

**Do buildings affect the attitudes of students towards
some sustainable development issues?**

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Abstract

“Schools could chop their carbon footprint in half by 2020 with the help of central and local government.” (Lipsett July 2008). This was an interesting aim of the Sustainable Development Commission and the DCSF which went on to highlight eight doorways of areas of concern and suggested ways that the curriculum campus and community could approach their target expectations. These were that “all schools were to be models of energy efficiency and renewable energy, showcasing wind solar and bio-fuel sources in the communities and maximising the use of rain water and waste water resources.”

This research compares the building designs of schools with the attitudes that pupils and staff develop towards sustainable issues, relating specifically to the use of water and energy.

My research questions are:-

In what ways does the design of the building have a direct effect on energy usage?

To what extent is there a difference in attitude towards energy and water used between students in different types of building?

To what extent is there a difference in attitude towards energy and water used between staff in different types of building?

I looked at four schools, each with a unique building design. The first was a fifty year old building with typical additional extra blocks added as the school expanded. The others were a new building built out of stone in a traditional style and two schools with

innovative modern designs. Each school had differing priorities relating to sustainable education. One school had embraced a multitude of sustainable development issues, whilst at the other end of the spectrum one school was only just starting to investigate ways in which to address the issue.

The attitudes that the students developed towards the sustainable use of water and energy did not appear to change because of the specific buildings that they were educated in. There were differences between the attitudes and actions of the students in the different schools but these could not solely be attributed to the type of building nor just to the approach that the schools used to deal with sustainable education in the school. The outcome is much more complex.

There are many more areas of interesting research that could continue from this thesis.

It raises questions such as can students feel too immersed in sustainable issues? Or does the method of teaching - direct or indirect, discovery or dictatorial, effect the attitudes that students develop?

It would also be interesting to make a long term study to see if the sustainable messages have any lasting effect on the students after 10 years and 20 years as they become adults with the associated responsibilities.

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Chapter 1

Introduction

This research compares the building designs of schools with the attitudes that pupils and staff develop towards sustainable issues, relating specifically to the use of water and energy.

The research questions are:-

In what ways does the design of the building have a direct effect on energy usage?

To what extent is there a difference in attitude towards energy and water used between students in different types of building?

To what extent is there a difference in attitude towards energy and water used between staff in different types of building?

An article in a newspaper caught my eye “Minister wants all schools to be environmentally friendly by 2020” (Sarah Cassidy 2006). What an exciting forward looking prospect. The DCSF highlighted eight doorways or areas of concern and suggested ways that the curriculum campus and community could approach their target expectations. These were “Food and Drink” “Energy and Water” ”Traffic and Travel” ”Purchasing and Waste” “Buildings and Grounds” “Inclusion and Participation” “Local Wellbeing” and “Global Dimension” (www.teachernet/sustainableschools)

The energy and water door way set the expectation that “By 2020 we would like all schools to be models of energy efficiency and renewable energy, showcasing wind solar and bio-fuel sources in the communities and maximising the use of rain water and waste water resources.” (DCSF 2006a)

There were many new buildings opening in West Yorkshire or still in the planning stages through various funding streams PFI BSF and the Academies building programme. These school buildings were appearing at a rapid rate and were to be models of sustainability for the next 30 - 50 years. A vast amount of public money was being spent on their construction.

I developed an interest in the new school buildings that are appearing across the country. I have taught for over 30 years and have experienced many school buildings that are very energy inefficient - too hot, too cold, too light or too draughty. The essence of saving energy has never seemed to be a priority in any of the education establishments I have worked in.

As a teacher of science, I have an interest in the subject of sustainable development within education, how it relates to traditional environmental education and the attitudes that students develop and display to matters relating to sustainability.

I have also had many discussions with students, of various abilities, relating to a multitude of environmental issues. I interact with young people every day. I listen to their views on energy conservation which range from uncaring to passionate. I am sure that these experiences will provide sensitivity and focus which I will apply to the interpretation of the data I collect.

Connecting these two ideas I would like to investigate the effects, if any, that buildings which display sustainable elements have on the children who are taught in them. I

would like to determine whether they and cause them to adopt good sustainable attitudes and practises.

The research was carried out in 4 schools in the north of England. Each school had its own specific characteristics as well as displaying key differences in the building design

One building was approximately 50 years old and included many additions to the original build as the pupil numbers grew and the curriculum became more diverse.

The other 3 buildings were comparatively new from two to four years old when visited. Their designs were very different from dramatic modern architecture to the more traditional.

These new schools had different approaches to sustainable development issues within their curriculum, from very intense to very light touch. I contacted many schools before these four schools agreed to take part in my research. I am very grateful for the time and effort the staff and students gave me. The schools were initially contacted by phone and discussions with either the head teacher or a lead teacher for sustainable development took place. I sent papers to the school before my visit including a copy of the questionnaire for staff and students and a list of information that I would like to discuss with the bursar or school manager. I then visited the schools and talked in assembly to the students about the reasons for my visit. Students then completed the questionnaires in their classrooms with their teachers and teaching assistants who would help with reading if needed. I then had an opportunity to have focus group discussions with students mainly in small (six to ten) single sex groups. I asked students to discuss sustainable development, especially relating to energy and water, with each other. If the students needed prompting at any time I had an array of photographs that they could mix and match to use to stimulate the ideas and

discussions. I then had an opportunity to talk with a member of staff, the head or a teacher with responsibilities for sustainable development so that I could form an overall idea of the part that sustainable development played in the school. The bursar then had in depth discussions with me relating to the consumption of energy and water within the school.

In chapter 2 I review the literature on sustainable development across nine themes:

- The need for sustainable development.
- What is meant by ‘sustainable development’?
- What is meant by ‘education for sustainable development’?
- How schools can play a part in sustainable development?
- The eight doorways framework.
- Curriculum issues and possibilities.
- Campus issues and possibilities.
- Studies on ways of influencing staff and pupil attitudes towards sustainability including other influences
- Absence of research on the possibilities of link between buildings and attitudes towards sustainability and how this study attempts to bridge that gap.

The methodology adopted in the thesis will be described in chapter 3 with information about the research process I used. This provides details of the strategies and methods I employed throughout the research, including questionnaires, observations, group discussions and interviews.

Chapter 4 reports on the findings obtained from the questionnaires, focus group discussions and interviews with staff in school A. Chapter 5 reports on the findings obtained from the questionnaires, focus group discussions and interviews with by staff in school B. Chapter 6 reports on the findings obtained from the questionnaires, focus

group discussions and interviews with by staff in school C Chapter 7 will report on the findings obtained from the questionnaires and focus group discussions with pupils in school D.

They will also incorporate the findings from the focus group discussions and the interviews with strategic members of staff. I will compare the data from the questionnaire and the focus group discussion data to see if they support or contradict each other .In chapter 8 I will compare the finding of the results of all the schools Finally in chapter 9 I will provide an overview of my findings and discuss the implications for further research suggested by my findings.

Chapter 2

Literature Review

2.1 The need for sustainable development

The planet is changing at an alarming rate. (WWF 2010) There have always been fluctuations in temperature and climate as evidence has shown in geological forms and ice bores. The problems are that these fluctuations have been enhanced and quickened by human beings producing carbon dioxide at a much higher rate than ever recorded before. The build up of carbon dioxide in the atmosphere is causing the average global temperature to rise (global warming) The consequence of this is a rapid rise in temperature that will lead to climate change throughout the globe perhaps including new areas of drought, new areas of severe flooding and other extreme weather patterns which may cause chaos to some peoples' lives. The problem that faces human beings is that we need to slow down this rapid change as much as possible so that we can continue to allow the planet to sustain us.

The attitudes we form towards sustainable development come from the complex pattern of our education experiences and background, how much we become directly involved in this depends on our exposure to and engagement with the consequences of temperature rise and global warming mentioned above.

What forms our attitudes towards preservation and development of ourselves as opposed to that of the environmental world in general? Do the majority of people have the willingness to adapt or change their ideas or behaviours to alter our social organisations? Is there a "none selfish" approach that will put social and

environmental causes before our personal and economic development? If an altruistic ideal is to be encouraged a lot of developmental educational work is to be done. Education does not only happen in school. The exhibition entitled Earth from the Air (Yann Arthus –Bertrand) was a beautiful collection of 165 photographs showing images from around the world. One of its aims is to raise awareness about the need for sustainable development. . “Yan Arthus –Bertrand was keen to show how human development was threatening the social and environmental fabric of the planet” (Whitehead 2007)

2.2 What is meant by ‘sustainable development’?

The term sustainable development means so many different things to so many different people. The most commonly referred to definition is: - “Development that meets the needs of the present without compromising the ability of future generations to satisfy their own needs”. (Brundtland 1987)

“Sustainable development is a way of thinking about how we organise our lives and work – including our education system – so that we protect our most precious resource, the planet” (QCA 2009).

The UK White paper Our Common Inheritance (cited in Houghton 2004) states that “Sustainable development means living on the Earth’s income rather than eroding its capital” and “keeping the consumption of renewable natural resources within the limits of their replenishment” Goodland & Daly(as cited by Bell & Morse 2003) state that sustainable development is classically portrayed as the interface between environmental economic and social sustainability.

“Sustainable development at its heart, I take it, is the perception that human kinds attitude to the natural world is essentially one of plunder of taking with no thought for the morrow” (Smith 2002)

The goal of Sustainable Development is “to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life without compromising the life of future generations “(DCSF 2005). This again reflects that people wish to retain the quality of life that they have and ways forward must be found to enable this to take place without further destroying the environment, the source of all our needs.

Haigh (2009) defines sustainable development as a “Doctrine for self management of ethical maturity.” He suggests the most important task is to persuade society not to consume everything now but to conserve for tomorrow. There is therefore some agreement that sustainable development means looking after our present needs whilst protecting our future but there is also a feeling from some areas that a conflict might arise between the environmental, social and economic ideals and that some humans may not be highly influenced by the sustainable issues.

2.3 What is meant by ‘education for sustainable development’?

Over the last twelve years there have been many influences shaping education for sustainable development ESD. These include world government alliances, individual governments, philosophers, “specialists” and NGOs. There is a complete wealth of messages and advice available to the confused educator.

There are two main schools of thought amongst those who write about the best methods for education for sustainable development. Some writers view sustainable development as a process, an ideology that is formed by the individual over a period of

time. (Bonnet 2002). Some believe that developing the skills of problem solving and the intellect to seek solutions, with the acquisition of knowledge is the best approach. (Huckle 2009).

In his article Ecological Intelligence Stirling (2009) discusses two sets of approaches and assumptions. One the problem solving analytical closed approach where answers and solutions must be found as the end point and the second where we encourage students to be open and to accept that all is not yet known but we should develop skills of enquiry.

Historically we have developed the problem solving determinist skills in schools but Stirling suggests that we, as educators need to develop and encourage students to use their intuition and imagination to connect with their learning rather than just be force fed information and concepts.

“There will be no sustainable development where learning is not happening. Thus sustainable development is for us, inherently a learning process through which we can, if we choose, learn to build capacity to live more sustainably “(Scott& Gough p.1)

O’Riordan (cited in Scott & Gough) “Education for sustainable development means preparing everyone to care for the planet by respecting justice, local identity and fundamental requirements of well being”

Education for sustainable development needs to nurture an approach that is clearly beneficial to the individual as well as to society, the environment and the economy.

Orr (1994; 12) suggests that there six principles to all education:

- First “All education is environmental education”
- Second “The goal of education is not mastery of the subject but mastery of one’s person. Subject matter is simply the tool”

- Third. “Knowledge carries responsibilities”
- Forth ” We cannot know something until we know the effects of this knowledge on real people and their communities”
- Fifth “The power of examples over words”
- Sixth “The way in which we learn, are they passive or active...do the methods of teaching inspire or subdue?”

One of his solution is for students to become real problem solvers and integrate into the curriculum real issues in their local environments rather than the business approach of “risk taking “ “entrepreneurship “ “competition “and “performance” that some schools seem to favour. (Orr 1994)

Another approach to sustainable development is that of Webster & Johnson (2008) who encourages us to understand that we are in a mess because of our “Take –Make – Dump” technology of the last century. They recommend that we need to develop into a circular consumerist society. They are positive and inviting and reflect on the idea that society has to make difficult choices now. Do we consume less or make more durable products or just adopt a simpler lifestyle. We have to make a moral choice. This choice is made very difficult by the economic situation that the world is in. The Chancellor of the Exchequer encouraged us to buy more goods to boost the economy and create more jobs. Advertising told us that happiness is buying goods (Just look at a shopping centre at a weekend to see hundreds of people seeking this happiness or watch the countless life style programmes and reality TV programmes that cram the air waves.) All of these things make it very difficult for a swing in consumerism to develop into a natural, no waste system and keep the masters of the economic market happy. This conflict between industry and the environment is not an indictment of commerce but an outgrowth of purely opportunistic design. The design of products

and manufacturing systems have yielded these unintended and disastrous consequences (McDonough and Braungart 2002)

There are many aspects of what and how we should learn about sustainable development and how we should go about it. Adults and children need to have an understanding and basic knowledge of environmental facts. Critical thinking skills need to be developed as does the capacity to have an open mind which will encompass rapid change and co-operation and as educators we should facilitate the learners by paying attention to the particular way the individual mind receives and translates data.

UNESCO suggests that ESD as quality education is characterised by six features “Its interdisciplinary and holistic; values driven; encourages critical thinking and problem solving; uses a wide range of methods, media and activities; fosters participatory decision making; and addresses local as well as global issues using languages which learners most commonly use (UNESCO website) This of course presents a massive task for educators. UNESCO continues to say that ESD is a catalyst for social change, a means of fostering the values, behaviour and lifestyles for a sustainable future

In her article Phillips (2009) suggests that it is not the content that is important in learning but the process, as sustainable issues develop at such a rapid rate. She asks what the point of education is if not to produce people who are flexible, imaginative and co-operative and who can communicate with all and see the need for change. She refers to (Stirling 2004) discussion of education about sustainability, for sustainability and education which has the capacity to allow change to take place.

There are a lot of uncertainties relating to sustainability, but with lots of pessimistic prescription about what we should do. There is always a lot of doom and gloom spread about our environmental future, and it is so easy to upset and alarm the public. It might be more democratic if we encouraged learners to develop a critical

understanding of sustainable development issues which will enable them to adapt as quickly as the changes to the environment we might face, to develop thinkers rather than those that just accept. (Scott 2010) This is supported by Huckle (2009))the idea that in order to help schools achieve their sustainable goal teachers should enable students to think critically and then go on to make sustainable choices within school and then carry this critical thinking into the decisions they make later in life. This idea is again supported by Elliot (1999) who suggests that “School should be a place to allow ongoing pupil exploration and engagement with environmental issues, where there is an encouragement to develop rational critical attitudes towards environmental issues.” Scott (2002) warns against indoctrination and draws our attention to the close proximity of stimulating students and prescribing to them.

Haigh (2009) encourages us to allow learners to understand that their personal lifestyle decisions have whole planet consequences. I agree, but perhaps learners are already aware of this. Perhaps what education needs to do is enable and empower them and give them a reason to care if they will have a positive or negative effect on the world. Haigh defines two roles for education establishments; one helping learners look for their personal responsibilities and the second to demonstrate how sustainability is practised. The schools can then become beacons for their communities. This is an excellent procedure in junior schools where students and parents link closely with the community .However , as children move into high school , the “local comprehensive “ hardly exists across the country and children are split from their communities so their beacon of light becomes too weak and their effect is too diffuse. Haigh (2009) talks of the challenge that education has been set in leading the global society towards a sustainable future. He says it must be re-orientated from the selfish personal competitive approach towards a responsible and integrated ethical approach that would

benefit society and the environment. *“Sustainable Development and learning might be viewed as a process through which we can learn to build our capacity to live more sustainably”* (Scott 2002). This suggests that we should encourage students to understand sustainable issues but we also need to develop the skills and desires to put this good theory into practise. Schools are there to give children not just the knowledge and skills they need to become active members of society but also to enable them to want to become people who will develop a sustainable way of life .

Is it the purpose of sustainable education to promote good attitudes and sustainable patterns of behaviour, based on the knowledge of experts, which could then be measured in a purely economic way as levels of consumption or is the purpose of sustainable education to enable students to explore and engage with environmental issues? Bonnet also suggests that education for sustainable development should be approached as a way of thinking so all actions should connect people with their origins in the natural world. It might be that we are now too far away from that frame of mind, too deeply involved in consumerism, the desires for objects, that the educators and politicians will need support and assistance to readjust their own selfish ways of thinking. Education for sustainable development is just one way of promoting attitudes and modelling patterns of behaviour. *“Sustainability as an attitude of mind seeks openness to as many facets and significances of nature as possible”* (Bonnet 2002 p 10.) *“The essence of sustainability is in the nature of human consciousness itself”* The closed prescriptive curriculum that we offer our children in schools with performance related targets attached could be relaxed to allow the young developing minds to be free to formulate their own ideas based on a sound knowledge base, at a time in their intellectual and emotional development that best suits the individual, rather than a dictatorial curriculum. Other factors, poverty, emotional disturbance may

be dominant in affecting the attitudes that develop towards sustainability; their inner consciousness may not be awakened.

We should be prepared to accept it if the students do not adopt the frame of mind that we would like or expect them to. Also many of their teachers have only experienced a commercial capitalist, environment so how they can nurture a sustainable attitude amongst their students? The education system that they work in also displays lots of competition and testing leading to parental choice. It is beginning to display privatisation by sponsorship in the building of new schools (not always built with a sustainable design) and the demise of the “local comprehensive”. These are not the principles that a student or member of staff in a sustainable school with a sustainable “frame of mind” could easily come to terms with (Huckle 2010).

Bonnett (2002) says that “there are clear implications for the aspects of education which fall outside the formal taught curriculum such as the attitudes and values expressed in the ethos and practices of the school and the status it accords to different activities and relationships and versions of success in life.”

The way that we teach children about sustainable issues might be critical to their understanding and the attitudes that they develop. There is the traditional teacher who talks and exposes students to the “facts” and the children learn, but there is also the approach that teacher should be enablers, who encourage students to think critically so that they can go forward and make sustainable choices within their school life and then on afterwards in their adult lives. (Huckle 2009)

There has been some research that looks to see if different methods of teaching affect the way that students approach sustainable issues. Do the values and beliefs of students and their teachers take them on different journeys and make different sustainable or non sustainable judgements or is it that the teacher “opens the students’

eyes” and awakens an interest in sustainable issues by directly highlighting sustainable solutions that students may adopt.” Pitt and Lubben (2009) conclude that although the direct approach that sees the environmental, social and economic dimensions of sustainability as Webster's overlapping circles, true understanding comes from the more complex interactions between society ecology and economy. The environmental, social and economic dimensions all have an individual influences on sustainable change. That change can only be quick and successful if all three areas work together.

Then there is the building “A school employs and models technologies that advance sustainability “The school is a building that teaches” (Jackson 2006) Can attitudes towards sustainability be acquired just by being immersed within a school that displays ecologically sound energy and water conservations?

As I conducted my research I hoped to uncover which of these theories apply to the students in the schools I visited. The theories are;

- A sustainable person one who uses learning processes to change their inner feeling towards sustainability.
- Problem solving, critical thinking and flexibility essential for sustainable learning
- Acquired knowledge is not useful if it is not supported by responsibility
- A global awareness helps develop an understanding of sustainable issues
- An awareness of wasteful consumerism helps develop an understanding of sustainable issues

2.4 How schools can play a part in sustainable development

A long term plan for Education for Sustainable Development was launched by the DCSF (2005) alongside UNESCO “Decade of Education for Sustainable Development”. These state clearly the need for simple talk and simple messages to engage all ages with all aspects of education to work together for one goal that is for sustainable development to become a reality, by being understood and embraced by all sections of the community.

Schools were set three clear objectives: - Students should gain knowledge and values, teachers should gain skills and knowledge to deliver sustainable education as an integral component of the life of the school and schools should ensure that the environment that the students work in is a sustainable one, encompassing not only the curriculum but also, the school’s ethos and school estate management. This is a once in a lifetime opportunity whilst refurbishing and rebuilding schools to create sustainable working environments. (Sustainable Development Education Panel 2003)

There is serious look at climate change and energy where climate change becomes a priority. A draft code for the sustainable buildings programme was developed and the public sector (including schools) is identified as having a role to play in leadership and driving change. One target was to reduce absolute carbon emissions from fuel and electricity use in buildings on their estate by 12.5% by 2010-2011, relative to 1999-2000 and another increasing the energy efficiency of buildings on their estate by 15% by 2020 -2011 relative to 1999-2000. “The approach through schools is twofold: the education sector is important in terms of opportunities to inform young people about climate change but also because it is responsible for 10% of all emissions from commercial and public buildings”(H M Government 2005)

2.5 The 8 doorways framework

In 2007 the National Framework for sustainable schools was produced displaying its eight doorways through which schools could achieve sustainability. (www.teachernet/sustainableschools) These were:- food and drink, energy and water, travel and traffic, purchasing and waste, buildings and grounds, inclusion and participation, local well-being and global dimension. The vision was that by 2020 schools would be places of example displaying sustained lifestyles within the curriculum and students would be involved with the improvement of their own school estate, the built environment becoming directly linked to the curriculum. There was also the suggestion that by 2020 all schools would have reduced their carbon emissions by becoming examples of energy efficiency and renewable energy showcasing wind solar and bio fuels to their local communities. “ We would like all schools to have minimised their use of freshwater by becoming examples of sustainable water management , showcasing freshwater conservation, rainwater use and other water conservation measures in their communities” as well as including in the curriculum the needs to address energy and water stewardship. There were many positive outcomes from several of the schools recorded. There were lots of positive actions and even tangible financial gain being made. Energy saving attempts were sometimes made by energy conscious students monitoring the consumption in school with special meters, to reach target levels of use. However, although there were many successes, ESD still seems to be a peripheral issue (OFSTED 2008). Schools just appear to be tinkering with ESD as an add on perhaps as extra curricula activities, still with a minority of students, rather than a complete integration into the curriculum for all. (OFSTED 2008).

2.6 Curriculum issues and possibilities

The government has been offering advice and planning for education for sustainable development for many years.

Following the Kyoto Protocol in 1997 the UK government rapidly responded and set up the Sustainable Development Education Panel (SDEP) in 1998 which had a five year task to consider ESD in the broadest sense and develop, amongst other things, a strategic approach. In 1998 SDEP suggested both generic and specific learning outcomes, which were then taken up when the National Curriculum was reviewed and sustainable development issues were raised. This was further supported by the Qualifications and Curriculum Authority (QCA) in their guidance in 2002 with the launch of the sustainable development website.

“Education for sustainable development enables pupils to develop the knowledge, skills, understanding and values to participate in decisions about the way we do things individually and collectively, both locally and globally, that will improve the quality of life now without damaging the planet for the future.” (DfEE 1999)

About this time the Carbon Trust was launched in 2002 to help implement energy efficiency and schools could easily access this to seek information and advice.

In 2003 education and children’s services came together in one strategic service Every Child Matters (DFES 2003). This was an ideal opportunity for sustainability to drive these services together.

Further guidance was offered to schools as a document pulling together lots of ideas from the eight sustainable doorways and some vague guidance as to how to match these with the National Curriculum, including some practical activities to encourage teaching staff to rethink their teaching methods and styles to enable learners achieve their required goals. It also showcased some very successful schools whose approach to engaging students in sustainable activities was interwoven within the curriculum (QCA2009)

Another picture revealed that in the vast majority of the schools reported on, although showing considerable progress towards becoming sustainable by improving their premises and using energy more efficiently, it was still necessary to make sustainability a priority in school improvement plans. Improvements were most needed to develop whole school approaches to sustainable development both in curriculum and in carefully managing the school estate ensuring it became a model of good practise. (OFSTED 2009)

The curriculum advice from QCA identified seven key concepts relating to ESD through which pupils could develop their understanding of the subject. These were: sustainable change, needs and rights of future generations, interdependence, diversity, citizenship and stewardship, uncertainty and precaution, quality of life, equity and justice (QCA2009)

The National Curriculum is clear about the need to promote awareness about sustainable development. Aim 2 states “It (the school curriculum) should develop pupils awareness and understanding of and respect for, the environments in which they live, and secure their commitment to sustainable development at a personal, local national and global level.”

Sustainable development is a statutory requirement in four curricular subjects; science design and technology, geography and citizenship.

However in most secondary schools the curriculum is organised in specific subject areas science, design and technology, citizenship and geography, where some schools can manipulate the exam syllabus to have an ESD focus in as many lessons as practical. (WWF-UK. 2004 s)

Cross curricular themes run through these subjects and in some schools form plans which thread through the subjects and the eight doorways from DCFS can pervade that whole school.

One definition (Huckle 2000) of the curriculum splits it into three areas: knowledge, skills and attitudes and values, with suggestions that education for sustainability is advancement on much environmental education, in that it pays more attention to the social structures .These social structures shape the social use of nature and construct environments in more or less sustainable forms. Education for sustainability can take place in both formal and informal settings but requires teachers who are committed to sustainability amongst other political ideals but who also need to have an understanding of the natural and social sciences, and strong links with local and distant communities (Huckle 2000)

There seem to be difficulties in implementing ESD in school subjects for three main reasons: low priority, teachers feel the curriculum is full and a lack of time, knowledge and co-ordination. (Cheadle Symons & Pitt 2004) The National Curriculum does not include any wide political issues especially in the area of sustainable development, so students are not encouraged to understand how the government have an ability to interfere and shape the way that things will happen. (Huckle 2009)

2.7 Campus issues and possibilities

Energy consumption and carbon emissions are part of many schools curriculum but is learning enhanced and attitudes changed if pupils are immersed in energy efficient surroundings?

There have been many studies of the effects of buildings and learning environments on pupils' behaviour or learning. However it is clear from my literature search that looking at pupils' attitudes to sustainable development in relation to the buildings they are submerged in is largely un-researched. There is an argument that a child's well-being and environmental issues are inextricably linked. The worse a local environment looks, the less able children are to play freely and develop the habits and commitments that will enable them to address environmental problems in the future. (Thomas & Thomson 2004).

This argument is further backed up by another article relating the quality of the physical environment to an individual's behaviour within a school. If an environment becomes unkempt, strewn with litter and covered in graffiti the poor quality physical neighbourhood has a detrimental impact on the school. It has also been shown that the quality of the physical environment surrounding the school affects behaviour within schools, and also attendance, academic achievement and parental support (Broadhurst Owen Keats & Taylor 2008)

However some research has been carried out in eco-schools and it was proposed that in the building itself might be used as a lever for environmental education. One study looked to see if eco-schools influence a child's way of thinking in different ways than

traditional schools, in terms of environmental attitudes. Across four schools studied, findings indicated that the number of environmental features in a school was not a significant predictor of environmental attitudes (Day 2009).

Local Authorities have been working with schools on projects such as Building Schools for the Future (BSF) and the Primary Capital Programme where it is suggested by central government that “planning energy performance should be at the heart of the capital programme from the very earliest stages, and safeguards should be in place throughout each step of the project.”

Since March 2005 it has been a requirement that all major new builds or refurbished projects *aim* to achieve a minimum BREEAM (Building Research Establishment Environmental Assessment Method) rating of “very good” and should be subject to a BREEAM schools assessment. It seems strange as we know how quickly technology is advancing that the level of excellence in this area is rejected and the lower standard of “very good” rather than “excellent” is deemed acceptable.

In 2006 BRE Trust launched its schools design forum along with the DFES Sustainable Development Action Plan. This should ensure that the schools get a twofold benefit they will save money and cut their carbon footprint. (DCSF 2006b). The same requirements are appearing in America where there has been a trend to design and build with the intent to provide healthy, comfortable places to learn. Here it was discovered that over a five year period this “greening school” design is extremely cost-effective. Amongst other great benefits the 30 schools in Days study reduced their water use by 32% and their energy use by 33% compared to the average conventionally designed school. The green schools cost on average almost 2% more to build than conventional schools so payback time for the extra expenditure would be acceptable. (Kats 2006)

2.8 Studies on ways of influencing staff and pupil attitudes towards sustainability including other influences

Looking at pupils attitudes and behaviours and what forms them Maguire (1985) cited in Sjoberg and Engelberg (2005)) suggests that there is seldom a strong direct relationship between attitudes and actions (Sjoberg 1982) suggests that there is a relationship between specific behaviour and general attitude but only if the attitude measures are more specific or are measured using complex composite criteria. Ajzen & Fishbein (1980) suggest that behaviour depends on interventions which are partly dependent on attitudes and partly on a subjective form.

When looking at specific behaviours relating to energy conservation, many things might influence them, “*environmental knowledge and awareness altruism, empathy sociological models economic models, psychological models and marketing*” to name but a few. (Kollmuss, and Agyeman, 2002). Even when people are aware of energy problems there is no strong relationship between energy related attitude and conservation (Crossley 1983). Duvall and Zint (2007) cited in Goodwin, Greasley John and Richardson (2010), suggest that children may influence their parents in actions and attitudes and act as environmental ambassadors, the parents viewing their children as an important source of information but, contrary to this, it is sometimes suggested that attitudes and behaviours of children are seemingly unrelated to those of their parents Evans et al cited in. (Goodwin, Greasley John and Richardson 2010). Other things also influence peoples’ attitudes for example, the benefits of making your

own energy. This does not only seem to offer people a financial gain, but once people experience the pleasure of creating their own energy through wind or solar power they seem to become hooked. In schools the existence of micro generation of electricity does not seem to be enough to generate interest on its own. It needs to be utilised as a teaching tool and become integrated into school life to begin to stimulate a change in culture (The Hub, n.d. 2005)

2.9. Absence of research on the possibilities of link between buildings and attitudes towards sustainability and how this study attempts to bridge that gap

There has been much research relating to students learning and aspects of their environment: room colour and temperature to name but two. A study by Engelbrecht (2003) as cited in Woolner, et al (2007) reported that younger children prefer bright colours and patterns, while adolescents prefer more subdued colours on the wall. Another study by Harner (1974) cited in Jensen (2005 p. 84) says that a room temperature of 70 degrees Fahrenheit is ideal for most learning situations

I could not find any research on links between building design and pupils attitudes towards energy and water conservation, so I was intrigued to discover if my research would prove there are any.

If paint colour and temperature can influence the way students' learn then perhaps many other external influences do to. This research compares the designs of school buildings with the attitudes that pupils and staff develop towards sustainable issues, specifically to the use of water and energy.

Chapter 3

Methodology

3.1 Rationale for the study

The research was undertaken in four schools in Yorkshire. Many schools in the north of England were approached but did not wish to take part in the research for a wide variety of reasons ranging from the schools being too busy with internal matters to those schools inundated with requests from external visitors because of their excellence in specific areas. Personal recommendation and personal contacts were the deciding factors in the selection of schools I am extremely grateful to the schools who allowed me to conduct my research in their school. All of the schools approached were non-selective state schools. The sample size of schools is small but there are limited resources available to the researcher in terms of time and finance. Although small, the sample does extend across the spectrum of building design. School A is four years old made of stone and to a traditional design. School B has been open for two years and has a very modern striking design. School C is a 1950s traditional building with more recent extensions. School D is only one year old and has a very striking design.

Each school ensured that there would be:-

- an introductory assembly to the whole year group
- an opportunity for all year 9 & 10 pupils to respond to the questionnaire
- approximately one hour put aside for discussions with groups of students

- an interview with the head teacher or a teacher with the main interest in sustainable issues
- an interview the school bursar
- access to the schools water and fuel bills for the preceding 6 months.

Whole year groups were chosen to prevent any bias and to obtain a complete response from all abilities within the school.

The use of surveys, observations interviews and focus groups require interactions with me as the interviewer: I recognise that, as a stranger, I may have had an effect on the way that the students responded.

Interviews were chosen for a tool to work with the Head teacher or lead teacher as they give the opportunity for the interviewer to develop the responses and investigate the feelings of the interviewee, (Bell 2005). A structured or semi-structured interview would hinder and restrict this approach and may stop the interviewee revealing information as the interviewer would still be setting the list of issues to be addressed. An advantage of the interview over questionnaires is the one to one contact which this method allows this would enable the interviewer an opportunity to interpret facial expressions and tone of voice. It enables the researcher to gain valuable insights into the research based on the depths of the information given (Denscombe 1998). The disadvantages are that the process is time consuming and sometimes difficult to arrange a convenient time for both parties, interviewer and interviewee. The interview also produces unique responses which then present difficulties with analysis. At times there may be an effect on reliability as the as the interviewer can have an external

effect, however this is balanced out by the increase in validity and deep insights they provide

Questionnaires were very useful as they allowed the collection of a large number of responses. The questionnaires removed the influence that the interviewer might have on the interviewee. However questionnaires are costly to produce and distribute the response rate is variable as is the completeness of the answers. The design of the questions limits the responses and the reliability of the truth of the answers cannot be verified.

The inclusion of both closed, structured questions and open ended questions was useful to gain a balance in the response of the students. The structured question using a Likert scale gives an high frequency response that can quickly be analysed using statistical tests (Cohen et al., 2007), they are quick to complete and do not rely on the respondent having a high level of literacy . The disadvantage is that the respondent has no opportunity to develop their ideas by adding explanations and qualifications this may lead to a bias in them. Oppenheim (as cite in Cohen et al., 2007), To overcome this disadvantage open ended question are useful to explore the respondents feelings and attitudes further, however as (Cohen et al., 2007) suggest the open ended question can lead to problems of irrelevant information being offered or the respondent may think that they will be too time consuming so refuses to answer.

3.2 A Discussion of the Research Questions

Table 1 Research Questions

Research Question	Methods
In what ways does the design of the building have a direct effect on energy usage?	Questionnaire Observations Discussions
To what extent is there a difference in attitude towards energy and water used between students in different types of building?	Questionnaire Discussion with students in focus groups
To what extent is there a difference in attitude towards energy and water used between staff in different types of building?	Questionnaire Interviews with lead staff

Methods for each research question

1. In what ways does the design of the building have a direct effect on energy usage?

This section of the research was conducted initially using a questionnaire given to the school bursar relating to energy and water usage. This was followed by a discussion where I could elicit further relevant information. Using both the questionnaire and an interview enabled access to factual knowledge as a comparison between all schools. The opportunity for asking further questions and probing issues was also available.

The bursar interviews were unstructured and informal. Whilst touring the school and having discussions with the bursar, energy and water saving features were noted e.g. automatic lights, individual thermostats, wind turbines, solar cells etc were noted. Field notes were made in situ and written up the following evening (Denscombe 1998).

2. To what extent is there a difference in attitude towards energy and water used between students in different types of building?

Questionnaires were used as they offer a consistency in response; they are direct and easily cope with the large numbers of students. They show relating to the attitudes to energy and water conservation elements of sustainable development. As the research questions focused on the attitudes of students and staff it was important to construct the questionnaires to measure the real attitudes and see if they were backed up by actions. To this effect the questionnaire had three parts:- information, attitude, action.

(Appendix 1) The questionnaire was trialled with 50 year 9 and 10 students to ensure that there were no errors or wording which could be misunderstood.(Bell 2005) I chose to sample whole year groups to avoid bias in choice. I chose year 9 and 10 as these represented KS3 & KS4 students but did not interfere with any major exam times. The questionnaires included a mixture of open and closed questions.

The advantages of the questionnaire are that it:-

- is that it is a truthful way of finding out information
- provides access to a large number of students quickly
- is quick to complete
- avoids bias from the researcher.
- The disadvantages of the questionnaire are that;-
- might disadvantage, or exclude students who have reading difficulties (I attempted to overcome this by asking staff to read to students if necessary)
- some students might answer without thought or miss things out.
- some may go missing or not be completed.
- The questionnaires had identified concepts, categories and codes embedded into it.
- The questionnaires were delivered to year 9 and 10 students and all staff.
- The questionnaires allowed identification of sex, age, curriculum exposure, ability, ethnicity, and social background.

To investigate the attitudes of students towards energy and water usage, an attitude scale was used.

The purpose of an attitude scale is to place each respondent in an attitudinal dimension or continuum, and divide people into broad groups with respect to a particular attitude. It disclosed the strength of feelings that people hold. The advantages of using this scale are that it offers an efficient method of questioning; giving data that lends itself to statistical analysis. The disadvantage is that there is no way of knowing if the respondent would choose to add more detail to their response, their choices are constrained. Another disadvantage is that individuals often choose not to be seen as extreme so do not select the poles of the scale. The scale is used in this study to see if there is a relationship between attitude towards sustainable issues and other variables in my survey (school, gender and school year)

The Likert scale was selected as this offers a good measure of the person's attitude or feelings towards a given statement which will reflect a degree of sensitivity from the respondents (Cohen et al. 2007). Most often, the higher the category chosen the greater the strength of agreement, so students' attitudes can be put into an order to compare with each other. Some questions have been inverted so that respondents do not just tick the response box to please the questionnaire.

Discussion with Students Focus Groups

The original intention here was to give students an open ended question. For example "tell me anything you associate with or know about sustainable development" I also provided a set of stimulus photographic material to offer the students if they "dried up". (Cohen et al. 2007). This method was chosen so that the students would challenge

each other and relax in a less formal atmosphere, compared to an interview situation where a strange adult would be firing questions at them.

Photographs were chosen to stimulate the group discussions as students are often inhibited by a “blank page” and a stranger. Interviews with children, either in groups or as individuals, can be difficult as children sometimes feel uncomfortable, nervous or hesitant in such situations as the researcher may appear as an authority figure. (Cohen et al.,, 2007)). The focus group is useful because amongst other things it *“encourages the group rather than the individual to voice opinions and encourages non-literate participants to take part”*(Krueger 1988; Morgan 1988. Bailey 1994: p 192-193; Robson 2002: p 284-5, cited in Cohen et al., 2007 p 376).

A focus group discussion method was chosen as the next method of collecting data to allow the students freedom to express definite opinions; it provided qualitative data to help deepen the understanding of the students’ attitudes towards energy and water conservation. The use of a focus group to develop my research was beneficial because it captured the students’ original ideas, and perspectives. They feel safe in a comfortable non judgemental place and so were able to explore and explain their own thoughts on energy and water conservation in a relaxed atmosphere. The focus group allowed a freer approach to the research so that theories were allowed to develop. Groups of students have diverse abilities and backgrounds in each institution. School staff’s advice was taken to select students who were willing to participate in open discussions.

The group size between six and ten students was chosen to ensure a large enough group to interact but not too large to be unwieldy. Morgan (cited in Cohen et al. 2007)

This allowed a wide group discussion with students who had different points of view in each institution. Age groups were kept separate as, if mixed, the younger child might have felt intimidated or the older child might have felt embarrassed if their view point be thought silly by a younger student.

Discussions were transcribed and analysed for insights as to how water and energy conservation is viewed in each institution by repeated combing and clustering and analysis in order to crystallise and condense the respondents' thoughts (Cohen et al.,, 2007 p475)

The disadvantages were that there was no quantifiable data for analysis and the size of the sample of students was small so yielding less information compared to the questionnaires. I was aware that less articulate students may not speak up as easily as the more confident vocal students (Cohen et al.,, 2007) and ensured that I encouraged all students to participate.

3. To what extent is there a difference in attitude towards energy and water used between staff in different types of building?

The questionnaire was given to staff for the same reasons as questionnaires were given to students.

Open discussions with the staff were not included as it would be difficult to persuade many staff to give up even more time.

Interviews (unstructured) with lead persons in each school (teacher or bursar or teacher with responsibility for sustainable developments) took place. I chose to have a conversation (unstructured) with the opening "Tell me about sustainable development

in your school” as I wanted to hear a genuine, honest account from the individuals and did not want them to be led either by a questionnaire or by direct questions from myself. This open discussion lead me to have a better understanding of each institution. I chose not to make an audio recording of these conversations following informal conversations with senior staff in another local school, as it could be intimidating for the staff and they might not express their true opinions of their school (might tow the party line). I took brief notes during these conversations. I finished the day writing up my field notes.

3.3 A description of the methods and procedures used for data collection, including their justification

The following research methods were chosen, interviews, focus group discussions observations on tour of the buildings and questionnaires to staff and pupils. This would give me a mixture of qualitative and quantitative results to work with.

There were many variables involved in this research; the type of school building, old, new with overt sustainable features, and new with no obvious sustainable features. Other variables included the way the curriculum was delivered with specific attention to sustainable issues or not. The ethos of each school was unique in how they approached teaching and learning, empowerment of students and the background of the students. The study revealed any peculiarities or idiosyncrasies about each school allowing clear distinction between them.

Focus group discussions and questionnaires gathered quantitative and qualitative data to be analysed. The data was analysed making comparisons between schools and also between genders and year groups within each school to see if these effected that attitude the students developed. A Mann-Whitney U-test and Kruskal-Wallis test were

applied to the data. The non-parametric Mann-Whitney U-test was used to test two independent samples whilst the Kruskal-Wallis test was applied to look at variance between three or more independent samples comparing ordinal and categorical variables. (Hinton, Brownlow McMurray and Cozens 2004). Following the transcription of the interviews and focus groups discussions they were analysed in several ways. Frequencies of specific word occurrences were made and ideas were clustered. The evidence was condensed and interpreted; the silences as well as the spoken word were taken into account. Brenner et al (1985) cited in, Cohen et al. (2002) The interviews were listened to and read several times so that a context for the emerging themes could be identified.

Then comparisons were made using the information gained in focus groups and questionnaires to see if the different building designs had any valid effect on the students' attitudes towards energy and water conservation. More information for this element of the study came from discussions with head teachers and bursars and from making observations on tours of the schools. Mathematical comparisons of energy and water consumption, along with comparisons of size, were made to see if any design was favourable to conserving energy.

The pupils participating in the study came from across two key stages 3 and 4. Year 9 and 10 students took part in the study so that schools did not have to worry about interference with examination study time.

All students in year 9 and 10 completed the questionnaire. In the focus groups single sex groups were chosen to prevent a gender issue where males might dominate the conversation (Denscombe 1998).

As shown in Table 1 four schools were visited and a total of 895 students responded to my questionnaire but only 21 staff responded. Focus group interviews were held with

94 students and 7 members of senior staff took part in an interview. Some of the students in the focus group at school B were part of the schools eco committee and the students in school C were taking part in a “Green Week” where sustainable issues were being discussed.

Table 2 The numbers of participants in the research

School	Type of building	Number of students in the school	Number of students responding to questionnaire	Number of staff responding to questionnaire	Number of students taking part in focus group discussion	Number of senior staff interviewed
A	New traditional build	1441	218	0	24	1
B	New		212	7/64 11%	20	3
C	Old	830	114	14/42 33%	26	2
D	New	1369	166	0	24	1

The interviews with the bursars took a semi structured form, I had given them a list of areas of interest before the meeting. Some had completed a questionnaire and others were just prepared to discuss the facts and figures with me. When interviewing a head or senior teacher the discussion was totally open and unstructured. I asked the member of staff to talk with me about any sustainable features or interests that they had in their school.

The tours of the school were hosted by a variety of people: - head teacher, assistant head teacher, and bursar. They clearly pointed out any features that were appropriate. In some case the architect's plans and aerial photographs of the school made explanations of direction and features clearer.

Data collection was by several means and a commonality was sought between building design and attitudes towards sustainable development, especially in the areas of energy and water usage. Some research took a highly structured approach, (Cohen et al. 2007) and allowed statistical judgements which are objective and measurable with a definitive outcome to be made. The questionnaire included both open ended and closed questions. The more structured questions provided information that was easy to analyse Youngman (as cited in Bell 2005). The disadvantage with this approach to acquiring opinions is that the respondents only had a limited opportunity to make comment. To attempt to compensate for this disadvantage other aspects of the research were less structured. The open ended questions allowed the respondent to answer in a more complex manner. (Denscombe 1998). Discussions with school leaders were totally unstructured. These discussions encouraged the conversation to flow and follow a natural course, the advantage here was that the interviewee had the opportunity to tell the interviewer anything that they considered important and the interviewer could probe further and clarify and develop any unclear issues (Bell 2008). The disadvantage was that the responses were less well organised and the data analysis more difficult. Other methods of interviewing e.g. guided approach or standardised would have prevented the interviewee giving me an insight into the individual ethos and characteristics of their school. (Cohen et al. 2007)

During group discussions the students responded freely to issues of sustainability. Information regarding the consumption of energy and water was sought via

questionnaires and unstructured interviews with the school bursar. This enabled a direct comparison (of energy and water consumption per person and per square meter) to be made between the schools in my study and facilitated an assessment of the schools energy and water efficiency.

Observations of the school display, clubs etc were made as I visited the school and had discussions with members of staff.

3.4 Ethics and Reliability

An “Ethical issues audit “was conducted before the research began. The respondents and their institutes would remain anonymous. The respondents were encouraged but not forced to complete the questionnaire and could omit questions if they felt that they were intrusive. The questionnaires and data would be destroyed on completion of the research. The interviews were conducted with the cooperation of school staff and students were asked if they wished to participate. The interviewees were informed of the purpose of the research and thanked for their cooperation. The data and transcripts of the interviews were destroyed on completion of the research (Cohen et al.,2007)

The questionnaires allowed the respondents to be anonymous if they wished so tended to be more reliable than the interviews. However the closed questions could prevent the respondent from giving as full an answer as they wished which could restrict reliability so some open ended questions were included to overcome this .The size of the sample is crucial as too small a sample can distort the data. (Cohen et al., 2007)

The student questionnaire was analysed using SPSS software conducting a reliability analysis Cronbach’s Alpha. The result for the total questionnaire was Cronbach’s Alpha based on standardised items 0.914 which suggests an excellent level of reliability. The staff responses were also analysed and this gave a result for the total questionnaire was

Cronbach's Alpha based on standardised items 0.961 which suggests an excellent level of reliability.

The validity of the content study was ensured as careful samplings of students in the school were made by selecting whole year groups. Triangulation of information from the questionnaires and interviews avoids bias and allows combining both qualitative and quantitative methods Gorard and Taylor (cited in Cohen et al., 2007)

3.5 Procedures and Processes

Interviews with lead teachers for sustainability or eco schools or head teacher were written up immediately and later analysed. The Head teacher or ESD leader or Eco leader was interviewed to elicit any aspects of the school which enlighten the research or would bias the results of the research. These interviews were informal and unstructured, they were not recorded but notes were written up immediately afterwards and analysed for additional information.

Focus groups discussions were used to gather further information which could then be grouped and classified. Analysis of this data contributed to a developing theory.

Grounded theory led me on a voyage of discovery which allowed a focus on the energy and water aspects of sustainable development with no constraints. The collection of evidence, and subsequent sifting and pattern seeking helped develop a theory that emerged from the data. The "grounded theory" approach for data collection is chosen as there is no defined theory to test. Grounded theory is a single, unified, systematic method of analysis. There was no previous research to base any theory upon. Comparisons were be made between the populations in four different schools staff and students. Glaser (cited in Goulding 1999). suggests using interpretive, contextual,

emergent, category saturation. That is to stay working until no further evidence emerges. This could continue into infinity so the suggestion of Strauss to use a complex, systematic coding technique to allow the findings to emerge (Goulding 1999) seems more favourable to analyse the interviews and open responses of the students. During the literature search no evidence or reference could be found relating pupils attitudes to energy and water conservation with the design of the school building. As there is no evidence on which to base a hypothesis the grounded theory method has been chosen. Information was collected from a variety of sources: questionnaires, notes from interviews, notes from discussion groups, factual information from documents. This was analysed and themes that ran through and across the data were identified.. The issues that developed presented a new focus for the study and eventually conjectures and hypotheses from the data were formed until a theory emerged. Although this goes against the idea of Glaser & Strauss (cited in Bell 2008) to start with empirical field research, Strauss says that it is impossible to start with a blank sheet as I too bring prejudices to my research and thus have control over the content (Lars Seldén, 2005). This was the best way forward for me to initially gain information from a large sample of unknown, unfamiliar students. The research utilised several methods; there was no hypothesis... just questions.

On completion the questionnaires were analysed by coding them and feeding the numerical data into SPSS. Then Mann-Whitney U-tests and Kruskal-Wallis tests were completed to look for similarities or differences between attitudes towards sustainable issues relating to water and energy, the actions the pupils took which would support their attitudes and their willingness to learn more about these issues. The Mann-Whitney U-tests and Kruskal-Wallis tests were also used to see if the year groups had different attitudes, took different actions or showed any different willingness to learn

about sustainable development issues. CROSSTABS then helped to identify specific areas of differences.

Spearman rank order correlations were applied to each school group to see if there was a relationship between their attitudes and their reported actions as well as between their attitudes expressed and their willingness to learn more about water and energy conservation.

Chapter 4

School A Findings .

4.1 Description of the school

This is a comprehensive Foundation School that is heavily oversubscribed. It had a sixth form. The school moved into new premises in 2005. The majority of pupils come from the surrounding council estates, but some travel further from the rural surrounds. Nearly half the students qualify for Aim Higher support in deprived wards. The school was awarded specialist status as a Media Arts College in 2004.

The school holds the Healthy Schools Award, Artsmark Gold, Sportsmark, Investors in People, Safe Mark and Investors in Pupils Award . The school is working towards meeting the expectations of the Sustainable Schools Framework

The school is a very airy building set out in a traditional style with a central entrance and wings protruding to the front and back of the building. The classrooms are laid out on either side of each corridor some receiving sunlight at different times of the day. The building is not orientated in any specific direction. The school was open from 7.30am until 6.00pm and a small area of the school was used for extended hours activities from September to May, Monday to Thursday 6.00pm to 9.00pm.

The school ran a large number of computers (420) and (laptops 200). There were 76 projectors and interactive whiteboards in the classrooms. Some areas of the school had air conditioning such as, the computer server room.

The school was beginning to develop an interest in becoming sustainable. The main driving force for the bursar was to save money where ever possible. The school had

utilized the Carbon Trust to survey the school and help point out areas where savings could be made. They have made some suggestions that the school can implement immediately. These are to do with raising awareness amongst staff and students to operate in a more energy efficient way e.g. IT equipment procedures. However, even though the school is only four years old, the Carbon Trust made several suggestions that would cost the school a considerable amount of money in order to improve their energy efficiency. The school was prioritising these to begin their improvement programme. During the initial build of the school it had been provided with a lighting system, just within the school toilets, which were fitted with motion detectors. The classrooms are well lit by day light but the roofing does not offer any natural day light panels which would be helpful to light corridors etc. There is no obvious orientation of the building to suggest that there is a directional build to utilise the natural heating effect of the sun. In each classroom there are signs reminding staff and students to turn off electrical appliances when not in use. There are no meters used to display energy consumption to students. The school has no water saving features at the moment and does not use grey water.

The school's consumption averages 578 KWh/pupil over a 12 month period for gas; 423 KWh/pupil over a 12 month period for electricity and KLtrs/pupil over a 12 month period for water Total energy use is 1001 KWh/pupil over 12 month period. This was the lowest amount per pupil for all of the schools I looked at.

The former head teacher wanted the school to develop into a self sufficient sustainable building but he had struggled to convince the Local authorities and PFI managers to site a wind turbine on the site. After many months he lost the fight, on financial grounds and the school has no method of generating electricity. As mentioned earlier

the school has recently introduced “Green Week “to help stimulate the students thoughts and actions on sustainable issues.

4.2 Information from the student questionnaires: School A

This school is just beginning its sustainable journey. The questionnaire responses from the students from this school ranked second with a mean score of 439.78 when looking at the actions they took with respect to energy and water conservation. They also had the second highest score relating to the attitudes they displayed when discussing energy and water conservation. This was a score of 421.93. Pupils have clearly been stimulated by their Green Week. The students are developing a sound understanding of the facts relating to global warming and climate change but many have not progressed past this stage. Although these students were developing knowledge of these issues and showed obvious care for people in other parts of the world and they are beginning to develop a “frame of mind” in which to think about their actions and their consequences in a global sense, everything was still compartmentalised and factual. The environmental education that falls outside the formal taught curriculum expressed in the ethos and sound practices of the school are just starting to emerge in this school. (Bonnet 2002)

4.3 Analysis of results: School A Attitudes

It seems to be that the attitudes displayed towards sustainable development between boys and girls are very different ($U = 14062.5$ $p = 0.001$ (2 tailed) $p < 0.05$)

Of the twenty statements in the attitude section eleven revealed a difference between the genders. The girls displayed a more positive attitude towards energy and water conservation than the boys.

Using CROSSTABS and chi-squared analysis the following information was revealed.

Girls were more conscientious than boys and displayed a positive attitude towards conserving energy. 59.9% of girls stated that they cared how much energy they used whilst only 43.2% of boys did. ($X^2 = 19.235$ $df=4$ $p = 0.01$)

Girls (41%) also took slightly more pride in using less energy than boys (37.9%). ($X^2 = 11.308$ $df=4$ $p = 0.05$)

More girls (48.6%) than boys (36.6%) said that they always make an effort to reduce their carbon footprint. ($X^2 = 10.336$ $df=4$ $p = 0.05$)

More boys (38.2%) than girls (34.1%) thought that turning a thermostat down to control temperature would not reduce the carbon footprint. ($X^2 = 12.002$ $df=4$ $p = 0.05$)

More girls (49.7%) thought that the low energy light bulbs made a difference to their carbon footprint than boys (45.3%) did. ($X^2 = 28.039$ $df=4$ $p = 0.01$)

Many more boys (40%) than girls (23.6%) disagreed with the statement that using high levels of insulation helps us use less energy. ($X^2 = 11.138$ $df=4$ $p = 0.05$)

More girls (28.9%) than boys (21.6%) thought that using less energy would become a habit. ($X^2 = 13.691$ $df=4$ $p = 0.01$)

More girls (22.1%) than boys (18%) thought that what they did in this country had an effect on the quality of life for people in other countries". ($X^2 = 10.867$ $df=4$ $p = 0.01$)

In summary the girls showed more positive attitudes towards these issues than boys. Of the eleven statements that showed a gender difference in the response, the boys only made a more positive response than the girls twice. These were when reflecting on their knowledge of reducing their carbon footprint and also to the question asking if they were concerned about the effects of global warming.

More boys (57.2%) than girls (44.9%) said they knew how to reduce their carbon footprint. ($X^2 = 13.050$ $df=4$ $p = 0.05$) More boys (35.4%) than girls (22.9%) said they were concerned about the effects of global warming ($X^2 = 18.366$ $df=4$ $p = 0.01$)

However more boys (35.2%) thought, “It is too late, nothing I do will change the effect of global warming” Only 32.2% of girls thought this. ($X^2 = 11.736$ $df=4$ $p = 0.05$).

In their focus group interviews there was an array of attitudes displayed among the students. Most came from a basic knowledge base which showed awareness and care for others. During the discussion with the students it was clear that many had a basic understanding of sustainable issues. The students did not initially offer ideas readily, but after a while developed a little more confidence and started to enter into a discussion. Some of the students informed me that it was Green Week in the school and they were trying to have specific days where they would not use computers and other days when they would make the effort to switch off unnecessary or unused electrical equipment, and they were learning to use recycled materials. As noted by (OFSTED 2003) an initiative like this special week could cause motivation and enthusiasm that might lead to further developments. This was having a stimulating effect on some students. There was some knowledge of global warming and its causes and effects but some confusion with the misconception relating to climate and weather; “You know what global warming is like what’s happening now. It’s not common that we have summers this warm” There were also the misconceptions of the ozone layer being related to global warming. Some of the female students reflected that since they had started learning about global warming and climate change in geography and Green Week they had tried to conserve energy, stating that “It will only make a slow difference but it will make a difference for our children’s children ...it’s a slow process.” This agrees with their more positive attitudes suggested by the responses to the questionnaire. Some of the girls said that they had promised to make these little differences by not leaving electrical equipment on standby and wasting

electricity. There was an awareness of contributory factors to global warming and potential solutions e.g. renewable energies. Some of the boys discussed that these issues were a whole world thing and it was not given a priority by governments, some of which were thought to be corrupt. Some students, both boys and girls, felt that it was a vicious circle and it was difficult to break into that circle to change things “You can’t stop the world. We could change, but too many people, of all ages, don’t care” One boy said “I’ll do my bit but only to clear my conscience” and another said “Take a look at it, see what a mess it is, your world. “ Yet another student voiced his opinion “I am a bit bothered....I’ll do my bit but not if I have to give things up. I would rather have what I want.” Some children expressed concern over people in other parts of the world who made no contribution to global warming as they were not users of electricity nor had cars but they were the people who were suffering the consequences e.g. flooding.

To summarise, both boys and girls expressed the idea that Green Week had had an effect on their attitudes and behaviours. Some of the boys felt that they begrudgingly would begrudgingly take action but did not really believe that it would make a difference. These conversations reflected the observations made from the questionnaire analysis suggesting that the female students have a more positive attitude and a take more positive actions than the boys.

Data was analysed to see if there was any significant effect on the attitudes, actions or willingness to learn of the students studying geography and design and technology.

These subjects appeared not to make difference to the ways in which pupils viewed energy and water issues. This analysis could only be carried out for year 10, as all students in year 9 took both geography and design and technology classes.

A null hypothesis was proposed that in School A there was no significant difference in attitude towards sustainable development between those students taking geography and those who were not. When the Mann-Whitney U-test was applied to the data ($U = 2238.0$ $p = 0.700$ (2 tailed) $p > 0.05$) that indicated that the attitudes displayed by students taking geography and those not is similar. The subject makes no significant difference.

Nor was there any significant difference in the actions they said they took ($U = 2053.0$ $p = 0.709$ (2 tailed) $p > 0.05$) nor in their willingness to learn any more about these sustainable issues ($U = 2146.5$ $p = 0.992$ (2 tailed) $p > 0.05$).

A similar set of results showed that design and technology lessons did not appear to influence the attitudes ($U = 3206.0$ $p = 0.991$ (2 tailed) $p > 0.05$) actions ($U = 2779.0$ $p = 0.156$ (2 tailed) $p > 0.05$) or willingness to learn ($U = 3346.0$ $p = 0.630$ (2 tailed) $p > 0.05$) either. There was no evidence to suggest that these subjects addressed sustainable issues in their curriculum time.

. On their questionnaire the majority of students (62%) responded that at least one of their subjects encouraged them to think about sustainable issues. The most mentioned subjects were science and geography, although a minority also mentioned art and design technology business studies PSHE and RE.

4.4 Analysis of results: School A Actions

The actions relating to energy and water issues reported by the boys and girls were very different. ($U = 14863.5$ $p = 0.008$ (2 tailed) $p < 0.05$).

Of the ten statements in the action section CROSSTABS and chi-squared revealed three differences between the genders. In all three cases boys report that they are less careful with their use of energy or water.

More boys (8.4%) than girls (2.8%) said that they never turned the lights off when leaving a room ($X^2 = 6.368$ $df=2$ $p = 0.05$). Twice as many boys (18.8%) than girls (9.4%) reported that they did not turn their computers off when not in use ($X^2 = 7.239$ $df=2$ $p = 0.05$).

All girls reported that they turn off running taps always or occasionally where as 4.7% of boys say they never do so. ($X^2 = 13.713$ $df=2$ $p = 0.01$)

In summary, in the three statements that reflected a gender difference the girls always made the more positive actions relating to energy and water use .

A Pearson correlation was carried out between the attitudes of, and the actions reportedly taken by, the students at school A. The results ($r=0.436$ $N = 376$ $p < 0.01$) indicate that as the attitude becomes stronger so do the positive actions that students report to take. This encourages me to believe that the students responded to the questionnaires in a positive truthful fashion as I would expect people who had developed strong attitudes towards sustainable issues to reflect those attitudes in their actions.

4.5 Analysis of results: School A. Willingness to learn about sustainable issues

There is very little difference between the genders in their willingness to learn more about issues relating to energy water and sustainable development ($U = 162555.5$ $p=0.185$ (2 tailed) $p < 0.05$) so this warrants no further investigation.

There is no difference between the year groups and their attitudes ($U = 16097.5$ $p=0.261$ $p > 0.05$). However there is a difference between the year groups and the actions they report to take. ($U = 12554.5$ $p=0.001$ $p < 0.01$). I used CROSSTABS to investigate these findings.

There were differences in six out of the ten actions discussed. In all cases the year 9 students reported making more energy and water saving actions. The differences in actions between the year groups were as follows:- More year 9 students (51.2%) said that they always turn lights off when leaving a room compared to 37.8% of the year 10 students. ($X^2 = 6.315$ $df=2$ $p = 0.05$). More year 9 students (63.1%) said that they always turn lights off when room is lit by daylight compared to 48.5% of the year 10 students. ($X^2 = 8.782$ $df=2$ $p = 0.05$). More year 9 students (57%) said that they always turn computers off when not in use compared to 35.6% of the year ten students. ($X^2 = 19.754$ $df=2$ $p = 0.01$). More year 9 students (31.1%) said that they always turn the heating (thermostat) down compared to 15.6% of the year 10 students. ($X^2 = 17.828$ $df=2$ $p = 0.01$). More year 9 students (55.6%) said that they always use single flush toilets when appropriate compared to 37.7% of the year 10 students. ($X^2 = 11.483$ $df=2$ $p = 0.05$). More year 9 students (22.8%) said that they always ensure minimum water is used in kettles compared to 16.0% of the year 10 students. ($X^2 = 12.843$ $df=2$ $p = 0.05$.) These differences were not highlighted in the focus group discussions. Year 9 and 10 students seemed to display similar opinions. The questionnaires show a change in attitude between the year groups, perhaps as students get older they become more exposed to these issues in the curriculum and no longer feel that they have an ownership of their actions. They might have acquired knowledge but think of it as indoctrination (Scott 2002) and not supported this knowledge with responsibility (Orr 1994).

Chapter 5

Findings: School B

This school was progressing on its sustainable journey. Most students were aware of the issues due to the reinforcement of teaching them throughout the whole school curriculum, This was an aggravation to some students, however there was a high level awareness of environmental problems. Knowledge and understanding appeared secure amongst the students I spoke to. They had mastered the subject matter; many were beginning to use this knowledge as a tool to take personal actions to conserve energy and water, they had developed responsibilities (Orr 1994). Some were attempting to think of effective ways to stimulate others to look at environmental problems as they realised that this situation cannot be resolved in isolation. Whole communities must take action. This reflects the ideas of (Huckle 2009) who suggests that students need to be able to think critically to enable them to move forward. The school displayed many attitudes and values that reflected a sustainable way of life and some students embraced these whilst others rejected them. Could this have something to do with the difficulties associated with being a teenager? If a study could follow these students into adult life it might be more revealing on the long term affects of being immersed in a sustainable caring atmosphere.

5.1 Description of the School

School B is situated in a small town. The school has specialist status as a technology college and moved into new premises in 2006. About one-fifth of pupils, live outside its catchment area. The proportion of pupils entitled to free school meals is below average. Pupils reflect the full ability range. The proportion of pupils with learning

difficulties and/or disabilities is slightly higher than the national average, as is the proportion of pupils with statements of special educational needs. Very few pupils have a minority ethnic heritage. The school holds several national awards including Investors in People, Sportsmark, the Healthy Schools Standard and the Eco School Award, and the local authority's Gold Award Travel Plan.

School B is run by a PFI company which restricts the school freedom in many areas. At the time of my visit the school had no control over the food offered in the canteen and was unable to sell Fair Trade snacks. They are compelled to have excessive lighting on the site in the evenings. The school is open from 7.00am to 4.30pm and a small area of the school is used for extended hours activities (youth club and sports hall).

The school runs a large number of computers (217) and laptops (110). There are 39 projectors in the classrooms. Some areas of the school have air conditioning including the computer rooms, the server room and the reprographics area.

There are display wind turbines and solar panels on the roof of the building, but there is no means of the school generating its own power. There are no meters used to display to students energy consumption to the students. The school takes a pride in displaying environmental posters on the walls and utilizes ways of saving energy throughout the school as best they can. Pupils use the model wind generator and solar panels in their science curriculum in small groups, when they can gain access to the roof space. (This is sometimes difficult due to health and safety issues raised by the PFI company.)

In the discussions with staff it was clear that many sustainable issues are carefully threaded throughout the curriculum, in most subjects. The school is heated mainly by a gas under floor heating system.

The lighting system within school is fitted with motion detectors. There is an override in most teaching spaces but none in the office areas, which can cause irritation. The rooms are well lit by day light but the motion sensors override the need for light and turn lights on any way if movement is detected. There is no obvious orientation of the building to suggest that there is a directional build to utilise the natural heating effect of the sun. The school is built in an exposed area where, at times, it is subjected to strong winds.

The school has small capacity cisterns on their toilets but has no other specific water saving features and does not use grey water. The schools consumption averages 1107 KWh/pupil over a 12 month period for gas; 754 KWh/pupil over a 12 month period for electricity and 1.1 KLtrs/pupil over a 12 month period for water. Total energy usage is 1862 KWh/pupil over a 12 month period. This was the second lowest energy consumption per pupil of the schools in this study.

5.2 Analysis of results: School B

The attitudes displayed by boys and girls in school B were almost identical ($U = 5282.5$ $p = 0.924$ (2 tailed) $p < 0.05$). The actions that the boys and girls reported taking were very similar ($U = 5189.0$ $p = 0.754$ (2 tailed) $p < 0.05$). This was reflected in the focus group discussions. All students seemed to have a very positive attitude to the issues relating to energy water and sustainable development.

In School B there was no difference between boys and girls in terms of their willingness to learn more about sustainable issues. ($U = 5037.5$ $p = 0.506$ (2 tailed) $p < 0.05$).

These tests were repeated to seek differences between year groups and the results were as follows. The attitudes displayed between year groups were different, with year 9 displaying a more positive attitude. ($U = 3556$ $p = 0.001$ (2 tailed) $p < 0.05$).

Crosstabs and chi squared tests were then used and the following data revealed that 64.5% of year 9, compared to 41.7% of year 10, thought that they could make a difference to the rate of progress of global warming. ($X^2 = 18.590$ $df=4$ $p = 0.01$). In year 10, 46.1% of students stated that they would choose an energy saving appliance in preference to a high energy use appliance, compared to 71.5% of year 9 students. ($X^2 = 18.289$ $df=4$ $p = 0.01$). 52% of year 9 students compared to 38% of year 10 students cared how much energy they used even though they did not pay the bills. ($X^2 = 11.712$ $df=4$ $p = 0.05$). 52.6 % of Year 9 students stated that they took a pride in saving energy compared to 24.8% of year 10 students. ($X^2 = 18.907$ $df=4$ $p = 0.01$). 51.3 % of the year 9 students stated that they could make a difference to the amount of CO₂ in the atmosphere compared to only 25.8% of the year 10 students. ($X^2 = 16.034$ $df=4$ $p = 0.01$). 76% of year 9 students stated that they were worried about rising sea levels compared to 54.3% of the year 10 students. ($X^2 = 10.959$ $df=4$ $p = 0.05$) 50.7 % of year 9 students thought that there was something that they could do to change the effect of global warming compared to only 33.6% of the year 10 students. ($X^2 = 11.136$ $df=4$ $p = 0.05$) 62.2% of year 9 students agreed that the simple acts of turning their thermostat down by 1 degree would reduce their carbon footprint. ($X^2 = 10.640$ $df=4$ $p = 0.05$) In response to the statement “Using high levels of insulation helps us use less energy” 62.2% of the year 9 students compared to 45.7% of the year 10 students thought that this was effective. ($X^2 = 11.611$ $df=4$ $p = 0.05$). When students were asked about their attitude towards wasting energy if it was made using solar panels 70.6% of year 9 students thought that this was not OK but only 64.5% of year 10 students expressed this view. No year 9 students thought that it was OK to waste energy but 2.4% of the year 10 students did. ($X^2 = 9.926$ $df=4$ $p = 0.05$) Almost twice as many year 9 students thought that their behaviour affects the lives of people in other

countries than the year 10 students (Year 9 41.3% Year 10 23.3%). ($\chi^2 = 10.639$ $df=4$ $p = 0.05$). The year nine students responded to twelve out of the twenty attitude questions in a more positive manner. Hicks & Holden (2007) state that teenagers are less optimistic, that solutions to environmental problems would be found, than their primary counterparts. Perhaps this change in attitude does not take place at the change in school phase from KS2 to KS3 but maybe at the change in phase from KS3 to KS4. More research is needed here.

5.3 STUDENT ACTIONS

A null hypothesis was proposed that in School B there was no significant difference between year groups in the actions they reported to take relating to energy and water. However the Mann-Whitney U- test was applied to the data $U = 4064.0$ $p=0.016$ (2 tailed) $p < 0.05$ and indicates that the actions that the year groups reported to take were very different

Year 9 students reported taking more positive actions than year 10 students in response to three out of ten questions. 63.3% of the year 9 students said that they always turn computers off when not in use compared to 40.8% of the year 10 students. ($\chi^2 = 10.541$ $df=2$ $p = 0.01$). 32.9 % of year 9 reported turning the heating (thermostat) down as a way of saving energy compared to 17.7% of year 10 students. ($\chi^2 = 9.665$ $df=2$ $p = 0.01$)

79.7% of year 9 students said that they sometimes or always ensured that a minimum amount of water was used in kettles compared to 60.5% of year 10 students. ($\chi^2 = 8.818$ $df=2$ $p = 0.05$)

A null hypothesis was proposed that in School B there was no significant difference between the willingness to learn more about sustainable issues between year 10 and

year 9 students. When the Mann-Whitney U- test was applied to the data ($U = 3903$ $p = 0.005$ (2 tailed) $p < 0.05$) it indicated that there is significant difference in their willingness to learn more about these issues. In their responses to six out of ten questions year 9 students displayed a greater willingness to learn about sustainable issues. When asked if they would like to learn more about how energy can be saved or used in a more efficient way 83.8 % of the year 9 students said that they would, compared to 64% of the year 10 students. ($X^2 = 10.126$ $df = 3$ $p = 0.05$) When asked if the students wished to learn more about the effects of global temperature increase 82.7% of year 9 students expressed an interest compared to 63.2% of the year 10 students. ($X^2 = 9.250$ $df = 3$ $p = 0.05$) 81.3% of year 9 students expressed an interest in learning more about the lack of safe water in developing countries, compared to 68% of the year 10 students. ($X^2 = 13.618$ $df = 3$ $p = 0.01$) .When asked if students would like to learn more about ways of saving water 81.1% of year 9 students said that they would, compared to 60.1% of the year 10 students. ($X^2 = 13.015$ $df = 3$ $p = 0.01$). When asked if students would like to learn more about ways of reducing electricity usage 82.4% of year 9 students said they would compared to 56.8% of the year 10 students. ($X^2 = 14.499$ $df = 3$ $p = 0.01$) When asked if they would like to find solutions to improving my carbon footprint 78.3 % of year 9 students said they would compared to 48.8% of the year 10 students.. ($X^2 = 20.047$ $df = 3$ $p = 0.01$) In all other aspects there was no difference between the year 9 and 10 students. There could be many reasons why year 9 were more positive than year 10 students towards sustainable issues; perhaps they had not experienced as much exposure to the subject as the year 10 students had in this school and did not feel submerged and saturated or indoctrinated (Scott 2002). Perhaps it was the year ten students expressing a teenage contrary opinion which the year 9 students had not yet developed.

During the discussion with the students it was clear that many have a good understanding of sustainable issues but often hold opposing views on how to deal with the situations that may arise. Some students (mainly year 10 boys) showed some concern that specific topics relating to sustainable development were repeated over and over again throughout the curriculum. They cited issues such as sea levels rising, polar bears dying, lack of water and climate change. They suggested that these were important issues but felt that teachers just “wanted to beat the information into you” Another year 10 student suggested that “Adults have done all this damage and they are pinning it on us, even though it is our future that might be damaged.” These students displayed a discontent with the situation they were in. The first student thought he already knew everything and was insulted that he was being repeatedly informed of the same issues. The second student clearly did not want to take the blame for the damage that adults had already done and wanted them to do something about the damage rather than just requesting the younger generation to take action This is reflected by Webster & Johnson (2008) as they remind us that we are handing over to young people a degraded planet and expecting them to clean it up but the messages we pass on with this mess must be positive.

. Some year 10 girls expressed the reasoning that not knowing would be a better option than being informed: then what ever happened would be accepted as natural and we would have no responsibilities. Some year 10 girls thought that action should be taken now to lessen the impact of global warming and thought that if everyone tried the rate of warming would be slowed to some extent. Some female students were unsure how to motivate “all people” to not only be concerned but also to take action. Many solutions were discussed amongst both age groups, including waiting for a disaster to strike and then work with people’s emotions to make them take action, to the more

generous thoughts of offering prizes to households or companies when they saved the most energy. Other students thought on a smaller scale and suggested that children should not be allowed electronic games but should be offered alternative activities such as exercise and healthy things. There was some discussion relating to escaping into space and building survival stations on the moon. The focus group took place on a bright, sunny day and the room had plenty of natural light from the windows. I was therefore interested to hear the following conversation after about 40 minutes: “Here we are talking about saving energy, so why are the lights still on in here? What are we doing to save energy?” “I don’t know how to switch them off?” “There isn’t even a switch” “No these are the ones that come on and off to save electricity but you cannot even switch them off. That’s stupid.” Students had a sound knowledge of water shortage and flooding in various parts of the world. Both years expressed concern for people who were affected by these issues, but one year 10 boy commented that they felt they would never personally be affected by such issues and if disaster did strike “technology would save the day.” In general the students were well informed in many areas relating to sustainable development they displayed knowledge and understanding of green house gases, global warming and alternative energies. They could discuss and debate, issues between themselves, sharing their very different opinions. Their perspective on the future was mixed. Some were very positive about the actions they might take to improve their future and some took a rather fatalistic, “Nothing I do will change things” attitude. However most students spoke with an informed mind and many were willing to take action and encourage others to do so as well.

A Pearson correlation was carried out between the attitudes of and the actions reportedly taken by the students at school B. The results ($r=0.356$ $N=208$ $p< 0.01$) indicate that as the attitude becomes stronger so do the positive actions that students

report to take. This encourages me to believe that the students responded to the questionnaires in a positive truthful fashion as I would expect people who had developed strong attitudes towards sustainable issues to reflect those attitudes in their actions.

Data was analysed to see if there was any significant effect on the attitudes, actions or willingness to learn of the students studying geography and design and technology. There was no apparent significant difference. This analysis could only be carried out for year 10 as all students in year 9 took both subjects. The attitudes displayed by students taking geography and those not taking geography were similar. (U =1856.5 p=0.855 (2 tailed) p >0.05) The subject makes no significant difference to the attitudes the students had developed. Nor was there any significant difference in the actions they said they took (U =1714.5 p=0.597 (2 tailed) p >0.05) or in their willingness to learn any more about these sustainable issues (U =2122.5 p=0.130 (2 tailed) p >0.05). Another analysis of results showed that design and technology lessons did not appear to influence the attitudes (U =2200.5 p=0.236 (2 tailed) p >0.05) actions (U =2230.0 p=0.180 (2 tailed) p >0.05) or willingness to learn (U =1898.5 p=0.785(2 tailed) p >0.05) either.

5.4 Information from staff questionnaires: school B

The seven staff who responded to the questionnaire held very definite ideas relating to sustainable development but no differences were found between age groups or gender. In general their ideas reflected a positive and knowledgeable approach. There was a strong expression of feelings relating to global warming and the rate of its progress. All had some knowledge of controlling their carbon footprint and making a difference to the amount of CO₂ they put into the atmosphere. There was a strong

recognition that energy saving appliances insulation and low energy light bulbs made a difference to the amount of energy consumed. The staff expressed that they could protect their local environment and the global environment and that they did have an effect on peoples' lives in other counties. When their reported actions were looked at they were all very positive and displayed many energy and water saving habits. Only four staff responded to the question about future learning. They all expressed a willingness to improve their knowledge in most areas including using energy in a more efficient way, ways of finding solutions to improving their carbon footprint and ways of saving water. The other teachers either did not write in this section or simply stated that they thought this section was just for pupils. This had not been my intention I wanted to know if adults were open to developing their knowledge further.

There was no difference in the actions reported to be taken between male and female staff in school B ($U = 1.00$ $p = 0.108$ (2 tailed) $p > 0.05$) nor was there any difference in their willingness to learn more about these issues. ($U = 1980.5$ $p = 0.686$ (2 tailed) $p > 0.05$) There was no difference in the attitudes that they displayed towards them ($U = 3.500$ $p = 0.522$ (2 tailed) $p > 0.05$). The sample was very small (7) and involved teachers from a small range of subjects, art mathematics science and physical education. There was no significant difference in attitude or action relating to the subjects they taught. The staff came from a range of age groups 21-50. It was noted that, although not significantly, different the oldest staff (41-50) scored most highly when reporting the actions they took to conserve energy and water, this might be as a positive action towards sustainability or simply to save money in bills, further research could be developed here. Their age group did not have any effect on their attitude nor willingness to learn about sustainable issues.

Chapter 6

Findings: School C

The students in the focus groups in this school displayed diverse thinking and clearly represent the problem solving that (Orr 1994) alludes to. At times they were unsure or inaccurate in their scientific knowledge of global warming and climate change; however they had developed strong feelings and were able to take action on issues. The students were willing to explore solutions in a variety of ways. Many students were problem solvers who wanted to take action to slow the progress of global warming. This was not backed up in the whole year group's responses to the questionnaire. Here the responses were very similar to the other schools in this research project. Perhaps these students explored the issues further and clarified their ideas for action when discussing them. Alternatively, it is possible that in their discussions they simply displayed the attitudes that they thought I would like to hear. (Cohen et al. 2007)

6.1 Description of School C.

School C is a smaller-than-average secondary school. It is positioned in a valley and is often in shade from the surrounding hills. The proportion of students known to be eligible for free school meals is lower than average. The percentage of students with special educational needs and/or disabilities is lower than average, although the percentage with a statement of special educational needs is higher than average. The numbers of students from minority ethnic backgrounds is below average. The school acquired visual arts specialist status in 2003.

The school has achieved a number of awards, particularly in relation to the promotion of health and the environment. These include being designated a National Flagship School by the Food for Life Partnership, Sportsmark and the Healthy Schools award.

The school is open from 7.30am until 6.00pm and the technology and ICT rooms as well as the sporting facilities are used for extended hours activities. The school runs a large number of computers (307) and laptops (90). There are 50 projectors and 14 interactive whiteboards in the classrooms.

In the discussions with staff it was clear that the school was trying to empower the students, give them their own voice, and encourage them to think for themselves.

The school takes a pride in the allotment area in which the students grow fresh vegetables and salad for the canteen and also for sale in the local town.

The school is also investigating the possibility of developing a hydroponic fish system which would link with their vegetable growing.

There is no obvious orientation of the building to suggest that there is a directional build to utilise the natural heating effect of the sun. Extra classrooms have been added on the school over the years as it was originally built for only 350 students not the 878 that attend now. Some of the building areas conform to higher building regulations than others which are only two years old. The school is on a sheltered site at the bottom of a valley so is not exposed to high winds but does suffer from the shade at certain times of day. This contributes to the high level of energy use throughout the year, especially in heating and lighting bills.

The school has low fill toilets fitted but does not use grey water.

The schools consumption averages ; - 1337 KWh/pupil over a 12 month period for gas, 462KWh/pupil over a 12 month period for electricity, 3.9KLtrs/pupil over a 12 month period for water. Total energy use is 17597 KWh/pupil over a 12 month period. This was the highest energy use per student recorded from all the schools in this study.

The school has utilized the facility provided by the Carbon Trust to investigate how to become more efficient in their use of fuel. They have made some suggestions that the school can implement immediately. These are to do with raising awareness amongst staff and students to operate in a more energy efficient way e.g. developing energy champions amongst the staff and students and the efficient control of IT equipment. However, even if the school implements all the changes suggested it will save less than 2% of the total energy bill. It was hoped that the school would be rebuilt in the near future but the local authority decided that it was not a priority school and plans have now been shelved.

6.2 Information from staff questionnaires: School C

In school C 33% of the staff responded to the questionnaire. The subjects they taught were english, maths, science, design and technology geography and physical education. There was no difference in the actions reported to be taken between male and female staff in school C (Mann-Whitney test $U = 23.000$ $p = 0.946$ (2 tailed) $p > 0.05$) nor there was a difference in the attitudes that they displayed towards them (Mann-Whitney test $U = 22.000$ $p = 0.947$ (2 tailed) $p < 0.05$). There was no difference shown in their willingness to learn more about these issues. (Mann-Whitney test $U = 28.000$ $p = 0.410$ (2 tailed) $p > 0.05$).

Less than 50% of this group responded to the section on learning. Those that did stated that they were willing to learn more about all aspects of energy and water

conservation. Although there was no significant difference between the subjects taught, it was noted that in their responses, the design technology and geography staffs were most willing to learn more about sustainable issues.

There was no difference in action attitude or willingness to learn between the age groups of the staff.

All thought that global warming was a fact and 60%-89% thought that they could make a difference to the rate of progress of global warming. There was a greater range of responses from staff when answering statements relating to saving energy with (1 member of staff) stating that they did not care how much energy they used and neither did they take pride in saving energy or choosing an energy saving appliance in preference to a high energy use appliance whilst the rest showed a much more positive response.

Although most (80%-90%) reported to knowing how to reduce their carbon footprint and about 80% reported that they understood issues like using low energy light bulbs, insulation and turning the thermostat down, only 40% reported trying to reduce their carbon footprint. Most staff thought that energy saving activities would become a habit (100% men 78% women).

More than 90% of the staff thought that they could protect their local environment however this dropped to 64% thinking that they could protect the global environment and only 57% thought that their actions could affect quality of life for people in other countries.

When analysing their actions most staff reported taking energy and water saving actions most of the time. Using the minimum amount of water in the kettle, not opening

windows while the heating is on and turning the thermostat down were the actions that staff reported doing least.

6.3 Information from Student questionnaires

In School C there was no significant difference between the attitudes displayed by boys and girls. ($U = 1355.5$ $p = 0.128$ (2 tailed) $p > 0.05$). Also there was no difference between boys and girls in the actions they reported to take relating to energy and water. ($U = 1440.0$ $p = 0.294$ (2 tailed) $p > 0.05$) There was no difference between boys and girls in their willingness to learn more about sustainable issues. ($U = 1452.0$ $p = 0.328$ (2 tailed) $p > 0.05$) so no further investigation is needed. These tests were repeated to seek differences between year groups. Pupils in school C displayed different attitudes in each year group. Year 9 displayed a more positive attitude. ($U = 964.0$ $p = 0.001$ (2 tailed) $p < 0.05$).

62.5% of year 9 students thought that they could make a difference to the rate of progress of global warming, compared to 36.3% of the year 10 students ($X^2 = 14.581$ $df = 4$ $p = 0.01$). When asked if the student cared how much energy they used as they did not pay the bills 62.5% of students in year 9 said they did compared to 37.5% in year 10 ($X^2 = 13.917$ $df = 4$ $p = 0.01$) When asked if they took a pride in saving energy 43.9% of year 9 students said they did compared to 32.3% of year 10 students. ($X^2 = 10.277$ $df = 4$ $p = 0.05$).

When asked if they knew how to reduce their carbon footprint 65.8% of the year 9 students said they did compared to 32.8% of the year 10 students. ($X^2 = 12.973$ $df = 4$ $p = 0.05$). 65.8% of year 9 students said that they were worried about rising sea levels compared to 42.2% of the year 10 students ($X^2 = 9.675$ $df = 4$ $p = 0.05$). 30.8% of year 10 students thought that it is too late, nothing they could do would change the effect of

global warming whilst only 17.1% of the year 9 students held this opinion. 51.2% of the year 9 students thought that there was still time to counteract the effects of global warming compared to 15.5% of the year 10 students. ($\chi^2 = 20.724$ $df=4$ $p = 0.01$) 58.5% of year 9 students agreed with the statement “If everyone turned their thermostat down by 1 degree our carbon footprint would be reduced” but only 30.8% of the year 10 students believed this. ($\chi^2 = 18.046$ $df=4$ $p = 0.01$). 80.5% of the year 9 students disagreed with the statement “There is very little someone like me can do to protect my local environment” whilst only 43% of the year 10 students did. ($\chi^2 = 18.205$ $df=4$ $p = 0.01$). 41.5% of the year 9 students thought that there was something that they could do to protect the global environment whilst only 21.5 % of the year 10 students thought they could. ($\chi^2 = 19.357$ $df=4$ $p = 0.01$). 40% of the year 9 students think that their actions in this country has an effect on the quality of life for people in other countries, compared to 18.7 % of the year 10 students, ($\chi^2 = 9.706$ $df=4$ $p = 0.05$).

In school C the actions that the year groups reported to take relating to energy and water are very similar ($U = 1216$ $p=0.054$ (2 tailed) $p > 0.05$).

In school C there was no difference between the willingness to learn more about sustainable issues between year 10 and year 9 students ($U = 1215.5$ $p=0.054$ (2 tailed) $p < 0.05$)

A Pearson correlation was carried out between the attitudes of and the actions reportedly taken by the students at school C. The results ($r=0.586$ $N = 129$ $p < 0.01$) indicate that as the attitude becomes stronger so do the positive actions that students report to take. This encourages me to believe that the students responded to the questionnaires in a positive truthful fashion as I would expect people who had

developed strong attitudes towards sustainable issues to reflect those attitudes in their actions

Data was analysed to see if there was any significant effect on the attitudes, actions or willingness to learn of the students studying geography and design and technology. There was no apparent significant difference. This analysis could only be carried out for year 10 as all students in year 9 took both geography and design and technology. There was no difference between students taking geography and their attitudes towards sustainable development and those students that did not study geography. (U =511.5 p=0,253 (2 tailed) p >0.05) The subject makes no significant difference. Nor was there any difference in the actions they said they took (U =556.0 p=0.533 (2 tailed) p >0.05) or in their willingness to learn any more about these sustainable issues (U =501.0 p=0.0.832 (2 tailed) p >0.05).

A similar analysis showed that design and technology lessons did not appear to influence the attitudes (U =548.5 p=0.767 (2 tailed) p >0.05), actions (U =566.5 p=0.599 (2 tailed) p >0.05) or willingness to learn (U =593.5 p=0.386 (2 tailed) p >0.05) either.

During the discussion with the students it was clear that many of them held strong views. They were outgoing and held lively discussions often from totally opposing points of view. Some students from both year groups and both genders held typical misconceptions, confusing global warming with ozone issues. Some year 10 boys voiced the opinion that global warming was a myth whilst others showed an acceptance of global warming as a reality but reflected no concern. A set of year 10 students thought that global warming could not be stopped and they displayed some concern. The idea that global warming was a natural phenomenon was also raised with the addition that we, humans, were just speeding up the process. One year 10 boy

suggested “Humans are just like a swarm of animals that the earth is dealing with, bringing the population levels down and then slowly the population levels would rebuild” The idea of global warming floods and droughts were just natural population controls. The students across the year groups reflected a wide variety of ideas that they were happy to share in this none judgemental environment.

Some year 10 girls discussed their personal use of electricity as an energy source. At times, they explained, they chose to waste electricity by leaving equipment working or on standby, just to aggravate their parents, as an act of defiance as they had told them to turn it off!!!

Another year 10 girl said “I do care. I do care, but just well, when I get older, probably, no definitely, when I get older, but not just now I’ll do something about it. Just now it’s my mum’s job.” Another reflected “I would do something if it doesn’t hurt me and doesn’t cost a lot.” Year 10 boys discussed carbon footprints and some felt guilty about theirs, even though they were unsure of its size. They showed an awareness of other countries like China and the USA suggesting that as nations they had a much bigger carbon footprint than the UK. Students explained that they did not really know if any actions they took would have any effect. A year 10 boy explained his feelings: “If it is just me on my own and nobody else acts, then why should I? It needs to be a joint effort. The Prime Minister should tell us, but that removes our freedom of choice. Is this good? Or sometimes do you just want to be told what to do? When decisions are hard, dictators can seem to be good.” Some year 9 boys talked about electricity from a technological point of view. Sometimes their scientific ideas were a little confused but their enthusiasm for finding different solutions to the energy crisis was tremendous. They were keen to make solutions and move forward rather than restrict their use. They suggested an array of solutions: using hydrogen as a

power source: more wind turbines: nuclear power and even sending people to live in space. The idea of world power generation by placing solar panels in the Sahara Desert was discussed as an environmentally friendly way to solve the world's power needs but the students recognised that serious political issues might arise from peoples' greed. Some year 10 boys expressed scepticism of the use of bio diesel reflecting that too many people in the world need food. A few of the year 9 girls discussed the vital need for clean water in many areas of the world and felt bad about their own wasteful activities. A reflection that "I should personally do something about it, but I can't be bothered" was an honest expression from a student and another said "I know what I should do but I am lazy, so I will take the easy way." Year 9 girls had thought about recycling issues and commented on the television advertisement relating to recycling aluminium cans and turning them into aeroplanes. One student noted that only 90% of cans are recycled the other 10% is sent to landfill, so over years less aluminium would be available for use.

The year 10 girls were indignant about the need to recycle and felt that it was not their responsibility. Others suggested that there should be less packaging on goods so less energy would be used in their production and in the removal of waste.

These conversations supported the findings in the questionnaire analysis that year 9 students had a more positive attitude towards sustainable issues than the year 10 students. The students were engaged and eager to take action but there was a lack of knowledge and understanding of sustainable issues that prohibited them from making decisions about the actions they should take.

Chapter 7

Findings: School D

The students here were settling into their new school. They were only just beginning to develop an understanding of the scientific facts relating to sustainable development especially in the areas of water and energy conservation. Their sustainable journey was just beginning in school, however, their reflections of their home life suggest that their families (perhaps for financial reasons) are taking action to reduce the amount of energy consumed in their homes

7.1 Description of school D

School D is situated on the edge of a city. The school is a large comprehensive school. About 90% of the students come from deprived areas surrounding the school. Around two thirds of students are White British and the remaining third are from minority ethnic backgrounds, predominantly Pakistani. About one fifth of the students speak English as an additional language. The number of students entitled to free school meals is more than double the national average. There are a small number of students with a statement of special educational needs.

The new school building has only been open for 12 months. For various reasons the school chose not to share some of their data with me including their energy or water consumption. The school is built on an exposed site and suffers from very high winds. It has a very modern design being set out in the shape of a hand. The entrance is at the base of the palm of the hand and fingers protrude from a central atrium which has self ventilating windows. The school has a swimming pool. The classrooms are laid out on three floors, on either side of each corridor. The classrooms benefit from sunlight at

different times of the day. The building is not orientated in any specific direction. In the first year of operation there had been many issues with overheating in the summer and under heating in the winter. The PFI had control of energy input and ventilation and sometimes took a little longer than expected to react to issues. The school has a small farm which some students in the upper school use to study animal care.

The assistant head teacher who has responsibilities for the new building and PFI, he said “At the eleventh hour the wind turbines and solar panels were stolen from us. Also the use of grey water and exposure of pipes and wiring was removed”. It was cut for financial reasons. This was obviously very upsetting and disturbing for the school.

7.2 Information Questionnaires

Girls had a more positive attitude than boys towards sustainable development ($U = 1895.5$ $p = 0.001$ (2 tailed)). 63.7% of the girls thought that they can make a difference to the rate of progress of global warming compared to 33.8% of the boys. ($X^2 = 17.782$ $df = 4$ $p = 0.01$). 55.2% of the girls reported that they always make an effort to reduce my carbon footprint compared to 29.7% of the boys. ($X^2 = 12.141$ $df = 4$ $p = 0.05$). 53.8% of the girls reported that they were worried about rising sea levels compared to 30.1% of the boys. ($X^2 = 16.706$ $df = 4$ $p = 0.01$). 66.6% of the girls disagreed with the statement “There is very little someone like me can do to protect my local environment” compared to 43.4 % of the boys ($X^2 = 11.821$ $df = 4$ $p = 0.05$).

In School D there was no difference between boys and girls in the actions they reported to take relating to energy and water ($U = 2647.5$ $p = 0.111$ (2 tailed) $p > 0.05$) Also in School D there was no difference between the willingness to learn more about sustainable issues between boys and girls. ($U = 2939.5$ $p = 0.138$ (2 tailed) $p > 0.05$)

These tests were then repeated to seek differences between year groups and the results were as follows.

There was no difference between year groups in their attitudes towards sustainable development in School D ($U = 3044$ $p = 0.880$ (2 tailed) $p > 0.05$) There was no significant difference between year groups in the actions they reported to take relating to energy and water ($U = 2702$ $p = 0.214$ (2 tailed) $p > 0.05$)

There is no significant difference between year 10 and year 9 students and their willingness to learn more about these issues. $U = 3029.5$ $p = 0.268$ (2 tailed) $p > 0.05$

A Pearson correlation was carried out between the attitudes of and the actions reportedly taken by the students at school D. The results ($r = 0.388$ $N = 159$ $p < 0.01$) indicate that as the attitude becomes stronger so do the positive actions that students report to take.

Data was analysed to see if there was any significant effect on the attitudes actions or willingness to learn of the students taking these subjects there was no apparent significant difference. This analysis could only be carried out for year 10 as all students in year 9 took both subjects..

A null hypothesis was proposed that in school D there was no significant difference in the students their attitudes towards sustainable development of students studying geography and those not taking that subject. When the Mann-Whitney U-test was applied to the data ($U = 627.5$ $p = 0.305$ (2 tailed) $p > 0.05$) the result indicates that the attitudes displayed by students taking geography and those not is similar. The subject makes no significant difference.

Nor was there any significant difference in the actions they said they took ($U = 578.0$ $p = 0.328$ (2 tailed) $p > 0.05$) nor in their willingness to learn any more about these sustainable issues ($U = 523.5$ $p = 0.308$ (2 tailed) $p > 0.05$).

A similar set of results showed that design and technology lessons did not appear to influence their actions ($U = 622.5$ $p = 0.276$ (2 tailed) $p > 0.05$) or willingness to learn ($U = 733.5$ $p = 0.821$ (2 tailed) $p > 0.05$). However the attitudes ($U = 974.5$ $p = 0.04$ (2 tailed) $p < 0.05$) did appear to be influenced by the subject design and technology with the students who took the subject developing a more positive attitude towards sustainability.

The most mentioned subjects that discussed sustainable issues were science and geography. When students were asked if there was anything they would change; 32% would change nothing and 34% made no response. The remaining 34% wished for a variety of changes; stop climate change, global warming, cutting down trees, and ice melting. Small numbers of students expressed general fears of damaging the planet, destroying the earth and fears for future generations and flooding. When asked 56% of the students did express that they cared about global warming and its effects whilst 22% said they did not. When asked about rising sea levels 40% expressed that they had no worries whilst 34% were worried.

7.3 Pupil Focus Group Conversations

During the discussion with the students it was clear that many had a limited understanding of energy and water sustainable issues. The students were very quiet and said that they could not remember talking about sustainable issues or energy water conservation in any lessons except science. They did display was some knowledge of global warming and its causes and effects. Some year 10 boys said that they often left

electrical items computer games, televisions and lights on but sometimes tried to be more “green” by turning these things off. The students talked about energy saving light bulbs being sent to their houses without cost but they said that they did not think they used them nor did they think they were used in school. These boys also reported that their parents encouraged them not to waste energy by switching electrical items off when not in use. This was always from a financial stance. The year 10 girls discussed alternative technologies that they had learnt about in science. Some students thought the school had two wind turbines that generated electricity for the whole school and solar panels on the roof making the school self sufficient. Others said they did not exist. (I believe the confusion arises as these features are displayed on the model of the school). Students said they knew about solar panels because of the advertisements on television but had never seen any. Some boys felt that if no one takes action to slow down global warming things like flooding would get worse. However if they were the only people to take action against global warming, why should they do it as no real difference would be made? So everyone should do something. A nucleus of people was needed to spread the word and start it off. Some students thought that the government should pay for technologies to be installed throughout the country to reduce carbon emissions and taxes should be raised to help raise the money. Other issues students raised were lack of water in many countries, polar bears dying and animals’ habitats disappearing. When the group were discussing rising sea levels one student was very concerned and needed reassuring that death was not imminent. There was no real engagement with sustainable development, energy and water conservation. The students did not have the confidence to develop attitudes or take conscious actions as their knowledge base was low.

Chapter 8

Comparing all schools

8.1 Energy

Three of the four schools had taken advantage of services offered by the Carbon Trust to try to reduce their energy and water consumption even though two of these schools had a very new building. All had areas of potential reduction highlighted to them. Some were at no cost and some required major expenditure. All three schools had, to some extent, taken the advice given within the limitations of their budgets.

Looking at the energy costs of the schools it can be seen that the older school uses much more energy on heating the school than the newer schools: 1337 KWhr/student compared to 754/578 in the newer schools. There are many differences between the equipment used by each of the schools e.g. the number of computers and interactive white boards and the amount of air conditioning needed in the server rooms. The requirement of the PFI in school B to light the school at night makes further comparison of electrical use very difficult as this school's electrical consumption was almost 3 times as much as the other schools (1107KWhr (school B) compared to 423 KWhr (school A) and 462 KWhr (school C)) It is impossible to say just how much of this additional consumption was due to the constant night lighting.

Both new built schools reported a marked increase in electrical consumption compared to the school in the old building. They did not supply me with the data, and they found it difficult to give accurate reasons. Both state that the numbers of computers and interactive white boards have increased greatly in the schools.

Motion detectors and other light sensors were a cause of irritation as they are not easy to use. One member of staff commented that it was difficult to encourage children to develop energy saving habits if they had no control over this equipment.

Table 3 Summary of Energy and Water Consumption

School	Energy Form	Units consumed	Units /Pupil	Units /m ²
A	Electricity	614008 KWhr	423 KWhr	53 KWhr
A	Gas	838337 KWhr	578 KWhr	73 KWhr
A	Water	11351/KLtrs	7.8/KLtrs	0.98/KLtrs
A	Total energy	1452345 KWhr	1001 KWhr	125 KWhr
B	Electricity	539324 KWhr	1107 KWhr	76 KWhr
B	Gas	792127 KWhr	754 KWhr	112 KWhr
B	Water	2358/KLtrs	3.3/KLtrs	0.33/KLtrs
B	Total energy	1331451 KWhr	1861 KWhr	188 KWhr
C	Electricity	406082 KWhr	462 KWhr	65 KWhr
C	Gas	1174181 KWhr	1337 KWhr	187 KWhr
C	Water	3450/KLtrs	3.9/KLtrs	0.55/KLtrs
C	Total energy	15802630 KWhr	17597 KWhr	2519 KWhr
D	No data	No data	No data	No data

As can be seen school A has the lowest energy consumption per meter squared. This was the building of traditional design, conforming to the latest building regulations in 2005. It uses 5% the energy per meter squared compared to the 50 year old building (school C). The higher electrical energy use in school C may well result of the poor access to day light due to its position on the valley floor. The consumption of electricity in school B probably reflects the fact that many lights are left on throughout the night.

The comparison between the schools, although difficult, shows that the BREEAM regulations adhered to in the new buildings have undoubtedly led to less energy use than the old building even if they have had an increase in electronic equipment and enforced lighting.

School A uses more than twice as much water than the other two schools. Perhaps this could partly be due to the effects of low flush / fill toilets, as school A did not report having any whilst the other two schools did.

8.2 Analysis of staff data comparing two schools B & C

When comparing the responses to the questionnaires from these two schools (staff in the other schools did not respond) there was no significant difference between the attitudes ($U = 72.5$ $p = 0.078$ (2 tailed) $p > 0.05$) actions ($U = 64.5$ $p = 0.244$ (2 tailed) $p > 0.05$) or willingness to learn more about sustainable issues ($U = 46.0$ $p = 0.808$ (2 tailed) $p > 0.05$) displayed by the staff. However when looking carefully at their responses it became clear that although not significantly different (perhaps just the opinions of one or two staff) a difference in attitude does exist. For example 30 % of the staff in school C thought that what they did in this country has little effect on the quality of life for people in other countries. In contrast all staff in school B acknowledging their actions had far reaching consequences. 14% (of school C staff) said that they never make an effort to reduce their carbon footprint. All the staff in school B say that they always make an effort to reduce their carbon footprint. In terms of their actions, 14% of school C staff said that they do open windows while the heating is on compared to none of school B staff. This could simply be because, in the new building, school B has an energy efficient system where heating is efficiently controlled. 7% of the school C staff reported that they never bothered to ensure minimum water is used in kettles

compared to school B staff who all reported using a minimum amount of water. These attitudes and actions suggest that the staff in school B give more thought to sustainability and take slightly, more positive actions compared to staff in school C. This is backed up by their responses to the open questions in the questionnaires. In both schools there were staff who expressed fears for the next generations. Some of the staff at school C felt that global warming was inevitable and some tried not to think about it too much. The staff in school B recognised global warming as an issue but two members of staff thought that mans influence on the rate of global warming was over stated. To summarise the staff in both schools displayed similar responses they showed a raised awareness of sustainable issues and most took appropriate actions to conserve energy and water.

8.3 Analysis of Data Comparing Four Schools

Attitudes

When the Kruskal –Wallis statistic was calculated to determine if there was any statistical difference in the attitudes between the four schools ($X^2 = 15.211$, $df = 3$ $p = 0.005$) a statistically significant difference was found. School B had the highest attitude rating followed by school A, then schools C and D.

In two out of the three schools with new buildings students display a higher attitude rating than the students in the old building. However, other influences might also affect these students' attitudes e.g. Green Week or a curriculum biased towards sustainability.

Table 4 Ranking of Attitude Scores

Summary of attitudes	School	Number of students	Mean Rank
	A	374	421.93
	B	211	485.83
	C	115	403.85
	D	160	396.73
	Total	860	

The individual attitude questions were examined and differences were found in the following areas: knowing how to reduce their carbon footprint and stating that, they always make an effort to reduce their carbon footprint. Students expressed that they worried about rising sea levels, were concerned about the effects of global warming. They stated that it is not acceptable to waste energy if it was made by solar panels, and that using less energy becomes a good habit. All the other responses did not differ greatly between schools

When the schools responses were analysed a statistically significant difference was found between the schools. The students at school B always answered more positively to the following questions : Knowledge of carbon footprint ($X^2 = 57.960$ $df=12$ $p = 0.01$), made an effort to reduce their carbon footprint, ($X^2 = 30.133$ $df=12$ $p = 0.01$) concerns relating to rising sea levels, ($X^2 = 43.907$ $df=15$ $p = 0.01$), concern about the effects of global warming ($X^2 = 26.502$ $df=12$ $p = 0.01$) attitudes to wasting energy created by solar panels, ($X^2 = 28.700$ $df=12$ $p = 0.01$) using less energy use becoming a good habit ($X^2 = 32.841$ $df=12$ $p = 0.01$). School B has more students who hold more positive attitudes relating to sustainable issues

Actions

When the Kruskal–Wallis statistic was calculated to determine if there was any statistical difference in the actions between the four schools ($X^2 = 13.203$, $p = 0.05$) a statistically significant difference was found. School B had the highest rating followed by school A, then school C and school D was the lowest. In two out of the three schools in new buildings students report taking more sustainable actions than the students in the old building. However, other influences might also affect these students attitudes e.g. Green Week and style of teaching.

Table 5 Ranking of Action Scores

Summary of Actions	School	Number of students	Mean Rank
	A	374	439.78
	B	211	466.63
	C	115	397.30
	D	159	382.04
	Total	859	

When CROSSTABS and chi squared analysis were used on these results three main areas of difference became apparent: Turning off school projectors: lowering the thermostat to control heat and turning off running taps.

Using chi-squared statistic to examine the distribution of the actions of turning projectors off in the different schools, a statistically significant difference was found between the schools ($X^2 = 19.690^a$ $df=6$ $p = 0.01$) School B has more students who state they perform this action most and school D least.

Using chi-squared statistic to analyse the distribution of the action of turning the heating (thermostat) down it was significantly different ($X^2 = 12.621$ $df=6$ $p = 0.05$). Between 50% and 56% of the students in all schools report doing so some of the time but in

school C 31.5% and in school D 31.6 % of the students say that they never turn their heating thermostat down.

When reviewing the action of turning off running taps, a statistically significant difference was found between the schools ($\chi^2 = 27.862$ $df=9$ $p = 0.01$). Between 2.4 % and 7.6% of the students in all schools reported never doing so, but in school D 64.6% said that they always turned the taps off which was considerably less than in the other schools.

Willingness to learn more about sustainable subjects

When the Kruskal –Wallis statistic was calculated to determine if there was any statistical difference between the four schools in the willingness to learn further about energy and water issues ($\chi^2 = 6.321$, $p > 0.05$) no statistically significant difference was found. However it is interesting to see that the students in school D now rank higher as they display a desire to learn about sustainable issues and school B still rank first.

Table 6 Ranking of willingness to learn about sustainable issues.

Summary of Willingness to Learn	School	Number of students	Mean Rank
	A	374	423.41
	B	211	464.02
	C	115	397.19
	D	165	440.02
	Total	865	

During discussions with students in all schools it was clear that some students had a better understanding of sustainable issues than others. Three out of the four schools (Schools A, B and C) displayed typical misconceptions about the ozone layer problems and global warming and so at times confused their arguments. School B could talk fluently and sometimes with passion about energy and water problems and

school C was also well informed. In school A, as it was “Green Week “some of the students had developed an interest and understanding. In school D students were not confident about the issues and at times I felt it was difficult for them to form and discuss their own point of view.

Two out of the four schools (Schools A and B) discussed the potential use of renewable energies to reduce the carbon footprint.

In all schools there was an underlying feeling that the solution to issues relating to over use of fossil fuels was not just in the hands of one or two people: everyone had to be involved. One school (school B) had considered how to encourage others to investigate global warming and climate change and then become motivated to take actions to prevent its rapid progress. In three of the schools small groups of students said that they were prepared to take action so long as they did not have to give anything up or feel any pain.

The relationships between the way students felt towards energy and water conservation did not appear to be based upon whether or not they came from a newly built school or an old building but upon the emphasis that the teaching staff put on sustainability within the curriculum. In school B (new) and C (old) where students were treated to either a sustainable rich curriculum or an ethos which empowered the students to take responsibilities for their actions students moved the discussions that we had to levels where solutions were sought. The majority of students felt they could make a difference to how things would change. Perhaps in these schools the process of developing problem solving and critical thinking skills essential for sustainable learning was established. (Huckle 2006)

It is interesting that staff from these two schools only responded to my questionnaires.

Of these responses school C staff showed a moderate correlation between their actions and attitudes towards sustainable issues.

Also interesting was that these staff in school C held more positive attitudes towards being sustainable and displayed higher positive scores relating to the actions they took to conserve energy and water than those of the staff in school B, where the ethos of the school was very much with a sustainable tone.

In all schools there was a mixture of knowledge and attitudes to energy and water related issues. Some students were better informed than others. Some understood more of the issues and some displayed a more caring approach. It was clear that students who did not have a strong understanding of the issues sometimes displayed unrealistic fears for their own safety and future. The knowledge that students acquired in all four schools developed confidence and motivated some students to think seriously about these issues and take action to try to lessen their own personal impact. The type of building did initially appear to have an influence on the students, with the top two attitude and action scores coming from students in the new buildings. However the bottom scoring school in each case was also a new building. The main influence on attitude development, following an acquisition of basic knowledge of the scientific and geographical facts, was the approach the teachers in the school took to delivering the wider curriculum.

In all schools there was an expression of the idea that students alone could not make a difference and perhaps were not willing to if they felt it was “only them” There was definitely a feeling of “I will if you will” amongst the students. Again in all schools there was a section of the students that said they would only make efforts to save energy and water if they did not have to suffer any personal sacrifice. Several students

in all schools expressed the feelings that they knew what they should do, but it required effort and just now they were not prepared to make that effort. In all schools some students expressed a caring emotion for people in other countries, who suffered because of the effects of global warming such as flooding or drought, but it appeared to be just a shallow emotion rather than something deeply felt that would encourage the students to take actions. Only 33% of the students believed that their actions could affect people on a global scale.

Students across all schools showed a varied understanding of the issues relating to water and energy conservation. The knowledge base ranged from excellent to very limited. All schools had some students who displayed some basic misconceptions, relating to climate change and weather as well as the confusion between ozone problems and global warming. This lack of understanding is bound to have an effect on the students chosen actions. If you do not realise what causes the problem or even recognise that there is a problem, how can you be part of the solution? This, I think, is again reflected when between 60% and 72% of students in the schools accept that global warming is a reality. The other 28%-40% do not acknowledge that there is a problem. Consequently they will not feel the need to do anything about it.

The knowledge base that students had seemed to affect the level of confidence that they brought with them to discussions. Students in schools B and C talked with confidence about their ideas and their proposed solutions. The students at school C were empowered and they were developing an attitude for themselves. They realised that something was wrong and felt that they might be able to do something about it. The students at school B were told about the energy and water problems. They displayed excellent knowledge but did not display a real feeling or engagement. This, I think,

displays the differences in teaching do you teach the facts or allow the students to discover for themselves? (Cheadle Symons & Pitt 2004)

The head teacher at school C said that his main aim was to give the students power. This might be power to control relatively small issues like school uniform or what they grow to eat in the cafeteria. The students learnt to make the decisions at all levels in form groups and in an active school council and learn to live with the consequences. As these students develop they feel empowered as individuals who are willing to engage in discussions and find solutions to problems. This was reflected in the discussions they had with me. They recognised there was a problem but wanted to try and solve it in whatever way they could.

The more that the students are made aware of environmental problems, the better informed the students are and they are then more able to discuss the issues. Those students who had factual information and had been encouraged, as a priority, to be decision makers had very open minds which encouraged them to look for solutions to the problems that they had identified.

Students in all schools believed that the main subject that delivered factual content relating to energy and water conservation was science and in three out of the four schools geography was also specified. Only one school highlighted citizenship and design and technology as a subject where these issues were discussed.

Some of the schools had other special curricula activities that encouraged students to reflect on their sustainable lives. The Green Week at school A was very successful. Students reported that this did make them feel and act differently but it was too early to tell if these changes to energy consumption habits would be sustained as Green Week was in progress as I visited.

School B made sustainable issues a priority throughout the school. Some students thought there was a lot of repetition. This might be a reason for students to reject sustainable actions, in spite of being well informed of the facts.

School C initially highlighted the sustainable issues around food, and developed knowledge of water and energy issues mainly in science and geography lessons. The overall approach to education within the school seemed to enable the students to develop as thinkers and problem solvers and then to progress and become innovators.

School D delivered the sustainable curriculum through discrete subject areas

9 Findings Question by question

9.1 In what ways does the design of the building have a direct effect on energy usage?

It is clear from this research how effective new buildings are at improving energy and water conservation.

The school in the oldest building was obviously the highest consumer of energy. Both schools in new buildings that supplied me with data showed considerably lower consumption rates both per pupil and per meter squared. Of the two new buildings the more traditional design built in 2005 had the lowest energy consumption but other factors, such as position, exposure to prevailing winds and extremes of temperatures have not been taken into account. Another aspect of position might be, as mentioned before poor access to daylight due a site on a shaded valley floor, leading to a need for more lighting at certain times of day.

What is difficult to say from these results is how much of the energy differences comes from design and how much comes from good practice. Some schools (B and C) are trying to adopt the “If not in use switch it off” habit whilst others continue to use electricity and heat without much thought of the consequences.

The benefits of good building design were sometimes masked in this study. For example the requirement for continuous lighting at night, had a very large impact on electricity consumption in school B.

It is difficult to compare the energy consumption of new schools with their consumption in their former buildings as too many other factors have changed such as the increase in electronic equipment e.g. numbers of computers and interactive whiteboards.

9.2 To what extent is there a difference in attitude towards energy and water used between students in different types of building?

In all schools there was a mixture of attitudes towards the use of energy and water. Some students were very concerned about their overuse and others not. Within some schools there are small groups of pupils, perhaps belonging to the eco council or motivated by activities such as “Green Week” who feel very strongly about such matters. They may become the drivers of a sustainable world in the future but they are greatly outnumbered by the typical teenager who finds it “un-cool” to be interested in anything at the moment.

The two schools that displayed the highest ratings for attitude towards energy and water conservation and the actions they took to support these attitudes were both in new buildings. However so was the school that scored lowest in these areas.

In the separate analysis of the schools both gender and age seemed to make a difference to how the students felt about these issues, Girls and year 9 students displayed more positive attitudes and report taking more positive actions. There was a higher percentage of students in year 9 in school A than in any other school. Also there was a greater proportion of girls in school B. This might have an influence on the overall results for these schools. Consequently, I could not be sure that the difference could just be associated with the design of the building and any sustainable features that it might display. There are many more issues that seem to have an effect too: the use of the building, the attitudes that the staff displayed towards education for sustainable development and age and gender differences... If there was a driving force in the school then students discussed and thought about energy and water use in relation to global warming and climate change. In the school that encouraged students to take

responsibilities more students explained that they could find solutions to the problems that we are faced with. Whereas in the school that did not raise sustainable issues as a high curriculum priority (either within subjects or cross curricular) more students either expressed no interest in these subjects or simply despaired about their personal futures.

In all schools the students reported to be learning about water and energy issues relating to sustainable development in their science lessons and, in three out of the four in their geography lessons. However when the questionnaires were analysed those students taking geography and design and technology (two subjects that have elements of sustainability written into the national curriculum) did not display any significantly higher positive attitudes or greater sustainable actions nor desire to learn any more about these issues than their fellow students who did not study these subjects

None of the schools I visited had overt sustainable features for example a wind turbine generator, solar panels that generated electricity for the school or grey water systems. The schools I had approached which did have these features could not accommodate me as they were overwhelmed with requests from visitors from HMIs to other Head teachers looking for examples of good practice. It would be interesting research to compare these schools in a similar way if possible in the future.

9.3 To what extent is there a difference in attitude towards energy and water used between staff in different types of building?

In each school there is at least one key member of staff who drives sustainable issues the head or one or two dedicated teachers. The enthusiasm of these staff stimulates the students and other staff to think more about sustainable matters and to develop these issues within the school either as a direct input to the curriculum, or more subtly, as a way of teaching the students to approach all problems that might affect them. Perhaps it is this ethos and method of teaching that influences how staff attitudes develop.

The staff in two schools did not respond to the questionnaire for various reasons (School A and school D)

In school B the staff response was interesting. Only 57% accepted that global warming was a fact whilst 43% expressed care about its rate of progress and thought that it was too late to do anything about it. However, the majority of staff responded that they took most of the actions that would conserve water and energy, with the exception of 14% who said that they did not always turn their lights off or thermostats down.

In school B (new building with lots of sustainable features in its curriculum) just over 50% of the staff responding to the questionnaire said that they delivered sustainable development as part of their curriculum.

Like the staff in school C (oldest building) they report concerns for the next generations but two members of staff suggest that global warming is just a natural phenomena and not a cause for concern.

In both schools B and C some staff accepted global warming as a fact but surprisingly only 57% of those that responded to the questionnaire in school B compared to 100% in school C. Again in school B only 43% are concerned about the rate of progress that global warming seems to be taking compared with 100% in school C.

A very high percentage, (approximately 80%) of staff in both schools report making energy and water saving actions.

However when it comes to learning more about these issues staff in school B were slightly less willing to do so than staff in school C. (Perhaps this was because they felt that they already knew enough from their experiences at school.)

In general there was no significant difference between the staff attitude in these schools.

They all reported to be more active in saving energy and water than the students.

Perhaps this has to do with them paying the bills or perhaps they have developed a greater sense of responsibility towards environmental issues than the students.

However the attitudes of senior staff in all schools towards sustainable development did differ greatly from passionate to passing. This appeared to influence the attitudes of students in the school. Further research would be needed to investigate how strong this influence was.

Chapter 10

Conclusions

10.1 The effect buildings on energy usage.

Building design had a direct effect on the energy used; it was dramatically reduced in all cases. The new buildings with their increased insulation and compliance with the “Very Good” standard of BREEAM regulations had improved energy efficiency. What is surprising is that in two out of the three new buildings although still less than five years old the managers are already investigating and taking action to improve their energy efficiency through the Carbon Trust. Staff in the oldest building in my study, school C were also attempting to make improvements and invest in long-term sustainability by making their buildings more environmentally friendly but the frequently altered structure of the building, with the collection of extensions that have been added over its life of fifty years, makes it very difficult to make tangible energy savings.

The new buildings that incorporated demonstration energy generators, wind turbines and solar panels could have helped the school focus on sustainable issues and develop teaching scenarios around their use. They had been included in two out of the three new schools in my study but were not well utilised. In school B they were situated on the roof where access was thought to be potentially dangerous by the PFI company so only very tiny groups of students could access them at a time. If they were used more they could display and explain energy consumption and perhaps stimulate students to conserve energy. In school D they were just mentioned in the science lessons as examples but they did not play a significant role. This is despite the words of the Prime Minister in 2004:

“Sustainable development will not just be a subject in the classroom: it will be in its bricks and mortar and the way the school uses, and even generates, its own power. Our students won’t just be told about sustainable development, they will see and work within it: a living, learning place in which to explore what a sustainable lifestyle means.” (Prime Minister Tony Blair 2004)

The bricks and mortar of the new buildings helped the way the school used its own power by the high levels of insulation and efficient heating systems required by the BREEAM regulations. All the new schools I looked at had lost their planned electricity generators, wind turbines and solar panels.. The reasons ranged from public objections to planning permission in one school, to lack of funds for the building project in the other two schools. The idea then that these schools would generate their own power and become show cases of sustainability was lost.

Buildings designed as energy efficient spaces may themselves be the driving force which stimulates staff to consider environmental issues with the students, encouraging them to think about sustainable issues and become more active in saving energy. However this theory is not consistent as staff in the least energy efficient building, School C, displayed very conscientious attitudes towards ESD.

10.2 The difference in attitude towards energy and water used between students in different types of building.

Evidence collected suggested that the design of the building did not seem to directly influence the attitudes the students developed towards the energy use in the schools I looked at. It appears that the ethos of the school is most important. Students who have a sound knowledge base can develop their own ideas and attitudes as they connect with the subject matter. (Bonnet 2002)The questionnaire results revealed that

the students in school B (new building of modern design) held the strongest attitudes and reported taking the most positive actions towards energy and water conservation. This was closely followed by school A (new building of traditional design). However, the school that displayed the weakest attitudes and actions was also a new building, school D. It appears that, although the building may play a small part in the attitudes students develop towards sustainable issues, other influences also have an effect. The factors that most seemed to play a part were the influences that the head teachers and lead teachers made in the priority they gave towards the integration of ESD within the curriculum in their schools. The enthusiasm of these key people appears to be essential to drive the curriculum planning to ensure that education for sustainable development had a high profile within the school. These key people help learners look for their personal responsibilities and allow the students to explore how sustainability is practised. (Haigh 2009) The two schools that gave sustainable development a high priority (School B, new build, and school C the oldest school) both had significantly higher attitude scores than the school D in their questionnaire response. The focus group interviews revealed a much greater difference between the schools. The students in schools B and C spoke in an informed manner, and with some passion, relating to conservation of energy and water and reduction of waste. Their approaches were both different: school C ensured that the individual students were able to think for themselves and make decisions, thus wanting to solve problems to prevent further progress of global warming and climate change. School B, however, ensured that students had a secure knowledge of these issues and some students were then highly motivated in their desires to encourage others to begin to reduce their carbon footprint too. This reflects Orr (1994) as he suggests that students use subject matter as a tool to be used as they operate as critical thinkers. School A students also spoke with some

enthusiasm but some of this could be attributed to their “Green Week”. (Ofsted 2008) Here the students were beginning to develop attitudes that supported sustainable development whilst in school D the majority of the students, although immersed in the new building, had yet to develop a meaningful interest in sustainable development issues relating to energy and water use. In school D the students lacked confidence in their knowledge so they could not express their ideas relating to sustainable development issues and thus found it difficult to form opinions. If the students do not possess expert knowledge they cannot begin to take ownership of their ideas and develop the power to take action

My concluding theory is that knowledge is essential as without it opinions cannot be formed (Huckle 2009). The empowerment of students to be individual independent thinkers, flexible and imaginative and able to react quickly to change must also be developed. (Phillips 2009) Students may then start to develop the consciousness which is inside them and become confident to express innermost feelings towards sustainability.(Bonnet 2002).

10.3 The difference in attitude towards energy and water used between staff in different types of building

The staff from only two of the schools responded to my questionnaire. Perhaps this reflected the commitment that staff felt towards sustainable development or perhaps the low response could reflect the overwork that teachers sometimes feel and the questionnaire could be viewed as a non-essential piece of administration.

It was interesting that the responses from staff were from the two schools with students who spoke most eloquently about sustainable development issues and with most passion.

Both sets of staff displayed very high scores in the section of the questionnaire relating to sustainable actions. This might reflect their personal attitudes towards sustainable development or it might just be that they are adult and have developed a sense of responsibility towards energy conservation or even that they simply know how financially beneficial saving energy is.

In the free response section in the questionnaire no members of staff mentioned their styles of teaching or their attitudes to delivery of sustainable development issues. In one school (school B) some of the staff actually protested about being asked to complete the section of the questionnaire relating to learning. Their belief was that they had nothing else to learn. Perhaps they thought that their knowledge was complete as their school had given a high curricula priority to sustainable development issues.

10.4 Review and Critique of Methodology

Questionnaire

These were particularly useful for getting a lot of data from a large number of students in a short period of time without disturbing the normal timetables. The same questions are asked of each respondent so the variation in the answers should be a true reflection of the opinions of the respondents. At times this might not have been the case, as students sometimes look for a “correct” answer to give. To avoid problems with sampling I issued the questionnaire to whole year groups, year 9 (KS3) and year 10 (KS4). I designed the questionnaire to be as simple as possible for the students to respond to: requiring them to just tick their chosen response. The disadvantages were that, at times, I do not think that all of the students took the activity seriously and just ticked responses at random rather than giving a considered response. The open ended

questions were not answered by all students. They had been designed to explore the students ideas in more detail but frequently failed to do so. (Opie 2004:p.111) suggests that this might be “because many respondents are not keen or don’t feel confident in expressing their views, thoughts or feelings on paper.”

Focus Group Discussions

Recording these group discussions was very useful for transcription and later analysis.

At the beginning of these discussions the students were often quiet but once they became relaxed some interesting lively discussions took place. In some groups the students needed to be stimulated into discussion by the pictures I had taken with me. Many of the students interacted with each other and were not afraid to contradict and correct their peers. Even when talking in single sex groups some students were more exuberant than others and attempted to dominate the discussion. This tended to happen more in the boys groups. I was also aware that some students might have been inhibited by my presence, as I was an unknown adult to them. However, I think that in most discussions students were empowered to speak out in their own words and were encouraged to participate as part of a group rather than just individual voice. The topics covered were decided by the students rather than myself. (Cohen Manion & Morrison 2007; p377) Even though I asked the schools to give me random groups of students I could not be sure that the students I spoke with represented a true cross section of the school. Taking all these issues into account the students gave me a useful insight into their ideas relating to sustainable development.

Interviews

The purpose of the interview was to allow the bursars and teachers an opportunity to tell me what was most important to them about Education for Sustainable Development in their school. During the interviews with members of staff they spoke with great

passion and enthusiasm for their school and the state of sustainable education within the institutions. I was aware that at times they might have been speaking, not from the heart, but telling me what they thought I wanted to hear. I did not record these interviews as I did not want to unnerve the interviewee: the recording device might be seen to be obtrusive and therefore off putting to the interviewee. During the discussions I took some field notes but tried very hard not to let that inhibit the flow of conversation. It was critical to write up these field notes as soon as possible so that as many points raised could be noted and not forgotten. The unstructured interviews yielded a lot of information from the head teachers and teachers. I felt that they need to be very flexible so that each individual unique school could inform me of their most important ideas relating to Education for Sustainable Development. The interviews with the bursars need to be more structured as I wished to gain specific information from them. These too produced excellent information for me to analyse. The combination of these methods provided me with reliable data to analyse and a sound base to form my conclusions

10.5 Suggestions for further research

As I progressed through this research there were more questions to ask. The new buildings themselves did have an effect on the energy use in schools but did not seem to change the attitudes of staff or pupils towards these issues. What might?

Is it the ethos of the school that changes the attitudes towards sustainable development and if so who sets that ethos?

Does the way in which students learn affect their capacity to care about and act upon sustainable issues?

Would more obvious energy monitoring or energy generating equipment in a school change students' attitudes and actions towards energy consumption?

Will the attitudes that some students have developed stay with them after they leave school?

Further study could be made comparing a school that did generate its own electricity or one that monitored its own use of electricity with those that did not.

Is there a difference in attitude between KS3 & KS4 students?

10.6 Implications for practice

Education is critical for the future generations understanding of sustainable development, a reduction in our carbon dioxide emissions and a slowing down of the process of global warming. Students can only be engaged and empowered if they have a concrete understanding of the basic facts of the issues surrounding energy production and consumption. Without this understanding, as seen in my findings, students may develop irrational fears when they hear reports in the news or, in their ignorance believe they have no need to care.

The best way to educate these students has been widely discussed. Do we bombard the students with facts through various school subjects, test and examine them to see if they “know the right answer” and then leave them to distil their own ideas about what can be done? Do we encourage discussion, interaction and problem solving to lead to a cooperative solution that the students own? Do we encourage by example and good practice in our new sustainable buildings and hope, again, that these will be mimicked by the students? Do we model good practice by monitoring our energy and water consumption? Do we enable students to think for themselves, to discuss and take time to reach the correct decisions for their own generation and, if we do, is this for all students who attend all schools or is it just for those schools that are free from the

constraints of the national curriculum and the performance tables that schools seem to compete within.

Looking at the findings from my research there is no simple answer. For some students it might be the design of a building (good or bad) that generates ideas that will help them become a sustainability conscious citizen. For others it might be the care and compassion that they feel for people when they see images of flood victims that bring about sustainable actions. For yet another group of students it might be the careful monitoring of energy use in school followed by planning and action to reduce this energy consumption that makes them actively try to reduce their energy consumption and think about their actions in a sustainable way , both in school and out of school.

For progress to be made in schools teachers and managers need to make decisions for their own students as to which activities and approaches are most suitable. The most successful of the schools I visited was school B. It ensured that students had a sound knowledge base and then encouraged them to feel empowered, to join the school eco-group, pursue interests and take actions that would ensure a good sustainable environment within those schools At the age of 13 or 14 the students may not have had enough knowledge to create solutions but the desire and willingness to do so stemmed from the feeling that they could and should.

If schools enable students to follow the aspiration of (Tony Blair 2004) and are able to *“see and work within it: a living, learning place in which to explore what a sustainable lifestyle means.”* Then teaching about sustainability might become easier and more meaningful. New buildings that are designed with sustainable development as a focus might be too expensive in this economic recession, but we cannot afford to allow the school buildings to continue to use and waste an excess of energy. A sound academic understanding of sustainable issues is critical for students; only with this

knowledge and understanding can they begin to make decisions about how they wish to contribute to slowing down the rate of global warming and why it is important. The students also need to have the ability to discuss and debate with each other. Teachers need time to see the joined up picture and start to de-compartmentalise their teaching of these issues. In conclusion there is no formula for every situation. It is a mixture of buildings and the teachers' approach to curriculum issues within those buildings that helps to shape students ideas. It also appears that in this rapidly changing world where the sustainable future is constantly taking on a new image, education, in school should prepare students to adapt and develop to cope with all situations that may arise.

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Appendix 1

Questionnaire

Sustainable Development questionnaire

Sustainable development allows people to meet their basic needs and enjoy a good quality of life without compromising the quality of life of future generations.

Oil, gas and coal are fossil fuels. To get the energy to power the stuff we use in everyday life, we burn these things.

It's been happening for years and it's led to lots more carbon dioxide getting into the Earth's atmosphere.

Carbon dioxide is one of the so-called greenhouse gases which are warming up our planet.

Experts are concerned that - if we don't cut down on the amount of carbon dioxide we produce - warmer temperatures will really harm our planet.

There's a term to describe the amount of carbon dioxide produced by the stuff we use - it's called our "carbon footprint".

I am very interested in your ideas and attitudes relating to Sustainable development.

It would help me a lot if you would complete the questionnaire below

Your teacher will read through it with you

Please answer the following questions

Are you a boy or a girl?

Which school year are you in?

How old are you?

Years__

Months__

What subjects do you take at school? Please tick or add other subjects in the spaces

Maths	<input type="checkbox"/>	Business Studies	<input type="checkbox"/>	Biology	<input type="checkbox"/>	<input type="checkbox"/>
English	<input type="checkbox"/>	Art	<input type="checkbox"/>	Photography	<input type="checkbox"/>	<input type="checkbox"/>
Science	<input type="checkbox"/>	Design & Technology	<input type="checkbox"/>	German	<input type="checkbox"/>	<input type="checkbox"/>
Applied Science	<input type="checkbox"/>	Media Studies	<input type="checkbox"/>	French	<input type="checkbox"/>	<input type="checkbox"/>
Geography	<input type="checkbox"/>	Physics	<input type="checkbox"/>	Spanish	<input type="checkbox"/>	<input type="checkbox"/>
History	<input type="checkbox"/>	Chemistry	<input type="checkbox"/>	PE	<input type="checkbox"/>	<input type="checkbox"/>

Do any of your subjects tell you or encourage you to think about sustainable issues?

Are there any issues to do with the way the world around you is developing or changing that you would change if you could?

Do you practise any of these forms of energy saving at home or at school?

	Always	Occasionally	Never
Turn lights off when leaving a room			
Turn lights off when room is lit by daylight			
Turn computers off when not in use			
Turn projectors off when not in use			
Turn the heating(thermostat) down			
Open windows while the heating is on			
Use blinds or curtains to control room temperature			
Use single flush toilets when appropriate			
Ensure minimum water is used in kettles			
Turn off running taps			

How does Global Warming worry you?

Are you worried about rising sea levels?

Do you care about the Environment globally and locally?

To what extent do you agree with the following statements?

Please tick the correct box

	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Global warming is a fact					
I can make a difference to the rate of progress of global warming					
I would choose an energy saving appliance in preference to a high energy use appliance					
I do not care how much energy I use I do not pay the bills					
I take a pride in saving energy					
I know how to reduce my carbon footprint					
I always make an effort to reduce my carbon footprint					
I am worried about rising sea levels					
I am concerned about the effects of global warming					
A temperature rise of only 1°C is OK					
I can make a difference to the amount of CO ₂ in the atmosphere					
It is too late nothing I do will change the effect of global warming					
If everyone turned their thermostat down by 1 degree our carbon footprint would be reduced					
Using low energy light bulbs makes no difference to our carbon foot print					
Using high levels of insulation helps us use less energy					
It is ok to waste energy if it was made using solar panels					
Using less energy becomes a good habit					
There is very little someone like me can do to protect my local environment					
There is very little someone like me can do to protect the global environment					
What I do in this country has little effect on the quality of life for people in other countries					

In your lessons at school how interested are you in learning about the following?
Please tick the correct box

	A lot	A little	Not much	Not at all
How energy can be saved or used in a more efficient way				
New sources of energy (Sun waves wind etc.)				
Consequences of burning fossil fuels				
Effects of global temperature increase				
The Greenhouse effect and how we can influence it.				
Lack of safe water in developing countries				
Water shortages in the United Kingdom				
Disappearance of ground water resources				
Ways of saving water				
Ways of reducing electricity usage				
Ways of finding solutions to energy problems				
Ways of finding solutions to improving my carbon footprint				

Is there anything else that you would like to tell me about these issues ?

Thank You for completing this questionnaire.

Appendix 2

Questionnaire Coding

Sustainable Development questionnaire Coding

Sustainable development allows people to meet their basic needs and enjoy a good quality of life without compromising the quality of life of future generations.

Oil, gas and coal are fossil fuels. To get the energy to power the stuff we use in everyday life, we burn these things.

It's been happening for years and it's led to lots more carbon dioxide getting into the Earth's atmosphere.

Carbon dioxide is one of the so-called greenhouse gases which are warming up our planet.

Experts are concerned that - if we don't cut down on the amount of carbon dioxide we produce - warmer temperatures will really harm our planet.

There's a term to describe the amount of carbon dioxide produced by the stuff we use - it's called our "carbon footprint".

I am very interested in your ideas and attitudes relating to Sustainable development.

It would help me a lot if you would complete the questionnaire below

Your teacher will read through it with you

Please answer the following questions

Are you a boy or a girl?

1 = girl

2=boy

Which school year are you in?

9/10

How old are you?

Enter as 9.75 etc

What subjects do you take at school? Please tick or add other subjects in the spaces

Maths		Business Studies		Biology		
English		Art		Photography		
Science		Design & Technology		German		
Applied Science		Media Studies		French		
Geography		Physics		Spanish		
History		Chemistry		PE		

Do any of your subjects tell you or encourage you to think about sustainable issues?

Are there any issues to do with the way the world around you is developing or changing that you would change if you could?

Do you practise any of these forms of energy saving at home or at school?

	Always	Occasionally	Never
Turn lights off when leaving a room	2	1	0
Turn lights off when room is lit by daylight	2	1	0
Turn computers off when not in use	2	1	0
Turn projectors off when not in use	2	1	0
Turn the heating(thermostat) down	2	1	0
Open windows while the heating is on	0	1	2
Use blinds or curtains to control room temperature	2	1	0
Use single flush toilets when appropriate	2	1	0
Ensure minimum water is used in kettles	2	1	0
Turn off running taps	2	1	0

How does Global Warming worry you?

Are you worried about rising sea levels?

Do you care about the Environment globally and locally?

To what extent do you agree with the following statements?

Please tick the correct box

	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Global warming is a fact	4	3	2	1	0
I can make a difference to the rate of progress of global warming	4	3	2	1	0
I would choose an energy saving appliance in preference to a high energy use appliance	4	3	2	1	0
I do not care how much energy I use I do not pay the bills	0	1	2	3	4
I take a pride in saving energy	4	3	2	1	0
I know how to reduce my carbon footprint	4	3	2	1	0
I always make an effort to reduce my carbon footprint	4	3	2	1	0
I am worried about rising sea levels	4	3	2	1	0
I am concerned about the effects of global warming	4	3	2	1	0
A temperature rise of only 1°C is OK	0	1	2	3	4
I can make a difference to the amount of CO ₂ in the atmosphere	4	3	2	1	0
It is too late nothing I do will change the effect of global warming	0	1	2	3	4
If everyone turned their thermostat down by 1 degree our carbon footprint would be reduced	4	3	2	1	0
Using low energy light bulbs makes no difference to our carbon footprint	0	1	2	3	4
Using high levels of insulation helps us use less energy	4	3	2	1	0
It is ok to waste energy if it was made using solar panels	0	1	2	3	4
Using less energy becomes a good habit	4	3	2	1	0
There is very little someone like me can do to protect my local environment	0	1	2	3	4
There is very little someone like me can do to protect the global environment	0	1	2	3	4
What I do in this country has little effect on the quality of life for people in other countries	0	1	2	3	4

In your lessons at school how interested are you in learning about the following?

Please tick the correct box

	A lot	A little	Not much	Not at all
How energy can be saved or used in a more efficient way	3	2	1	0
New sources of energy (Sun waves wind etc.)	3	2	1	0
Consequences of burning fossil fuels	3	2	1	0
Effects of global temperature increase	3	2	1	0
The Greenhouse effect and how we can influence it.	3	2	1	0
Lack of safe water in developing countries	3	2	1	0
Water shortages in the United Kingdom	3	2	1	0
Disappearance of ground water resources	3	2	1	0
Ways of saving water	3	2	1	0
Ways of reducing electricity usage	3	2	1	0
Ways of finding solutions to energy problems	3	2	1	0
Ways of finding solutions to improving my carbon footprint	3	2	1	0

Is there anything else that you would like to tell me about these issues?

Thank You for completing this questionnaire.

Appendix 3

Bursar Questionnaire

	Question	Response
1	How many teaching staff	
2	How many ancillary staff	
3	How many pupils?	
4	How many Office staff	
5	How many rooms	
6	How many labs	
7	How many Halls	
8	How many sports spaces	
9	Surface area of floors	
10	How much electricity has been used over the last 12 months	
11	How much gas has been used over the last 12 months	
12	How much solid fuel has been used over the last 12 months	
13	How much alternative fuel has been used over the last 12 months	
14	How much water has been used over the last 12 months	
15	How much has been spent on sewage over the last 12months	
16	Is it possible to have a copy of the energy and water bills from the last 12 months?	
17	What time of day does the whole school open?	
18	Are areas of the school used for extended hours (if so which and for how long?)	
19	Number of computers	
20	Number of laptops	
21	Number of Interactive whiteboards	
22	Number of projectors	
23	Other equipment that uses considerable wattage of electricity?	
24	Does the school have any means of generating electricity	
25	Are there any methods employed to save energy.. Automatic switch of on idle computers or projectors. Sound / Movement sensitive lights?	
26	How well is natural light managed?..mirrored glass curtains blinds	
27	Is water recycled?	
28	Are there any ½ flush toilets	
29	Use of windows (south facing for heat)?	
30	Other important energy features of the school?	
31	Is there an easy access meter to show energy consumption? Are there any special features relating to water / sewage in the school?	
32	Are there any policies in the school that relate to energy conservation	
33	Does the school building have an expected life?	

34	Ethnicity of students %	
35	Socio –economic class FSM numbers?	
36	Is it possible to have a list of year 9 & 10 students on free school meals?	
37	Number of students attendance	
38	Number of students exclusions	
39	Age of building /extensions	
40	Any other information that you think would be of use to me	