair form can be rotated and repositioned, both individually and several together, to be used in a variety of ways both internally and externally. Constructed out of a repeated section of ply wood, adjacent sections are rotated to have perpendicular grains. This provides added strength allowing for a more slender, easily managed form.

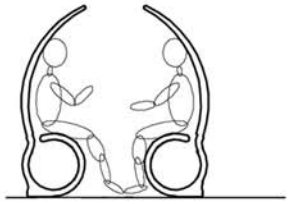
The chair form can also be flipped onto its side edge to create a low screen for playing behind and a circular storage area. The form in its many positions also acts a climbing/crawling apparatus for play. A series of the chair forms in a horizontal position acts as series of benches in the round, vertically they can act as a screen to separate an area of the classroom.

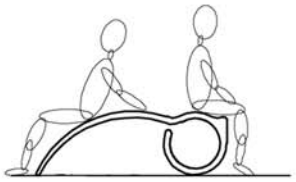












Prototype Physical Model

1. Main Entrance
2. Car Park
3. Bus Stop
4. Staff Offices
5. Community room/ gallery
6. Sports Hall / changing rooms
7. MUGA (Multi use games area)
8. Pond, underground water tanks
9. Community recycling facility
10. Stream
11. Main Walkway
12. Cob play shelter
13. Reception Class
14. Class 1
15. Class 2
16. Class3
17. Library
18. Tree-top reading room
19. Main Hall
20. Cultural Centre
21. Dining Pavilion
22. Town Square
23. Nature Galleries
24. 'Pit head' play garden
25. School stores
26. Gardening stores
27. Amphitheatre
28. Classroom gardens
29. Community sports fields

1:1000@A3

School Boundary_nts.

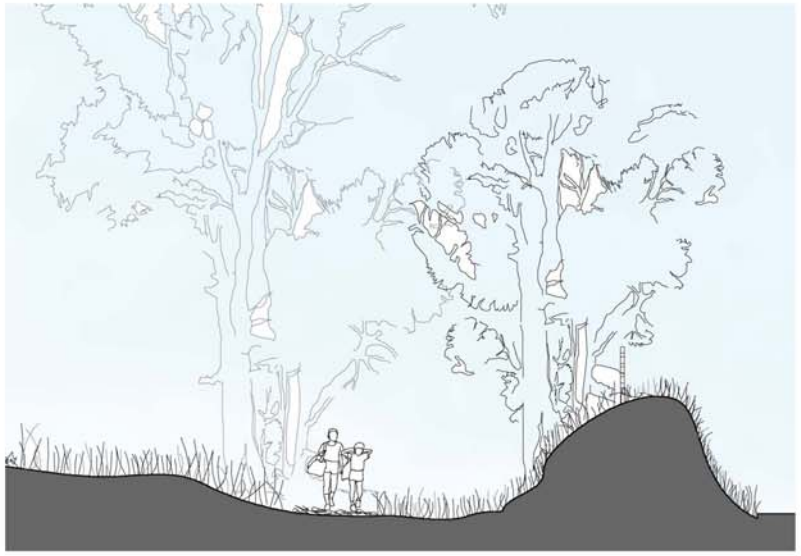
The school uses the natural elements of the site as boundaries where possible. The eastern fringe of the site is lined by the small stretch of woodland and the embankment. This forms a barrier to the main road and also reduces of road traffic noise. The western border of the site is formed by a footpath around the school towards the centre of the town. The path is lined with a timber fence which forms the boundary to the school.

There are several gates surrounding the main square to close off the main hub of the school when the library is in use late in the in the evening. The stream also forms a natural barrier to a portion of the site.

The main staff administration and office spaces line the entrance gateway and provide a level of security to the main access route into the school.

1. Embankment -Natural boundary
2. Timber fencing to footpath
3. Gated entrances
4. Main entrance gateway during the school day with supervision from offices

Embankment to eastern border of the site _nts.
Woodland creates a natural boundary to the school



Nature Trail Through the School Grounds_nts.

The bank of mature trees to the east of the site forms a natural boundary to the road, however it also provides a small stretch of woodland for the children to explore. A nature trail runs along the fringe of the woodland starting in the canopy of the trees in the library tree-top reading rooms.

The stream meandering with the walkway leads to a pond at the lowest point of the site. The pond adjacent to the main entrance is also a visual statement about the nature of the school. The water brings a different habitat to the site from that of the woodland. It is another area for the children to explore and care for. The pond becomes the destination of the nature trail as the children can follow the path of the water or take the walk along the woodland edge.

1. Nature trail
2. Nature/landscape viewing gallery
3. Woodland creatures
4. Pond
5. Library tree-top reading rooms
6. Main walkway meandering with the stream
7. One-way glass

Ecology Galleries_nts.

A series of sheltered play spaces with one way glass provide viewing galleries to the stretch of woodland. A visual connection with the local wildlife for the children to monitor and care for.

The School Grounds *'the gardens'*_nts.

To the west of the walkway amongst the classrooms are a series of more maintained gardens. Between the classrooms in this region of the site are areas of grass and planting. Each classroom has an area of grass for play and a series of allotments and flower beds to maintain. The children supported by the staff and community volunteers on weekends maintain the gardens are harvest the rewards for use in the school.

The garden spaces consist of numerous surface changes suitable for varied activities in different weather conditions, outdoor play equipment made from natural materials and a variety of seating.

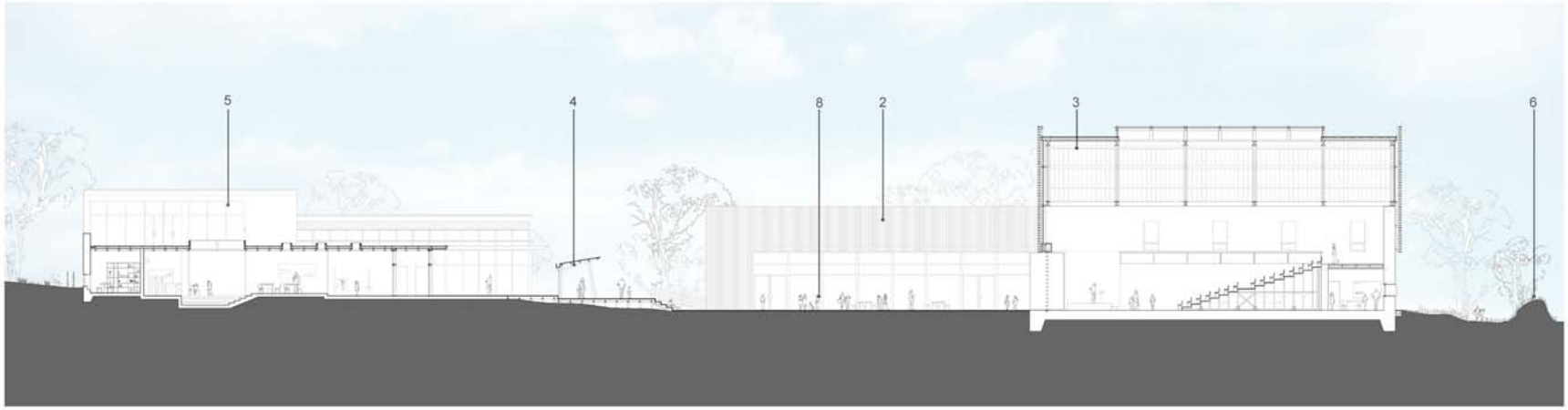
The image left highlights the garden arrangement for class 1. The external environment is a continuation of the internal layout. The gardens are part of the immediate learning environment. Along with the nature trail/ the woodland/ the external amphitheatre/ the stream and various hard surfaced play areas the children have a vast variety of outdoor environments in which to explore, experience and enjoy.

1. Main Walkway
2. Class 1 plan
3. Openable façade
4. Vegetable allotments
5. Herb gardens
6. Wild flower garden,
7. Grass area
8. Seating around base of tree
9. Stepped decking
10. Outdoor play equipment
11. Hard surfaced area and gravel
12. Amphitheatre
13. Covered Decking

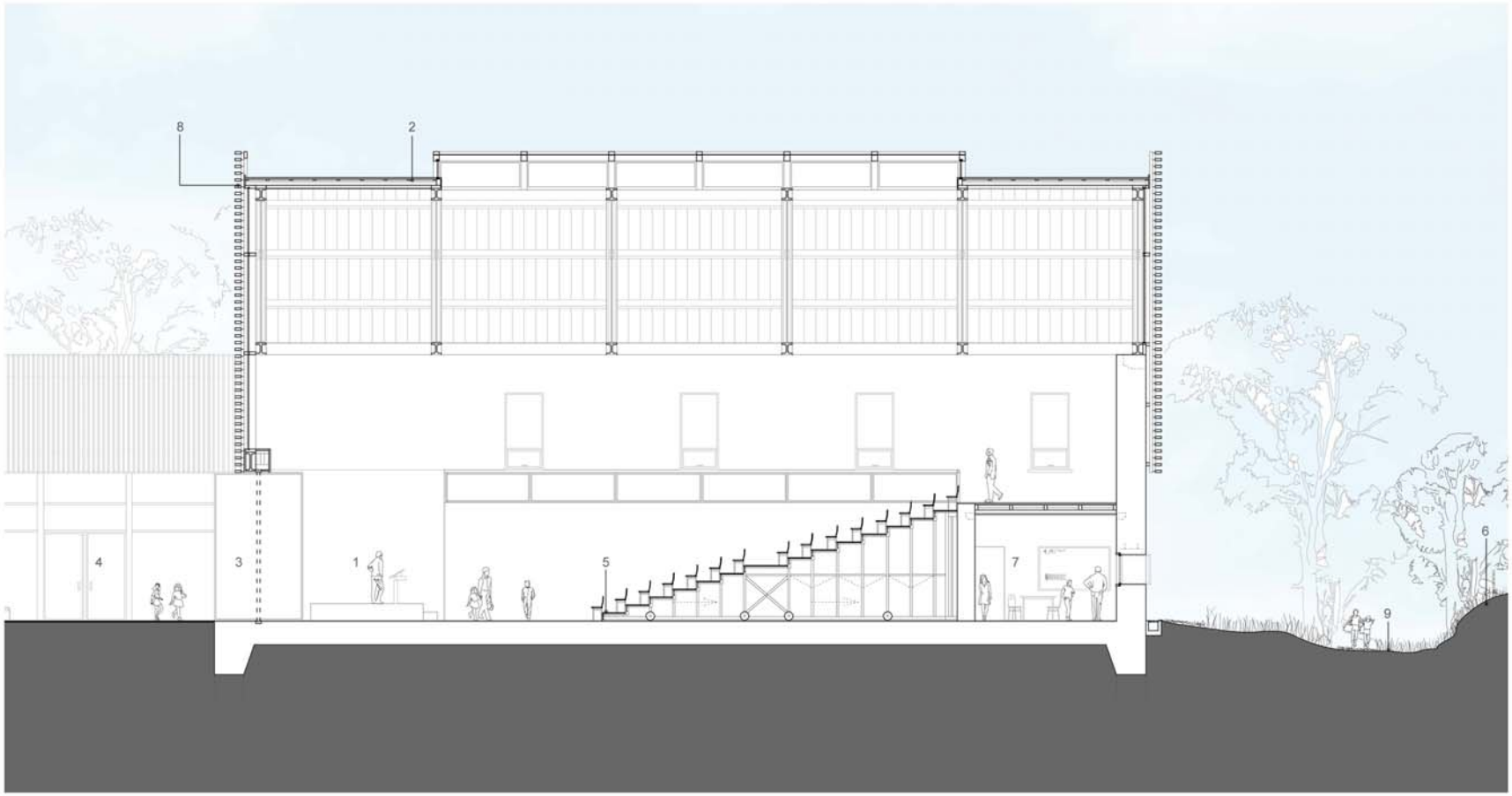
The Dining Pavilion, the Cultural Centre and the Main School Hall

1. The Dining Pavilion
2. The Cultural Centre
3. Main School Hall
4. Main Walkway
5. Class 1
6. Existing bank_natural barrier to the road
7. Road A4119
8. School Central Square

Long Section Through School Central Square a:a _nts.



Main Hall Section a:a_nts.



1. Stage for morning assembly and school performances
2. Traditional form_ trussed roof structure
3. Entrance_ series of folding screens
4. Cultural Centre beyond
5. Bleacher seating_fold away for market day
6. Existing bank_natural barrier to the road
7. Music practice room
8. Screen of horizontal timber slats shading glazed curtain walling
9. Nature trail within small woodland around periphery of site

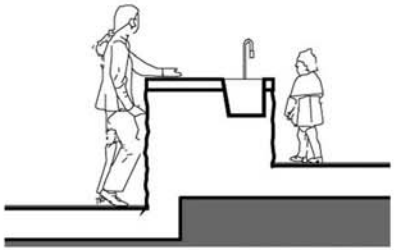
Reception Class (Children Aged 3-5) *'The Home'*

The reception class is nestled behind the school offices and sports hall in the north-west corner of the site. A visitor to the school, walking through the gateway of the offices would see a glimpse of the curves of the reception class beyond.

The design of the class developed towards the philosophy of the Steiner kindergarten as it successfully supports the favoured direction of education in Wales at this level. It is the first environment the children enter into at the start of their school lives.

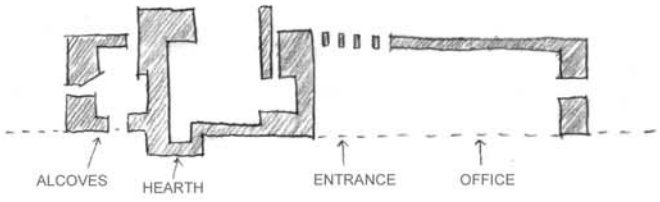
Precedent images:
Nant-y-Cym kindergarten.

Left: Central worktop has two different levels of floor either side, bringing the children and the teachers to a shared surface height. children learn through observation, interpretation and participation



Concept development sketch:classroom spaces are 'carved-out' of the earth.

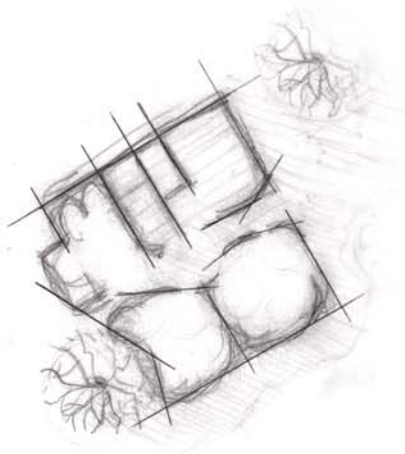
Controlled natural light, warm cosy 'safe' play spaces within the hearth. Offices/ stores/ back of house to the rear.



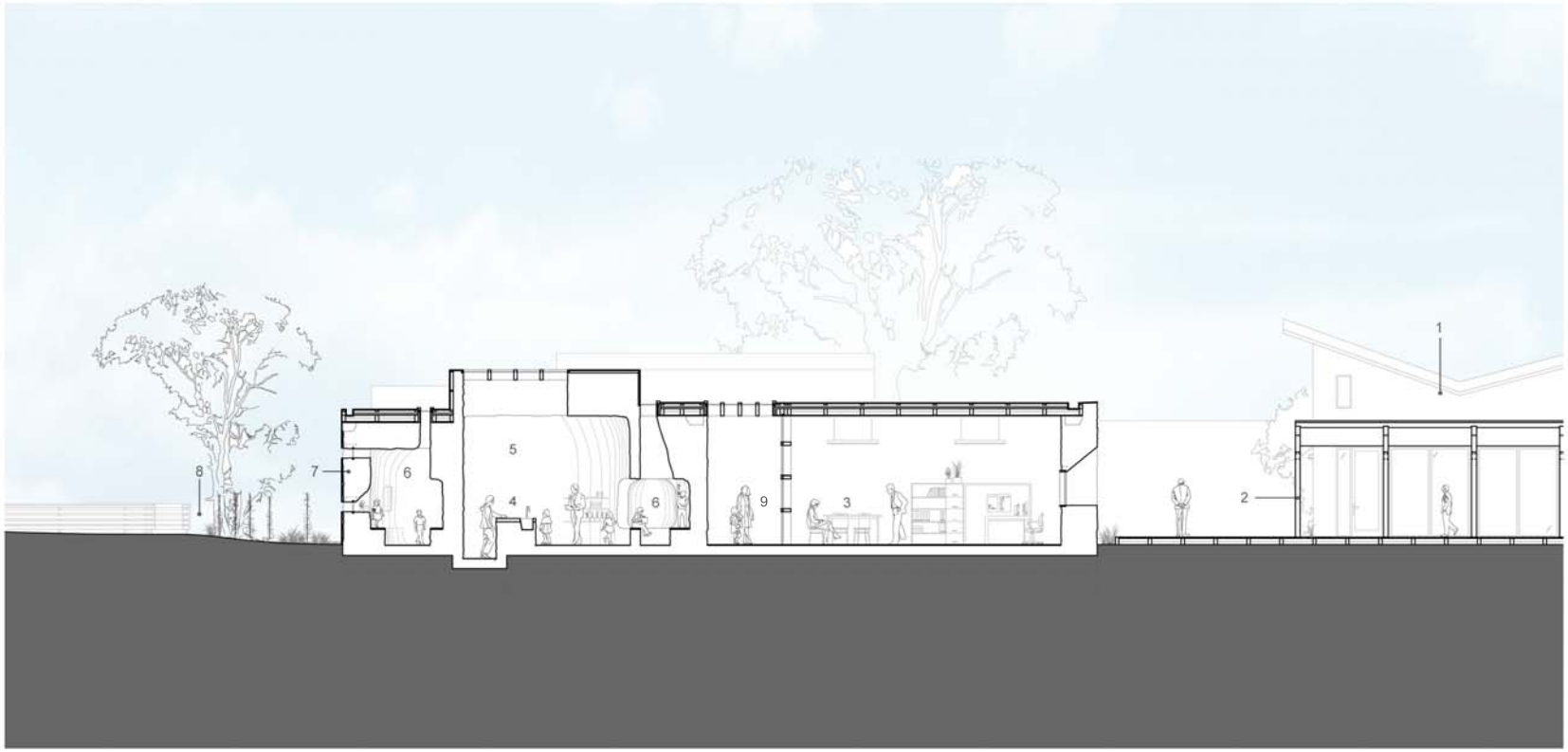
Classroom development sketch:

The classroom is designed with an array of alcoves off the central classroom space to accommodate the more intimate participation of a small group of children playing together.

It is through this focused activity that children develop the early human skills of peer interaction, sharing and communication.

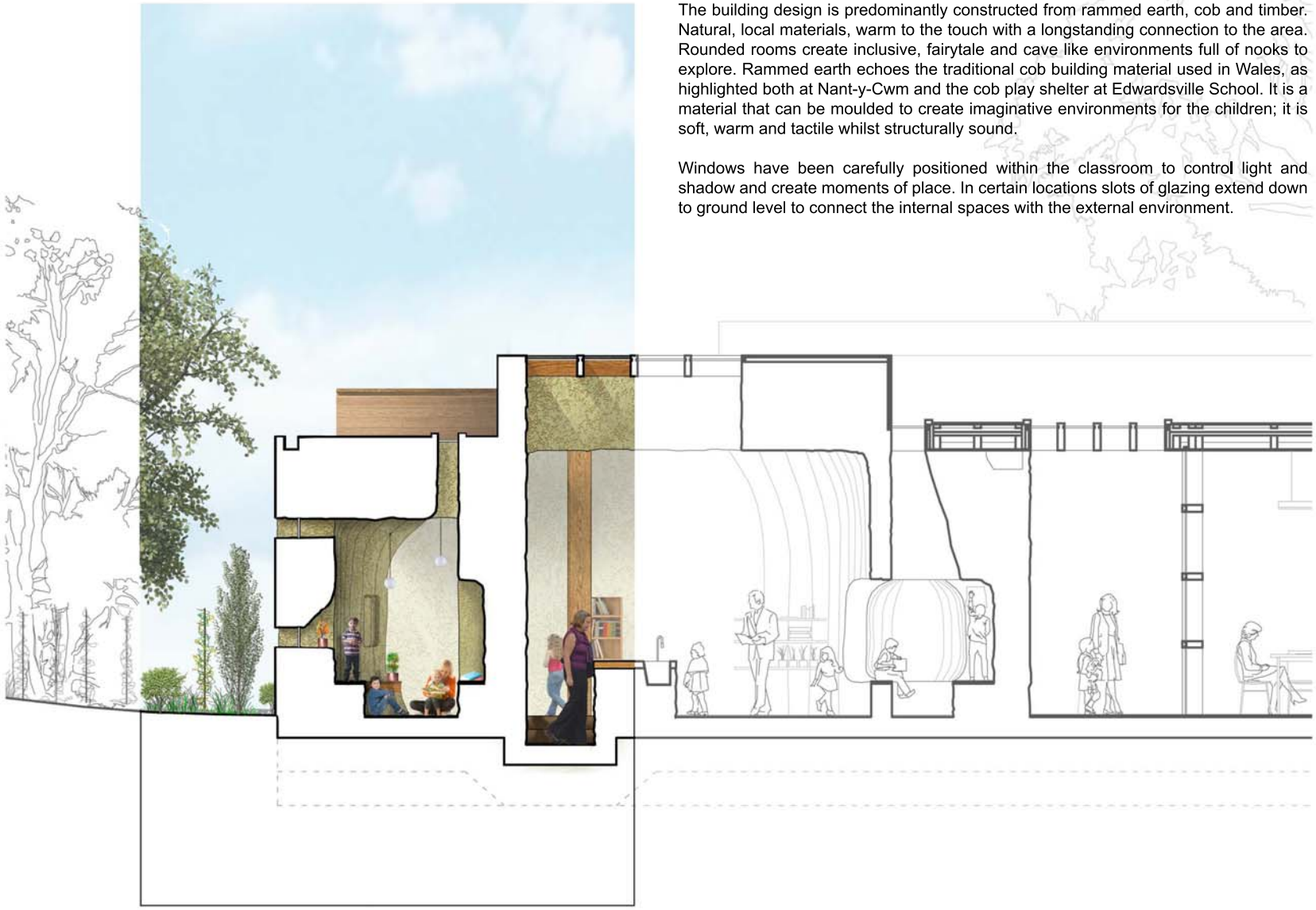


Reception Class Section a:a _nts.



1. School offices
2. Main walkway
3. Reception class staff spaces
4. Kitchen / wet area
5. Central classroom space beyond
6. Alcoves for small group activities
7. Sculpted rammed earth walls
8. Reception class gardens/ external play space
9. Central entrance hallway

Inhabited Section_nts.



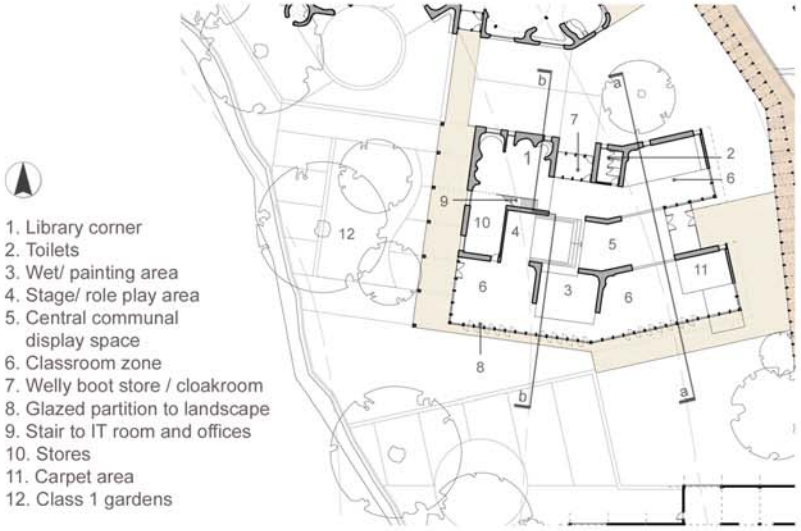
The building design is predominantly constructed from rammed earth, cob and timber. Natural, local materials, warm to the touch with a longstanding connection to the area. Rounded rooms create inclusive, fairytale and cave like environments full of nooks to explore. Rammed earth echoes the traditional cob building material used in Wales, as highlighted both at Nant-y-Cwm and the cob play shelter at Edwardsville School. It is a material that can be moulded to create imaginative environments for the children; it is soft, warm and tactile whilst structurally sound.

Windows have been carefully positioned within the classroom to control light and shadow and create moments of place. In certain locations slots of glazing extend down to ground level to connect the internal spaces with the external environment.

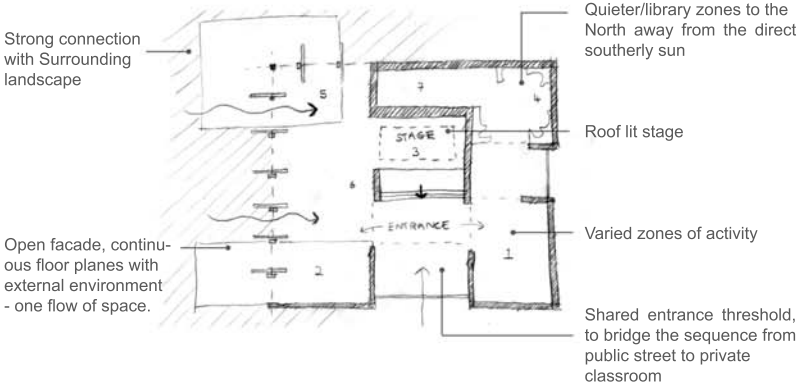
Class 1 (Children Aged 5-7) *'The Playhouse'*

The design for class 1 responds to the goals for the Foundation Phase by creating a varied space equipped to provide a mixed and creative educational experience.

The classroom has strong connections with the external landscape with the southern wall almost completely glazed. The facade is designed to maximise solar gains in the winter whilst controlling the high summer sun.



Design concept sketch

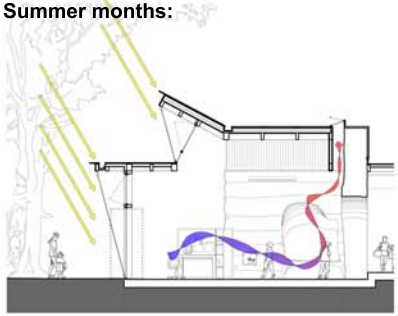


Passive heating/ ventilation strategies: Winter solstice sun: penetrates the building warming the rammed earth wall. High thermal mass of the walls radiate the stored heat during the day. Large roof gutters harvest rain water.

Summer solstice sun is blocked by the roof eaves, warm air rises through roof lights drawing fresh air through the teaching spaces

Winter months:

Summer months:



Precedent images:

Rogerstone Primary School_ naturally lit shared corridor space with role play equipment for the infants. Image highlights the southern glazing and strong contrasts of shadows.

Nant-y-Cwm Steiner school_ Controlled moments of natural light, 'place-making' highlighting textures of the building form.

Class 1 Section a:a _nts.

1. Entrance exhibition space
2. Glazed south façade_open threshold
3. Light chimney
4. Shared IT room beyond at second floor
5. Reading alcoves
6. Classroom space
7. Rammed earth wall
8. Class 1 allotments/ gardens

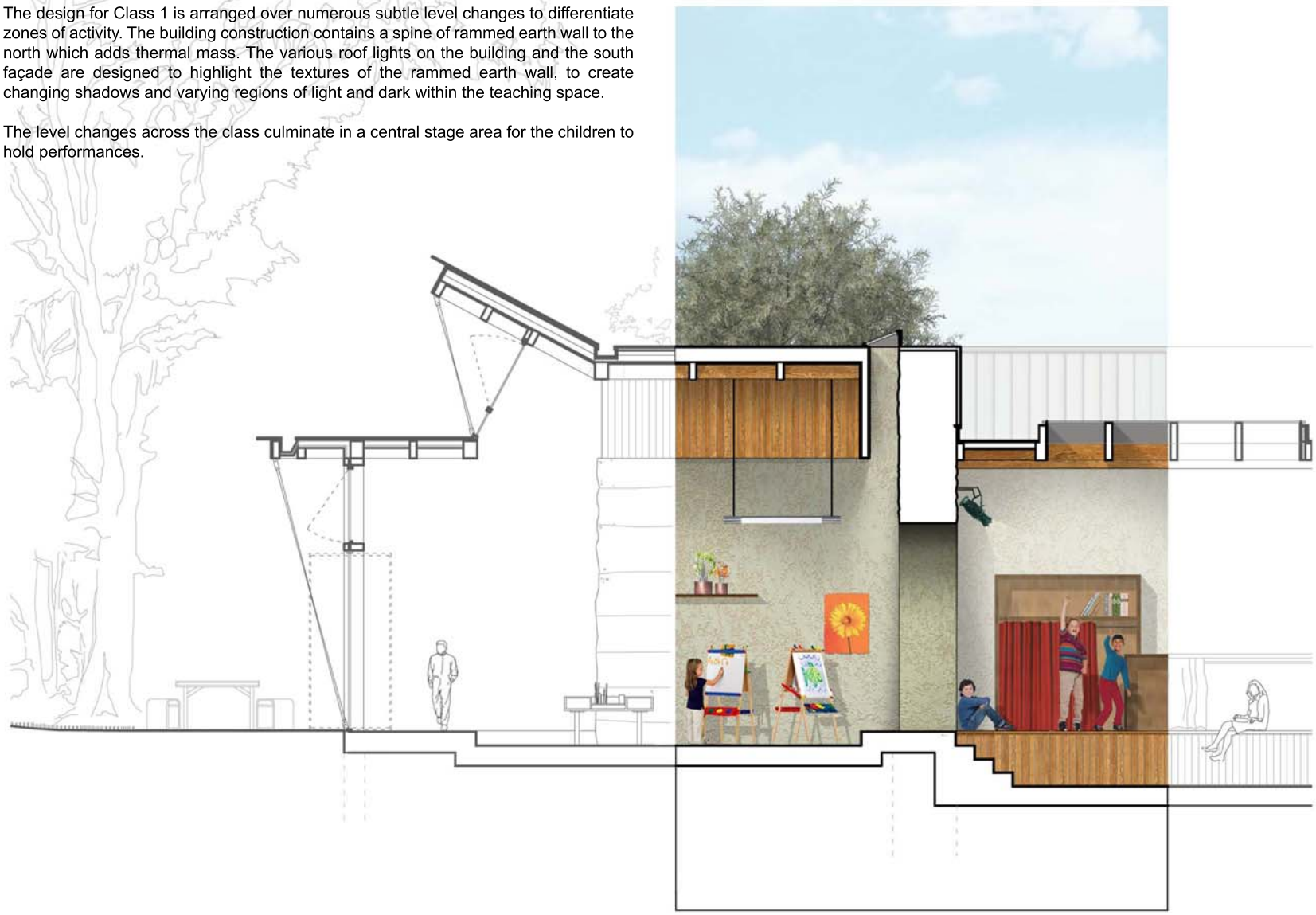
Class 1 Section b:b _nts.

1. Stage/ role play area
2. Glazed south façade_open threshold
3. Light chimney
4. Shared IT room
5. Library reading corner
6. Wet/painting zone
7. Rammed earth wall
8. Class 1 allotments/ gardens
9. Staff office
10. Roof terrace

Inhabited Section_nts.

The design for Class 1 is arranged over numerous subtle level changes to differentiate zones of activity. The building construction contains a spine of rammed earth wall to the north which adds thermal mass. The various roof lights on the building and the south façade are designed to highlight the textures of the rammed earth wall, to create changing shadows and varying regions of light and dark within the teaching space.

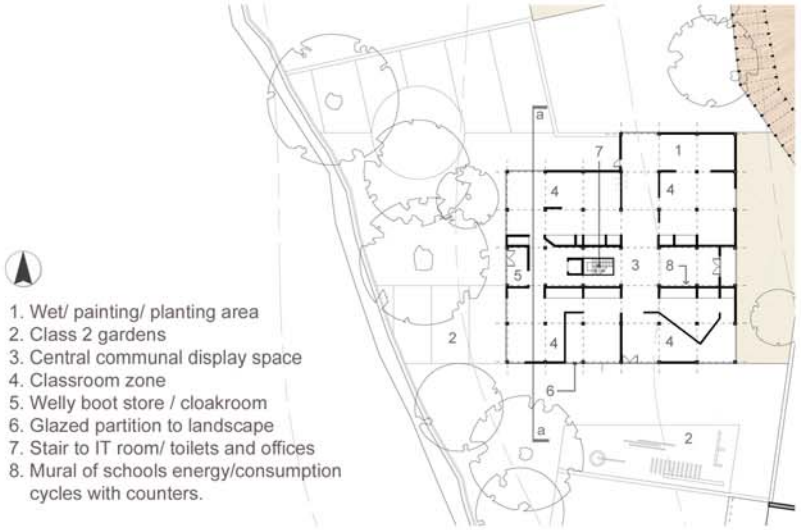
The level changes across the class culminate in a central stage area for the children to hold performances.



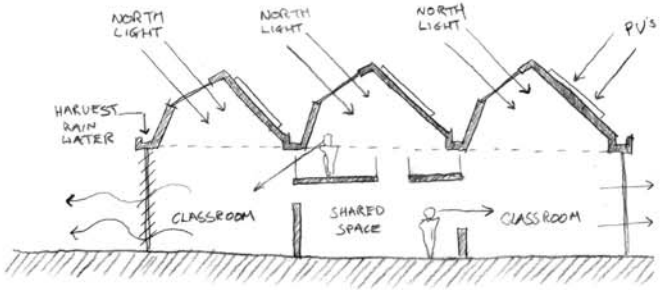
Class 2 (for children aged 7-9) *'the factory'*

Class 2 is the environmental technology monitoring station for the school. The building is the third pavilion along the western edge of the central walkway.

The pavilion for class 2 is based on simple geometries and patterns. The building is constructed on a simple grid and faces due south to maximise the solar gains reaching the photovoltaics on the roof. Class 2 is a sustainable educational teaching aid with four flexible classroom zones, a shared central library space and IT room. The classroom zones are open plan with movable screens to organise the space as required.

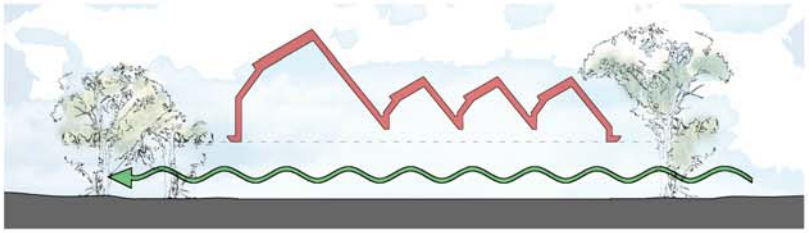


Class 2 concept
Design development sketch



The pavilion is constructed from a series of repetitive steel framed structures analogous with the industrial units of the area.

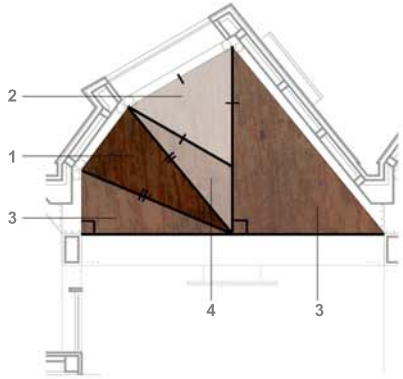
A concept of the valley landscape progressing under the roof canopy which acts as a simple shelter on a continuous plateau.



The whole structure is designed around the simple shapes of geometry. The classrooms are planned on a square grid and the bracing within the roof structure is based on the types of triangle.

The building itself is a learning tool, surrounding the children with number/ colour/ texture/ pattern and geometry.

1. Isosceles triangle
2. Equilateral triangle
3. Right angled triangle
4. Scalene triangle



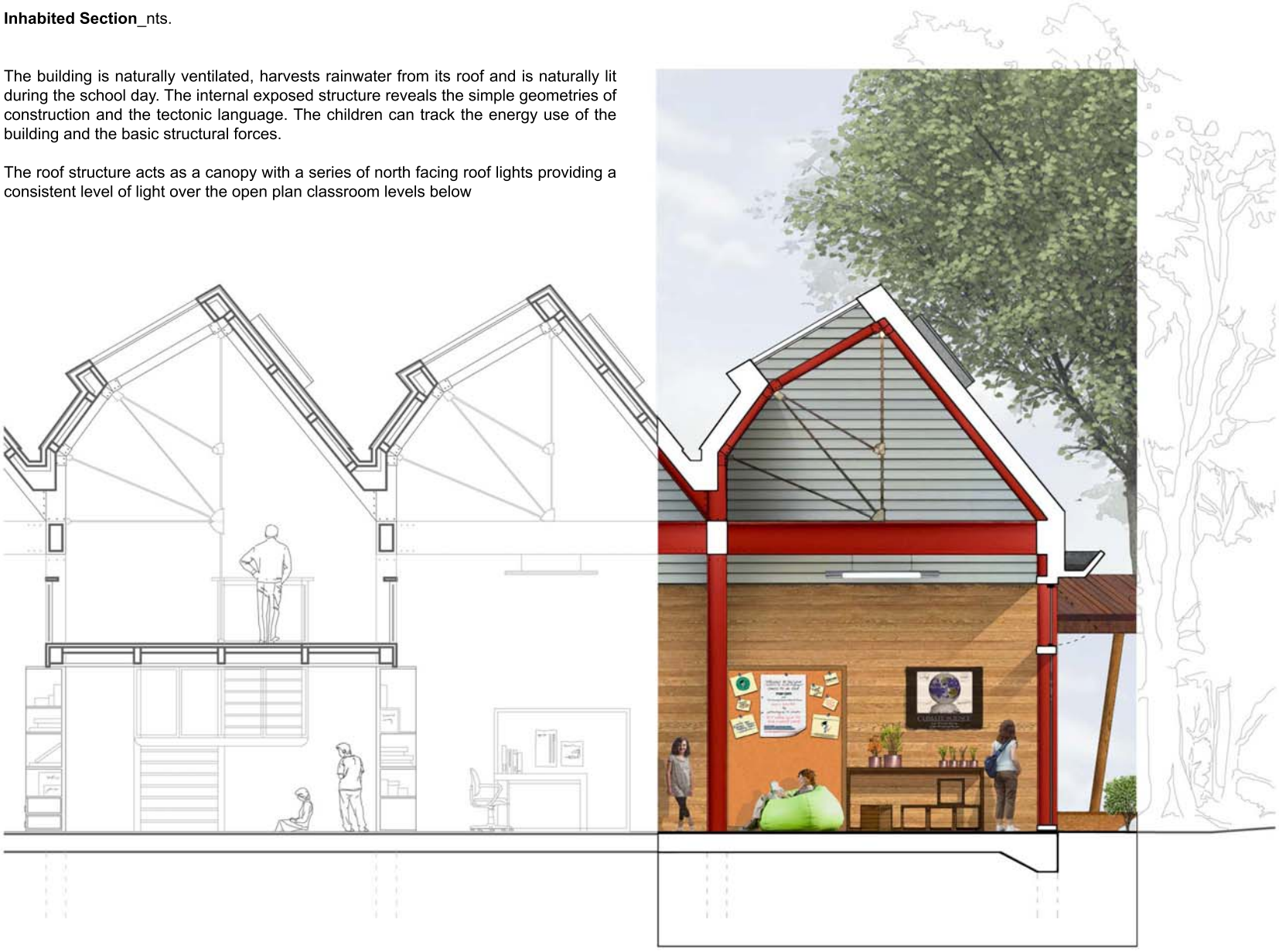
Class 2 Section a:a _nts.

1. Central gallery_ pasive supervision
2. Shared ICT balcony
3. Central walkway_ presentation space
4. Teaching space
5. Class 2 allotments / garden
6. Photovoltaics
7. North facing roof lights
8. Guttering for rainwater recycling
9. Main school walkway beyond
10. Glazing to floor, threshold with landscape

Inhabited Section_nts.

The building is naturally ventilated, harvests rainwater from its roof and is naturally lit during the school day. The internal exposed structure reveals the simple geometries of construction and the tectonic language. The children can track the energy use of the building and the basic structural forces.

The roof structure acts as a canopy with a series of north facing roof lights providing a consistent level of light over the open plan classroom levels below



Class 3 (Children Aged 9-11) *'The Terrace'*

Class three is for children aged 9-11 and is the last of the teaching spaces along the western boundary of the main walkway.

The building is split into four defined teaching classrooms. The classrooms form the central spine to the building with a more secluded shared teaching terrace to the west and an exhibition breakout space to the east. The central entrance to the building has a second level with a shared IT room.

1 Classroom zone
2. Storage wall/ reading corner
3. Shared teaching terrace
4. IT room and staff office at second floor
5. Exhibition breakout space
6. Toilets and stores
7. Class 3 gardens

Building form: Class 3 follows the contours of the land, with a maintained internal ceiling height, the interlocking pitched roofs of the classrooms echoes the rows of terraced housing on the valley slopes.

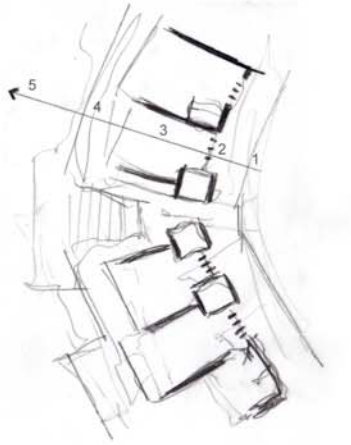
Precedent images:

Rogerstone Primary School (above left). Classrooms contain a high level window to provide consistent levels of natural light into the teaching space

Edwardsville Primary school (above right): Shared quiet/library space between children in the junior section_ A favoured 'special' place.

Concept sketch: Hierarchy of zones

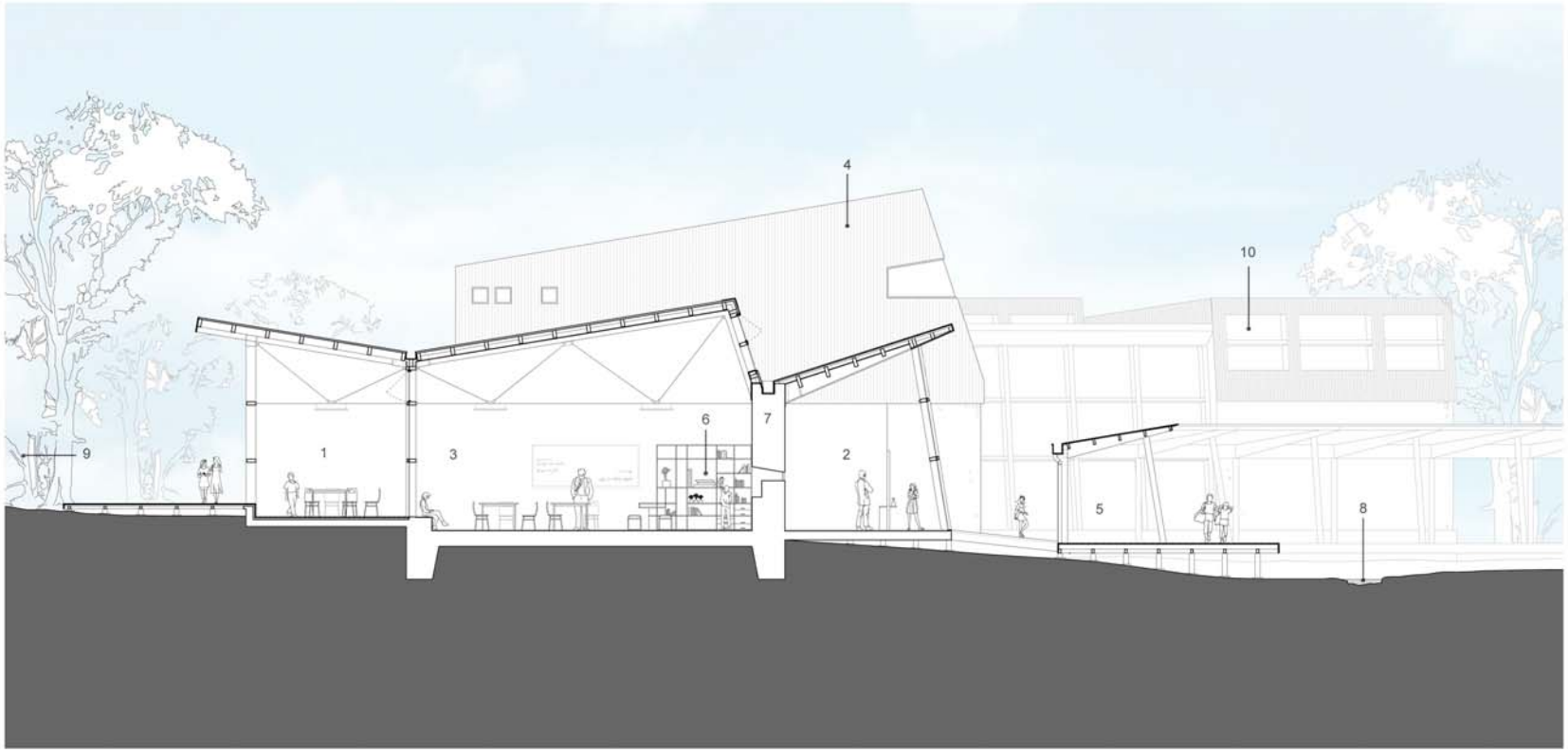
1. Main public walkway
2. Exhibition breakout space_ entrance threshold
3. Classroom space
4. Shared teaching terrace
5. Gardens



The shared teaching terrace provides an opportunity for smaller group work, individual study, messier activities, larger class activities and integration with the other children of the same age from the different classes.

The exhibition breakout space provides a sense of trust and responsibility from the teachers when children are given permission to work here. It is also a presentation space.

Class 3 Section a:a _nts.

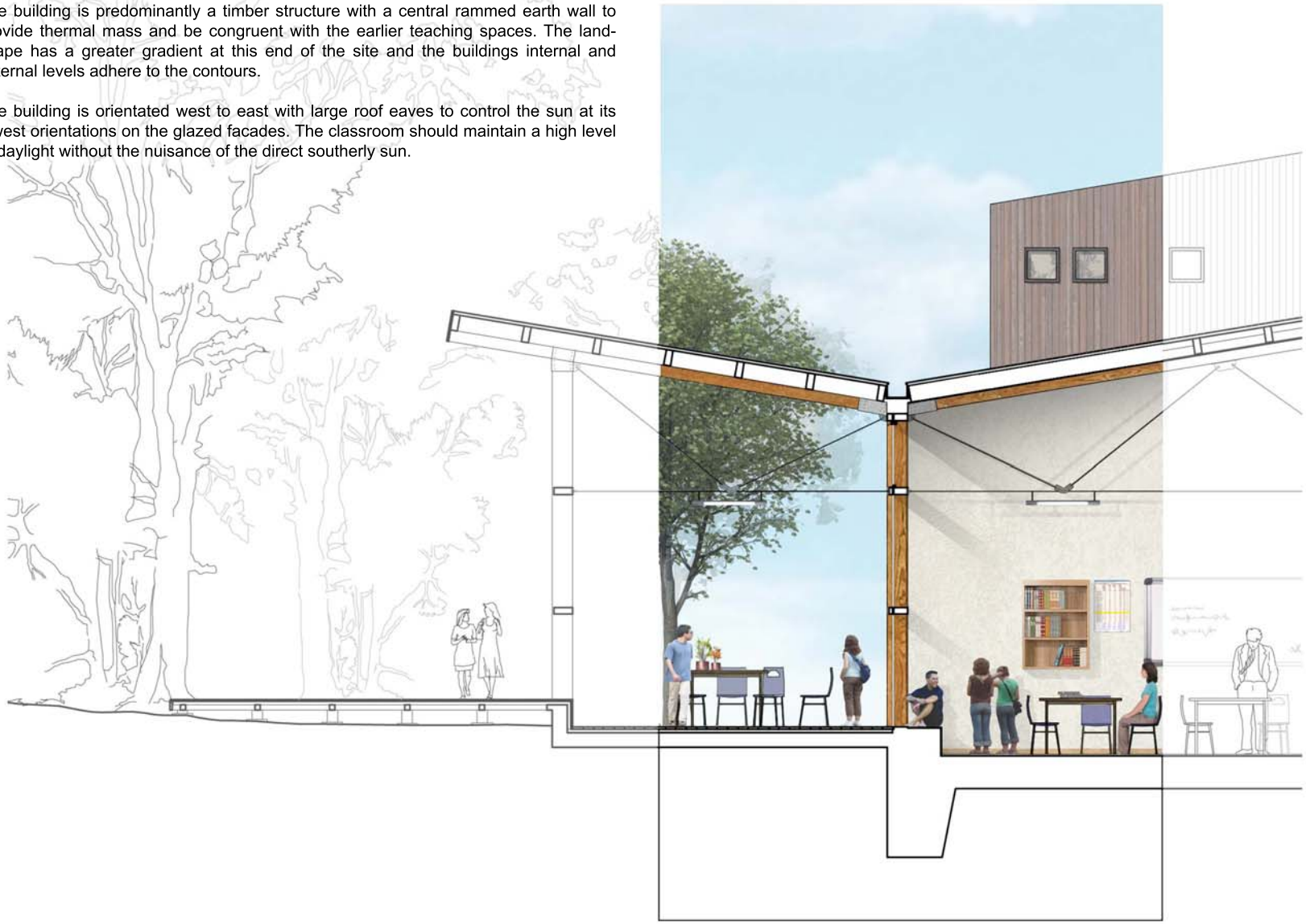


1. Shared teaching terrace
2. Exhibition breakout space
3. Classroom
4. IT room and staff office beyond at second floor
5. Central walkway
6. Library corner
7. Rammed earth wall
8. Tributary to the River Rhondda
9. Class 3 gardens
10. Additional classrooms beyond

Inhabited Section_nts.

The building is predominantly a timber structure with a central rammed earth wall to provide thermal mass and be congruent with the earlier teaching spaces. The landscape has a greater gradient at this end of the site and the buildings internal and external levels adhere to the contours.

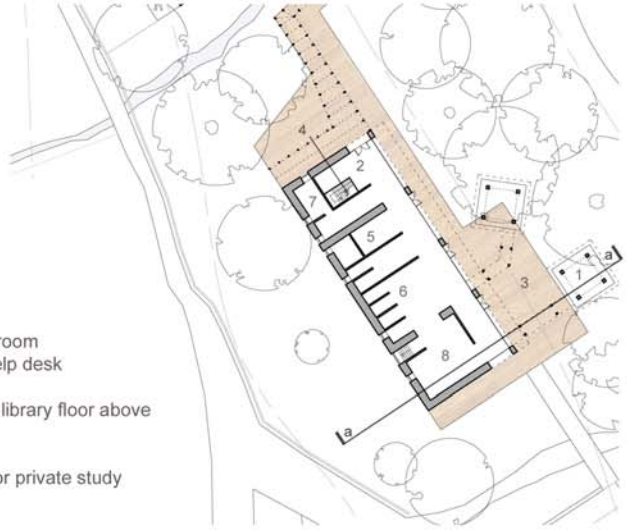
The building is orientated west to east with large roof eaves to control the sun at its lowest orientations on the glazed facades. The classroom should maintain a high level of daylight without the nuisance of the direct southerly sun.



The Library

The last building along the central walkway to the south of the site is a new library facility for the school and the wider community. The building is positioned on the perimeter of the school grounds so that it can be managed outside of school hours with controlled access.

The Library is nestled amongst the mature trees in the southern corner of the site. The building cuts into the gradient of the valley slope with a large rammed earth retaining wall.

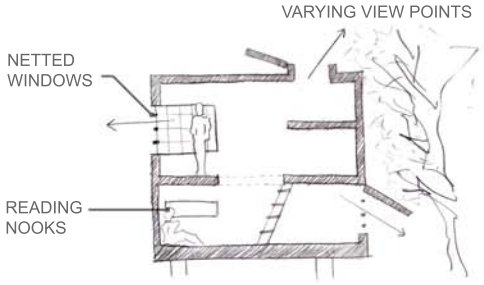


1 Tree-top reading room
2. Main entrance/ help desk
3. Library terrace
4. IT suite and main library floor above
5. Book stores
6. Book shelves
7. Secluded areas for private study
8. Carpet area

The tree top reading rooms:

A development from the reading towers of the 'Learning Curve' design entry submitted by the author and his colleagues.The tree top reading rooms connect the children with nature, providing secret reading nooks or a safe play environment that can also be used for teaching purposes.

The timber structures are safely accessed from the first level of the library however internally contain several levels ergonomically designed for children to explore. The various openings in the structures provide different view points and connections with the surrounding environment.



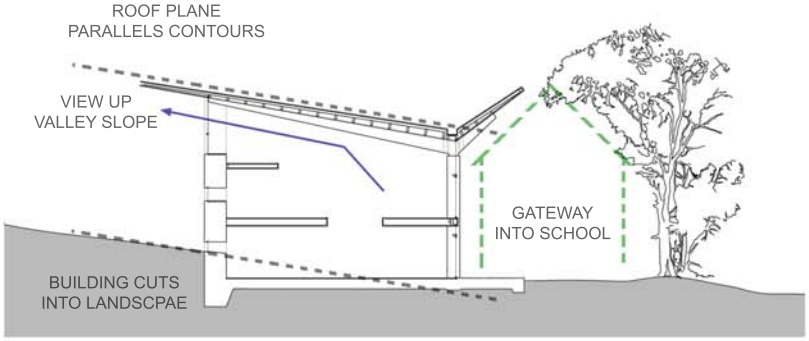
Precedent images:

Nant-y-Cwm Steiner School (above left): teaching environment connecting with nature
Rogerstone Primary School (above right): shared library space, integral to the school

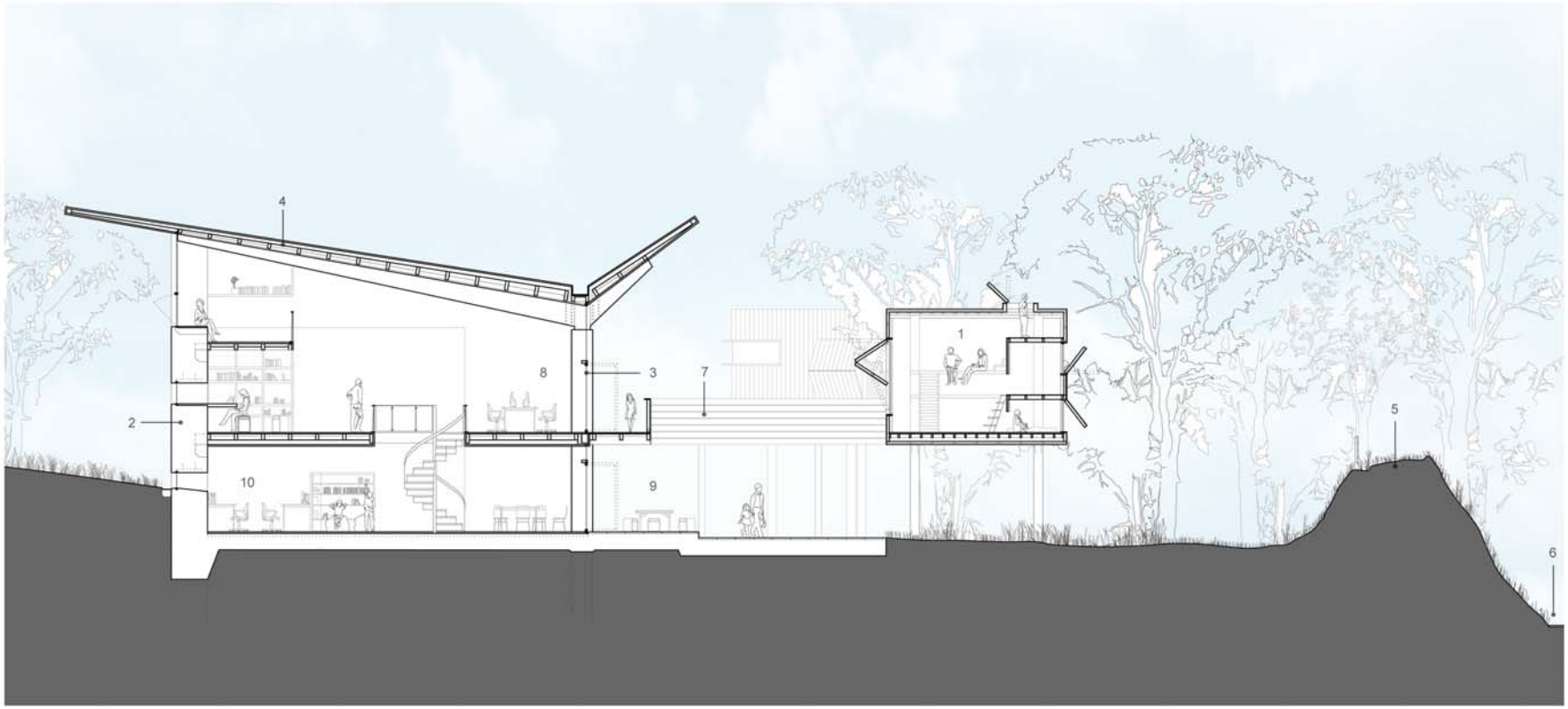
Buidling concept:

The roof above the central library space parallels the topography before reflecting the canopy of the trees to the north-east façade. The canopy of the trees and the angle of the roof plane create a gateway to the entrance of the school community beyond.

The expanse of glazing to this façade connects the interior of the building with the surrounding woodland and externally reflects its environment. The roof plane appears to hover above the levels of the library floor, guiding the eyes of its visitor up the valley slopes to the cliff face summit.



Library Section a:a _nts.



1. Tree top reading room
2. Rammed earth retaining wall
3. Glazed facade
4. ‘Floating’ roof plane
5. Existing bank_ natural barrier to the road
6. Main road
7. Bridge links to reading rooms
8. IT suite
9. Library terrace
10. Secluded areas for private study

Inhabited Section_nts.

The tree top reading rooms connect the children with nature, providing secret reading nooks or a safe play environment that can also be used for teaching purposes.

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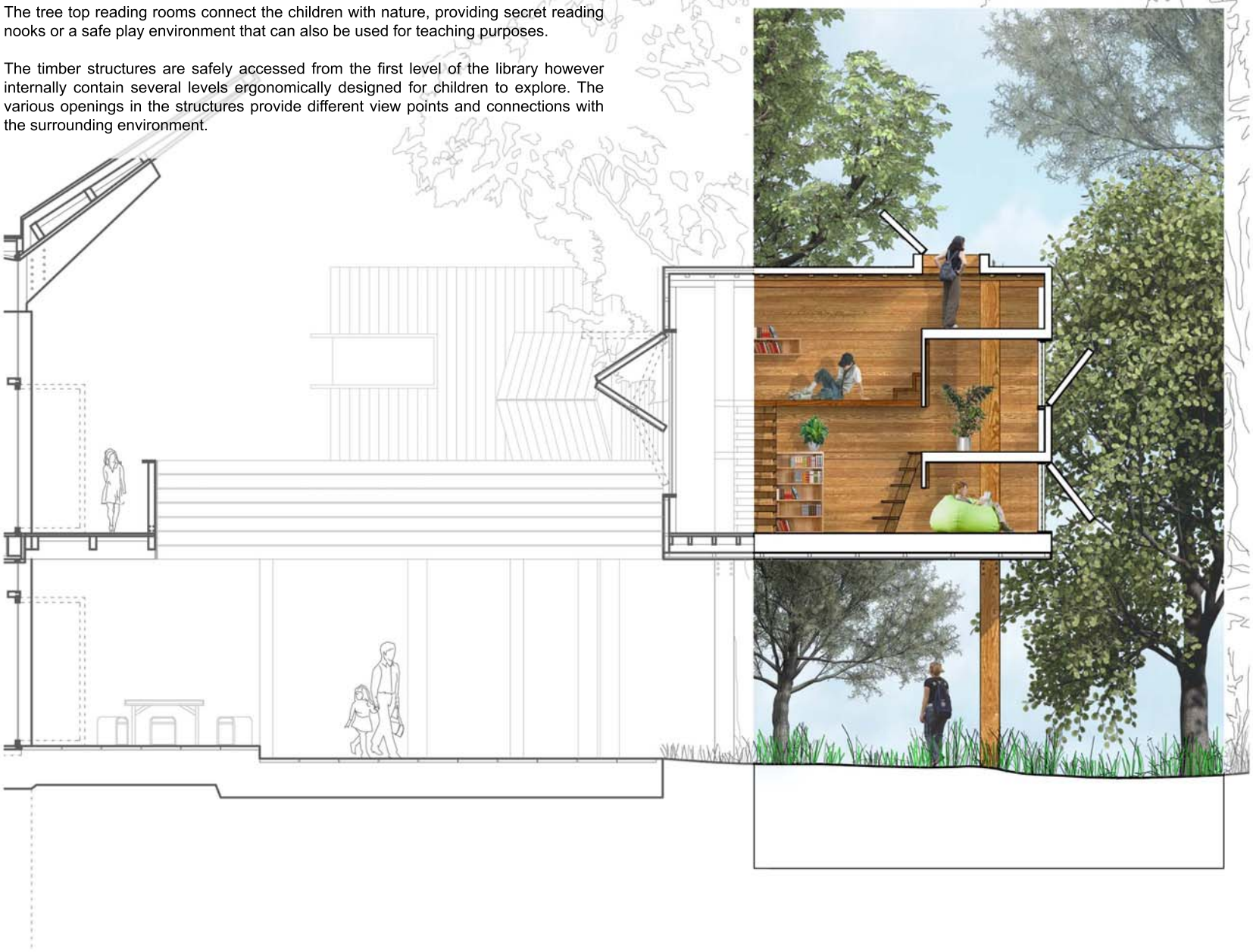

Axonometric of Williamstown Primary School

1. Main entrance
2. Car park
3. Bus stop
4. Staff offices
5. Community room/ gallery
6. Sports hall
7. MUGA (Multi use games area)
8. Pond, underground water tanks
9. Community recycling facility
10. Stream
11. Main walkway
12. Cob play shelter
13. Reception class
14. Class 1
15. Class 2
16. Class 3
17. Library
18. Tree-top reading room
19. Main hall
20. Cultural centre
21. Dining pavilion
22. Town square
23. Nature galleries
24. 'Pit head' play garden
25. School stores
26. Gardening stores
27. Amphitheatre
28. Classroom gardens