

Beach Classrooms

<http://www.creative-partnerships.com/projects/176716/>



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1 INTRODUCTION

1.1 Beach Classroom Project

Researchers Joe Caudle and Laura Osborne have a personal interest in developing creative science and the links between science and art in school. Having been involved in leading the 'Beach Classrooms Project' in Cornwall for three years those experiences inspired the researchers to apply to Creative Partnerships for funding to carry out an action research project looking at the impact of the coastal visit and creative approach on children's attitudes to and learning in science.

Cornwall has the longest coastline of any English County and the coast provides a potentially stimulating and exciting environment in which to develop learning. The Creative Partnerships "Beach Classrooms" project was developed as a response to the reduced visits to the coast by Cornish schools and concerns that such visits were not always making good use of the opportunities presented for developing learning. There was a clear focus on enhancing learning in science through the arts, particularly the opportunities presented by working with a 'creative partner'.

In the past two decades many changes to the primary curriculum, school budget managements and concerns about taking children off site have lead to the outdoor learning opportunities for children to become more limited to the classroom and school site, hence signifying that outdoor education is in decline (House of Commons Education and Skills Committee, 2005).

Most teachers see developing creativity in young people as an important educational aim (e.g. Craft 2005, Jones and Wyse, 2004). However, whilst teachers endorse many of the ideas implicit in creativity, they often find that the everyday demands of classroom life make it difficult to give anything more than superficial attention to these matters. National guidelines and educational initiatives are sometimes seen by teachers as tending to stifle their ability to be creative in the classroom and to foster creativity in young people. They are also unaware of freedoms in the current framework fearing that innovation may compromise performance in inspections and tests (QCA, 2005).

In this context a brief survey of Cornish school's visits to the coast and seashore indicated a small but committed number of teachers continued to provide these opportunities for their children. These teachers, together with the Science Advisor for Cornwall Local Authority, put forward an initial proposal to Creative Partnerships to carry out a project to develop an approach for teachers that would enable them to engage with outdoor learning, specifically the beach environment, in a creative way which would be sustainable, purposeful and, ultimately, could be rolled out to more teachers across the county. This particular outdoor environment was chosen as the coast is a special resource available to Cornish schools and it plays a rich part in the children's cultural heritage.

During the summer term of 2005 classes from Nancledra, St Stephen Churchtown and St Newlyn East Primary Schools in Cornwall visited three different coastal locations to trial and experience creative, cross-curricular learning experiences. The challenge for each teacher and a creative partner was to plan and deliver exciting and worthwhile experience with a creative science focus. The science content was based on the requirements of the National Curriculum and cross-curricular opportunities were included as appropriate. Each day was recorded through observation and video or still images. The days were followed up back at school as appropriate. A monitoring visit was made to each school in the second half of the autumn term to interview children to examine their recall of the learning that took place and obtain their views about the experience.

Following this initial project, 'Creative Science at the Coast' evolved with partners from Creative Partnerships, Cornwall Children's Services Authority, and the College of St Mark and St John, Plymouth and was rolled out to 14 Cornish Schools. The second stage of the project set out to promote and develop schools' use of Cornwall's distinctive coast and seashore for children's learning, with particular emphasis on creative and purposeful cross-curricular science teaching. Opportunities were provided for teachers to work with the arts and science to their mutual enhancement (Appendix 1).

The third stage of the project, entitled 'Beach Classrooms', was developed through the Creative Partnerships initiative. This enabled a unique opportunity to examine a creative learning experience in the outdoor environment in terms of teachers' pedagogical practice and the impact of this approach on children's learning. Children in selected areas were given the opportunity to gain creative and scientific skills and knowledge through partnerships between schools and cultural organisations. The focus question being '*How does cross curricular teaching in a coastal environment, with a creative partner, impact on the pedagogy of individual teachers and the children's learning of science?*'. This is returned to in Section 2.

1.2 Project Schools

Six schools were chosen to host the project. Each school chosen was not within easy walking distance of the coast and therefore needed to address the logistics of arranging transport and consequent funding issues. Due to difficulties with the weather five schools successfully completed all aspects:

St Dominic C of E VA	Lead Teacher	-	Anna Winfindale
St Martin in Meneague	Lead Teacher	-	Ruth Cleaver
St Mellion C of E VC	Lead Teacher	-	Brenda Welch
Stoke Climsland CP	Lead Teachers	-	Jacqui Payne & Sian Vaughan
Threemilestone CP	Lead Teachers	-	Ian Boreham & Kirsten Maun
Lewannick CP	Lead Teacher	-	Stephanie Cole *

* This school was unable to complete the beach visit in the summer term so is not included in this report, results or the analysis.

1.3 Why outdoors?

Paradoxically alongside the concern about declining opportunities for outdoor learning (Dillon *et al* 2005) the growing importance of learning outdoors as a vital element of children's education is highlighted by OFSTED's (2004) report on *Outdoor Education* and the Governments Select Committee on Education and Skills report in 2005 on 'Education Outside the Classroom'. It was suggested by the Select Committee that the DfES should issue a 'Manifesto for Outdoor Learning', giving all students a right to outdoor learning; they advised that a more formal structure should exist in the Department that has 'responsibility for outdoor learning across curriculum areas'. They concluded by saying:

'We believe every child and young person should experience the world outside the classroom as an integral part of their learning and development, complementing learning in the classroom.'

Following the Committee's recommendations the then Education and Skills Secretary Ruth Kelly (<http://www.dfes.gov.uk>, 2005), stated that the Government wanted outdoor learning to be an important part of all children's education. She said the Government would aim to cut the bureaucracy faced by teachers on school trips, increase staff confidence and improve outdoor provision. This resulted in the Government's publication of 'Learning Outside the Classroom Manifesto' in 2006. The Government has also established a Growing Schools Programme which seeks to enable 'schools to make better use of the outdoor classroom as a context for teaching and learning' (DfES, 2005).

The potential of learning outdoors is vast; not only for the enhancement of the knowledge base in the academic subjects but also for the contribution to children's motivation, independence and engagement with learning. OFSTED (2004) observe in their report on *Outdoor Education*:

Outdoor education gives depth to the curriculum and makes an important contribution to students' physical, personal and social education. However, not all students in schools benefit from such opportunities.

Clearly in today's agenda of social inclusion and with the publication of Every Child Matters (DfES 2004) the opportunities offered by outdoor education have a key role to play in the future of education. The Select Committee add that there is a link between outdoor education and the skills developed with the evolving employment market. In their review of the literature on outdoor learning Dillon *et al* (2006) found that effective outdoor learning offers valuable opportunities to learners that are in addition to their classroom based-experiences. Dillon *et al* (2005: 1) highlight the many aspects of learning promoted by outdoor education

'Outdoor education can involve working with others, developing new skills, undertaking practical conservation and influencing society. The intended outcomes of such experiences can encompass: knowledge and understanding, attitudes and feelings, values and beliefs, activities or behaviours, personal development and social development.'

They reported the gains were not only for the students but for the teachers too. Along side the benefits of acquiring new subject knowledge and the development of new skills and ideas the teachers described the advantages of being able to 'interact with their students in relaxed, informal environments' and reported 'benefiting from the break from the normal teacher-pupil relationship'.

Although science is central to the project the purposeful integration of other subjects through cross-curricular activities are crucial. As noted by the Select Committee 'Academic fieldwork clearly enhances the teaching of science and geography, but other subjects such as history, art and design and citizenship can also be brought to life by high quality educational visits.' (p.7)

The Select Committee (2005), in their summary, criticise the DfES and local authorities for their lack of publicising the 'benefits of education outside the classroom or to provide strategic leadership or direction in this area'. They go on to say:

Provision by schools is extremely patchy. Although some schools offer an active and well-planned programme of outdoor education, which contributes significantly to teaching and learning, many are deterred by the false perception that a high degree of risk attaches to outdoor

education as well as by cumbersome bureaucracy and issues of funding, time and resources.

One of the aims of this project is the contribution towards developing a sustainable resource for use in schools.

1.4 Why Creativity?

Many teachers see developing creativity in young people as an important educational aim. However, whilst teachers endorse many of the ideas implicit in creativity, they often find that the everyday demands of classroom life make it difficult to give anything more than superficial attention to these matters. Even though the national guidelines, such as the document Excellence and Enjoyment (DfES, 2003), are giving teachers 'permission' to be more creative they need to be certain of what creativity means and how it can be implemented in the curriculum without adversely affecting test results (Hayes 2004). The debate centred around creative teaching and teaching for creativity is discussed throughout the literature, see for example Hayes 2004, Craft 2005, Jeffrey 2006.

In 1999 the National Advisory Committee on Creative and Cultural Education (NACCCE) published its significant report 'All Our Futures'. This fired the debate on creativity describing the curriculum as 'content based [which] does not encourage creativity'. It also states that "The National Curriculum does not support approaches which see science as a creative and imaginative activity." This project intends to challenge this perception and indeed the initial response from the teachers to the training day was overwhelmingly positive.

OfSTED have commented that 'the best primary schools have developed timetables and teaching plans that combine creativity with strong teaching in the basics' (DfES 2003:18) and are telling schools that 'We want schools to feel freer...To take a fresh look at their curriculum, their timetabling and their organisation of the school day and week' (OfSTED 2003). The teachers and schools taking part in the project were very keen to put this into practice.

It is worth noting that the QCA's 'Futures' debate on each subjects place in the future curriculum culminated in the publication 'A Curriculum for the Future: Subjects Consider the Challenge' (QCA 2005). Here it considers science can 'show learners what it means to learn like a scientist, stimulating creativity and imagination.' It continues by giving advice on the next steps.

1. Move away from a knowledge-based culture
2. Improve links between subjects
3. Learn from other subjects
4. Encourage learners to take responsibility for their learning
5. Emphasise imagination and creativity
6. Assess what we value

All these points are being addressed in the Project with an emphasis on points 1, 2, 3 and 5.

2 RESEARCH

2.1 Research question and focus for enquiry

The study looked at the effect of creative, cross curricular outdoor experiences on children's learning in science and how this way of planning has impacted on the teachers. The focus question was:

How does cross curricular teaching in a coastal environment, with a creative partner, impact on the pedagogy of individual teachers and the children's learning of science?

The question was driven by the belief that children learn better in science

- in a meaningful context when purposeful cross curricular links are made between science and the arts;
- when allowed to think and learn creatively;
- when the learning is driven by enquiry rather than knowledge;
- when outdoor learning as an integral part of their experience;
- and that this will impact on children's learning as a whole and as life long learners.

2.2 Methodology

It was decided to engage with a critical approach to the methodology in the form of action research, using Cohen and Manion's (1994) definition of action research as 'small-scale intervention in the functioning of the real world and a close examination or the effects of such an intervention.' Following on from the pilot this project took the opportunity to critically evaluate the impact on the teachers' pedagogy and evaluated how this way of working might affect future change and children's learning in the outdoor environment.

2.2.1 Methods

The following sources of data were used

- Teachers planning (see Appendix 4)
- Teachers' perceptions and ideas from questionnaires (administered pre- and post-project – (see Appendix 8) and informal interviews.
- Children's perceptions and ideas from questionnaires (administered pre- and post-project – (see Appendices 8 and 9) and informal interviews.
- Observations of teachers' and children's engagement with activities at the beach.

Observations and questionnaires were analysed and summarised, then conflated with the analysis of the transcribed interviews, for both entry and exit opinions. It was recognised throughout the need for objectivity to ensure the validity of the research. The significant variables from school to school were acknowledged throughout the project analysis. Also taken into account were the teachers' and children's perceptions of the value of the experience; the affect this had on the quality of their responses and the children's capacity to interpret the language used in the

questionnaire. The strengths and limitations of the study will be noted within these contexts.

2.3 Induction and preparation

Lead teachers were provided with a training conference at a coastal location in Cornwall (Appendix 6). This provided all with an opportunity to learn about this research project from the researchers, receive information about previous 'Beach Classrooms' work, including a short creative workshop with a creative partner and a chance to carry out initially brain storming and planning. Assistance with finding appropriate creative partners was provided on the day and in the period leading up to schools' visits by Ed Whitelaw of Creative Partnerships.

Each school planned a visit to the coast that was integrated with their long and medium term planning. The researchers liaised with the teachers prior to visits and at least one researcher attended each of the schools' visits. The weather proved to be an influencing factor affecting the timing and possibility of the visits and many were delayed until later in the summer term than intended. However all except one managed to complete their commitment.

Schools varied in their approach to this work, some making the creative science element of the day the main focus and some provided a variety of curriculum subject on the day.

2.4 School Visits - Details of Venues and Descriptions

The teacher's planning as provided by the each of the schools can be seen in appendix 4

Photographs of the some activities and venues can be found in appendix 7.

School	Venue	Description
St Dominic	Wembury Beach	Sheltered, Plymouth Sound Small sandy beach, seashore rock pools – marine nature reserve
Stoke Climsland	Widemouth Bay,	Exposed, North Cornwall coast Large sandy Beach & seashore rock pools
St Mellion	Bigbury Bay,	Sheltered, South Hams Devon coast, large beach, seashore rock pools, river estuary & Burgh island
St Martin in Meneague	Durgan Beach,	Helford Passage, sheltered ria, river estuary, seashore & rock pools
Threemilestone KS 1	Gyllygnvase Beach, Falmouth	Sheltered south west Cornwall coast, sandy beach, seashore rock pools
Threemilestone KS 2	Godrevy, West Cornwall	Semi-exposed west Cornwall north coast, sandy beach with raised wave cut platform seashore & rock pools

The full cohort for the project included 224 children comprising

- 64 Key Stage One and
- 160 Key Stage Two (123 lower KS2, 37 upper KS2)

St Dominic

Morning

The creative partner introduced concept of adaptation of seashore fauna to climate change – global warming. Children constructed sculptures made with materials available at the beach. The sculptures were of imaginary animals of future to indicate the ways they would feed, respire move and deal with changes in the environment. Adults facilitated the children's ideas – except one teacher present who directed his group. All groups were confident and able to explain the features except the directed group who were very reluctant to feed back or discuss the sculpture as they seemed to have no ownership of it or the learning.

Afternoon

Activities were introduced by the creative partner and in groups facilitated by adults – see comments above. Children explored the upper and parts of the middle shore rock pools – finding information including identification of some species, indicator species, foreign species and proportionate content of rock pool fauna and flora. Information was gathered for possible follow-up including 'Top Trumps' – see appendix 4

St Martin in Meneage

Morning

The creative partner introduced investigation and identification of specific seashore species of flora and fauna. Information collected was shared and investigation developed into food chains of these species. Food web constructed using creative partner as 'sun' and coloured wool as energy lines. All children allocated species card to wear around neck and all joined (guidance poster provided). When completed the creative partner demonstrated how pressure (tug) on any species impacts (felt by the children) by other species.

Afternoon

Whole class co-operated to produce 5 metre long collage of a mackerel following discussion of the position on the mackerel in a food chain culminating in our consumption. Children demonstrated great ability to share out tasks and older children that completed theirs required no prompting to support and lead younger class mates. The collage was completed just before the tide came in.

St Mellion

The teacher planned a day to utilise the venue as a "beach classroom" with a full programme of curriculum activities equally facilitated by the Creative Partner, teachers other staff and volunteers – see planning in appendix 4.

Groups of children took part in each activity in rotation. The science activity was developed during the day following discussion with the children to give temperature measurement a context. Other activities included Andy Goldsworthy style environmental sculptures, orienteering geographical landscape study, and digital

sound recording with a creative partner. The latter resulted in a DVD of sonic and visual 'postcards'.

Stoke Climsland

The teachers planned a cycle of activities that each group of children participated in. The Creative Partner led workshops on instructional and persuasive language in literacy. The science based activities included rock pooling – identifying some species and looking at variety and some adaptation within the habitat. This activity was facilitated by a volunteer 'expert'. There was also a treasure hunt activity that developed some observational skills. One activity was free beach sculpture. The follow-up to the day included the creative partner focussing again on the literacy skills. The persuasive language was used to develop arguments about environmental issues and included science.

Threemilestone

Key Stage One Classes

Despite some effort to find a creative partner neither the teacher nor Creative Partnerships were able to link up with a suitable person. However the teacher provided the children with a site specific opportunity to test the buggies that they had made at school. The activities provided the children with a variety of ways to explore forces and to develop skill of testing and measuring. The groups were supported and the children's ideas facilitated by adults.

Key Stage Two Classes

The day started with the children getting into role with the story teller who shipwrecked them all on a desert island. In groups the children undertook a variety of activities in rotation: they had to find all that they would need for survival, though on a miniature scale for Action Man and Barbie; they took part in an orienteering challenge; they worked as teams in team building challenges; and did a rock pool and tidal scavenge. The day culminated in appreciation of their surroundings through paint-based art. The opportunity was taken to follow up both the planned and spontaneous outcomes of the beach trip back in the classroom.

2.5 Creative Partners

'Creative Partners' worked with schools to lead and support the teaching and learning activities including on site workshops. Creative partner approaches varied but most worked with children to facilitate the communication of their science learning through art including sculpture, sound, dance and writing.

St Dominic

Dr. Joanna Henley - 'SciArt Solutions'

'SciArt Solutions' worked with the key stage 2 class leading beach and rock pool based workshops at Wembury and Durgan Beach. Activities included sand sculpture of imaginary climate change-adapted species, rocky shore surveys. She led the creation of a 'time capsule' of materials and future environmental predictions as a follow up the next day.

Stoke Climsland**Will Coleman – ‘Brave Tales’**

Will Coleman led dramatic workshops to develop instructional and persuasive literacy at Widemouth Bay with year 2, 3 & 4 children. These were followed up in schools with workshops related to the other areas of the curriculum covered including science.

St Mellion**Anna Batson - Plymouth Music Zone**

Anna Bateson worked at the beach with key stage 2 children recording ambient and created sounds – these she later supporter the incorporation of the recordings into compositions and a multimedia “sonic postcards” DVD.

St Martin in Meneage**Dr. Joanna Henley - ‘SciArt Solutions’**

Joanna Henley ran a beach-based workshop at Durgan Beach. Activities included identification of seashore plants and animals, developing a practical understanding of food chains and a food web together with the impact of human activity on the latter. She facilitated the co-operative creation of a large collage of a mackerel from materials found on the shore. See appendix 7

Threemilestone KS 1**No Creative Partner found****Threemilestone KS 1****Nikki Chambers – ‘Skybluepink Storytelling’**

Nikki Chambers introduced the day with story telling that set the context for the activities during the rest of the day. The children role played an island shipwreck scenario having to find everything necessary to survive. She also led an art painting workshop in the afternoon looking at colour based on the work of Rothko. (Also see appendix 3)

3 BASELINE ANALYSIS – KEY FINDINGS

Please note: Although it was important to celebrate the schools engagement and participation in the project it was agreed that throughout the analysis the teachers' and children's responses would be treated anonymously.

3.1 Analysis of children's entry questionnaires

Five main categories emerged from the children's entry questionnaires, these were views about: science; challenge and problem solving; outdoor learning; teaching and learning creatively; and, teaching and learning strategies. (See Appendix 9 for graphical representations of quantitative analysis)

Science

A significant majority of children (>75%) said they enjoyed science. Overall the children's views of science were extremely positive across all age groups and these were linked predominantly to the investigative and practical aspects of the subject. When asked what they enjoyed about science the responses fell into 2 main sub-categories, that of the enjoyment of experiments and hands on practical activities to the more cognitively challenging notion of problem solving and finding out for ones self. There were very few references to the actual content area of science apart from those areas being studied at the time.

'I like science because I like solving mysteries and problems' (KS1)

'I like finding things out for myself, not other people telling' (LKS2)

'I enjoy practical work, experimenting and solving problems' (UKS2)

Most children in Y2 and Y3 either enjoyed all science or did not respond. The most notable dislike in science was writing; this increased in frequency in line with age and became particularly significant in upper KS2. In two schools 100% of children mentioned writing. The only element of investigative science referred to negatively was research. A minority of children expressed a dislike of working as a team; this dislike increased with age.

Challenge and Problem Solving

A significant majority of children (>70%) gave positive answers when asked if they liked problem solving but only 22% of children said they had developed strategies to have a go at challenges, and therefore found it hard to keep going. Over a third of the children said they found challenges hard and had no strategies they could draw on to cope. A secure LKS2 child expressed it as 'To keep me trying I say in my head "come on you can do it" and "You will get there in the end. Believe in yourself!"'.

The strategies adopted when given a challenge varied from KS1 where their 'brains' and thinking were the main things, to KS2 where there was very little reference to their brains and more to thinking with references to perseverance. Another LKS2 child expressed it very positively 'Thinking nothing's impossible – you can do it'. Only in KS2 was there recognition of the significance of friends as a factor that kept them trying; this was equal to that of the teacher. A propensity for independence was

reflected in the preference by the majority of the children to find things out for themselves and not to be told the answers.

'Trying it again because I like to keep trying' (KS1)

'I like solving problems and finding what has been done wrong' (LKS2)

'Sometimes I'm driven by will' (UKS2)

Outdoor Learning

Learning out of doors was regarded positively throughout all ages by a significant majority (approx 90%). Although aspects of science were mentioned, the majority of responses referred to more general features. References that were made to science were those that were included life and living processes (gardening, minibeasts, and habitats) and one mention of physical processes (shadows). The children included creative arts, PE and 'trips' as part of learning out of doors. The creative arts were more frequently mentioned by KS1 than KS2.

A noteworthy feature that arose, throughout all year groups, was mention of space and movement, sometimes relating to a change of environment: 'There is more space to think about stuff' (KS1) and 'I like having the space to wonder and work in' (LKS2). Other examples included using the senses, 'exploring', and 'fun'.

'You get to see the things instead of looking at a book. You get to feel the things.

'You get to smell the things.' (LKS2)

'I like exploring outdoors instead of sitting on a carpet' (LKS2)

'Learning outdoors is a lot more fun than doing boring worksheets in a boring classroom' (UKS2)

'I enjoy the fact that you can feel the wind. I also enjoy being able to see the items rather than the pictures' (UKS2)

The aspects of learning out of doors that were disliked were minimal. Where reference was made to negative aspects the weather was the most significant, this was mostly the cold and wet, although there were a few references to hot weather. In one school there were specific references to their work getting wet and spoilt rather than discomfort to themselves; 'Your work can get soggy or get blown away' (UKS2). An extremely small number of children mentioned a dislike of bugs and spiders. One school, with children in lower and upper KS2, had no dislikes at all – they all enjoyed learning out side.

All children who responded, except two, acknowledged that at school they spend some time learning outdoors, but only 7 made any reference to learning science outdoors. In KS2 the majority of references were to trips that school had made. The links to science were more obvious in lower KS2 though where mentioned it was related to biology or trips; only one school mentioned other aspect of science i.e. shadows. It was evident that some schools have specific outdoor areas as mention was made to ponds, school gardens and bog gardens. It appeared, however, that some schools make more specific use of these areas than others, particularly in one school.

Visits to the coast

	School	Family	Another group
KS1	52 (81%)	59 (92%)	17 (27%)
Lower KS2	88 (71%)	111 (90%)	44 (36%)
Upper KS2	23 (62%)	31 (84%)	18 (49%)

It is positive to note the significant majority of the children in the study had visited the coast with their family and/or the school. Only four children in the whole sample said they had never visited the coast.

Teaching and Learning Creatively

The majority of children (73%) in KS1 and KS2 (80%) considered that they had creative abilities although more of these in KS2 said that this was only 'sometimes'. The examples of creativity provided were predominantly 'making things' and then art activities, particularly in KS1 and Year 3. Recognition was given to a cognitive aptitude with reference to imagination in all year groups. However it is interesting to note that even though the older age groups recognised imagination and ideas as a major definition of creativity only five children from the whole sample made specific reference to this quality when referring to themselves and their creative ability. Originality featured in one quote.

'Thinking things through and inventing' (LKS2)

'Creative means that you work things out on your own' (LKS2)

'Making something that no one has ever thought of before' (UKS2)

'Doing your own thing' (UKS2)

Teaching and Learning

A significant majority from all groups expressed their enjoyment of learning new things. Over 75% of children in all age groups like to know *why* they are learning new things. The children generally liked sharing their ideas, with lower KS2 being the most positive about this. UKS2 also liked sharing their ideas but were not as positive having a bigger spread of responses. KS1 showed a trend towards a polarity of opinion with 25% of children who do not like to share their ideas. Very interestingly there was a far higher positive response to children liking to listen to others ideas.

When considering 'What helps you remember when you are learning' no feature stood out as most dominant. Of the features that did emerge all but one intimated the responsibility for remembering in learning was down to the individual; the teacher had limited mentions especially in KS2. Children in KS1 tried to explain memory, with reference to their brain and 'pictures in my head', and children from two schools made significant mention of learning intentions as the best method that helped them remember in their learning. Pupils from one school made mention of songs as a technique to help their learning (a focus on learning science through music was being

taught that term). Writing was the most popular method for learning in KS2. It is interesting to note that the school where children were most critical of the amount of writing they do in science gave writing as the most popular method for learning.

'I created little people and they save it' Year 4

'Echo a little friend in my head' Year 5

3.2 Analysis of teacher's entry questionnaires

NB. As there was one male teacher in all cases throughout the analysis teachers are referred to as 'she' to maintain anonymity. Each teacher has been assigned a number (1-8) that remains consistent all through the analysis.

Science

View of science in schools

Majority of teachers believed science should be a core subject. They reasoned that 'you can't escape it [science] it's all around us' and that 'pupil's knowledge and understanding of the world' is key to their learning, science being an exciting way to understanding our world. However one teacher noted that ultimately children have to take SAT's and teachers are nevertheless accountable. Another teacher considered that science should not be a core subject explaining 'it is about the whole curriculum and is cross-curricular to the other subjects' (T6). All teachers held positive views about the children's view of science. It was generally considered that children enjoy and are excited by science. One school mentioned improved motivation in science as before it was 'rather tedious'.

In terms of management and other teachers in the schools the respondents believed that science was viewed as valuable, important, and as a core subject. Furthermore there was an indication of a growing interest in science.

The teachers were of the belief that parent's viewed science as not as important as literacy and numeracy. (It was not always clear whether these were subjective views or those based on actual consultation with the parents.) However two schools evidently had consulted parents who were surprised when they realise the depth and extent of knowledge taught.

Planning and assessment of science

All the schools involved in the project were either working with or moving towards a whole or partly themed curriculum. Schemes, such as QCA, were used only as a supplement by a minority. It was explained that science was generally delivered through themes, sometimes with science as the driving theme or with elements of science included. The delivery of science, weekly or blocked, was theme dependent for all the schools.

The schools used a variety of methods to ensure coverage of scientific enquiry, mainly tracking the delivery of skills through reference and coding on planning, with one school relying on the supplementary scheme. Some teachers made it apparent that they covered the skills twice a year, for others frequency of coverage was not explained. The majority of teachers utilised a variety of formative assessment

techniques to assess science; four teachers acknowledged that it was an area they needed to work on.

Teaching of science

Approaches to teaching science varied greatly from teacher to teacher. The focus on child centred teaching was mentioned by half the teachers, as was the need for relevance and context, but only two considered talk as a strategy. Practical investigations and enquiry were discussed by six teachers, with five expressing the need for fun and inspiration. There was mention of links to other areas of learning by three teachers, but only two mentioned outdoor learning.

All teachers felt they were able to teach science, in terms of strategies, the way they wished. The limiting factors for the majority were resources, with time as the second issue. Health and safety was an aspect mentioned only by two teachers.

Due the way the teachers approached their planning and teaching of science all felt the need to adapt to fit with the aims of the project would pose no problems.

Outdoors

All teachers believed learning outdoors is an important approach to learning, one teacher quoting Tim Brighouse 'one lesson outdoors is worth seven lessons inside'. Most teachers acknowledged the stimulation and motivation of being outside. The main reasons given were the use of real contexts, meaning to topic and the use of first hand resources. As one teacher articulated 'A classroom is quite often deliberately 'set-up' for learning. Outdoor education is more about using what's available' (T4).

All teachers utilised some elements of outdoor learning with their classes; predominantly through the use of the school garden or wild life area; notably no mention was made of the beach or coastline. A third mentioned trips outside the school grounds. All would like to do more!

The main barriers to outdoor learning were noted as financial, time for planning and curriculum constraints. Key Stage 1 teachers also expressed concerns about health and safety issues. One teacher was very honest and admitted it was herself who was the main barrier.

Creativity

When asked about their definitions of creativity the teachers' definitions were quite varied and non-explicit, often focussed on children and the curriculum. There was some mention of original or new ideas, with reference made to exploration, open minded thinking and approaches. Two mentioned purpose associated with creativity and there was one mention of value. Only one teacher could remember, in part the DfES definition of creativity; seven teachers either did not know or could not remember. One teacher remarked "Have read it but can't quote it – is this an exam!" if the question was a test!

Generally there was a self-developed theory of an understanding in the difference between teaching creatively and learning creatively, these differences were expressed as control and responsibility with teacher (teaching) and learning (children).

The project

The foremost expectation expressed by the teachers for the project was for their children to feel motivated and inspired by science. Secondly teachers mentioned enhancement of their own professional development in terms of more ideas and experience in delivering either a creative or themed approach to the curriculum. Five teachers had worked with a creative partner before, two of those teachers during the pilot project.

4 ANALYSIS OF OUTCOMES

4.1 Analysis of Children's Exit Questionnaires

Science

As an overview of children's perception of science content learned for the term, all children could describe to some extent their engagement with a knowledge aspect of science; many were able to articulate more than one area of knowledge. A very positive response indicated the enjoyment of science activities such as looking at habitats and searching for minibeasts. In depth knowledge of science at the beach was displayed especially from those schools whose foci were the animals and habitats at the beach. It was also apparent that other schools with a different content focus were very successful in the learning.

Implicit reference was made to scientific enquiry aspects through comments about doing and testing, one school able to talk expertly about testing beach buggies. This was a noteworthy addition to the responses given to the entry questionnaire. However only one school *explicitly* mentioned any aspect of scientific enquiry and even this was limited. Where these children made mention of 'Sc1', 'observation' and 'measurement' it seemed, from the way in which it was written with comments being very similar, that the children may have been reminded that this area had been explicitly covered.

Almost all children related their most enjoyable aspect of science that term to the coastal visit. The enjoyable aspects of the visits mainly related to the active parts of the science learning. Particularly positive and expressive comments were made related to the making and doing together with the observations and explorations of, for example, rock pools. A lower KS2 child liked the science because 'instead of just looking at a book we went and found animals and made circuits'. An upper KS2 child articulated her enjoyment thus:

I most enjoyed measuring the temperature of the sea in science, it was nice to watch the waves rapidly crash over and under each other in the deep water and calmly flow towards you. You can feel the chilly water seep through your shoes and slip through your socks and tickle the tips of your toes. I enjoyed making my own map from what I could see from on the cliffs in geography, it was lovely to watch the river and sea meet and flow into each other and I loved watching the sea cover the rock with icy cold water.

When asked what would make the science even better there was an overwhelming appeal for more outdoor learning. Scattered throughout the responses were requests to do more experiments or practical activities.

Challenge and Problem Solving

The children did not explicitly mention problem solving or challenges, however their engagement with this way of learning was implicit in their descriptions. At each beach session the activities and scenarios included active challenges for teams or pairs of children:

- constructing a sea creature adapted to climate change;
- making shelters from beach materials for Action Man or Barbie (these shelters had to include all that would be needed for survival on a desert island);
- constructing a beach collage as a team;
- constructing 'Andy Goldsworthy style' beach sculptures;

- reading and developing orienteering maps;
- scavenger hunts;
- building and utilising ramps to test buggies;
- constructing a food web based on seashore ecology;
- team building challenges – ‘walking the plank’, ‘crossing a swamp’ etc.

All the above were mentioned as enjoyable aspects of the visits to the coast, such as ‘I liked looking at the rocks that were 300 million years old and I also liked making our shelters and looking at velvet crabs in the rock pools and the 5 tasks to collect pebbles’ (LKS2).

Outdoor Learning

There was an extremely positive response to learning outdoors in the context of the beach trip with some excellent explanations as to why they enjoyed the experience. The most significant comments were about learning in a context and learning from real life. (Please see box below.) The most enjoyable aspects of the visit to the coast were the practical activities, exploring a different environment and carrying out tasks in a different place as indicated by this LKS2 child: ‘Painting the sea. Because of the sand on it, it looks like rocks in the sea.’ For one child in KS1 there was a notable impact ‘Furry teddy bear hunt helped me read.’

When asked how the outdoor experience had effected their learning some children from one school in lower key stage 2 indicated there had not been any significant differences. However it should be noted that this particular school has spent a lot of time outdoors and with teaching and learning beyond the indoor classroom during the past year.

The most negative aspect of their outdoor experience was the weather for some children, bearing in mind the horrendous weather that we had during the summer of 2007, this is understandable.

I have learnt more now and I have never seen a crab in my whole life. If we learn indoors we might not understand so well as learning outdoors. (LKS2)

I love learning out doors because you get to see it in real life and what they live in. (LKS2)

Instead of just reading a book we actually got to see it and it helps you remember the thing you are learning about. Because if we find out stuff outside you will know it's true. But if you were inside you might not believe it. (LKS2)

I think it has made me enjoy the lessons more and I do think it has made a difference because I put more effort in. I like learning outdoors because I don't like sitting in a hot sticky classroom. I think working outside links all the subjects together. Also it is better to actually measure things than talk about them in class (LKS2)

Being able to work in a bigger environment and in the fresh air. (UKS2)

It helped me understand adaptation more and why animals need to change.

Without the teacher explaining it to us. (UKS2)

It is easier than the teacher is explaining to you. You can see it for yourself. (UKS2)

We haven't been in a classroom learning from a board, we've been to the beach walking around learning in a different way. (UKS2)

Creativity and Cross-curricular Links

There were varied responses as to how the children saw cross-curricular links between science and the different subjects. Younger children showed limited awareness of links, often restricted to DT and art; whereas the older children were able to make more links between the science and made explicit mention of a wider number of subjects, including English/literacy, mathematics, art, geography, history, and ICT. Some children appreciated that it showed 'me how to link subjects and how to learn on the beach' (LKS2), another child revealed that 'It has made me include the coast when thinking about science.' (UKS2). It was interesting to note that it was common for children in same school to cite different links with science.

A number of children commented positively about learning about a number of different subjects whilst at the coast. As noted by an upper KS2 child 'The different activities we did and the way we did lots of different subjects on the beach as if the beach was our classroom for the day.' The children in one school represented their scientific learning in terms of the literacy focus they had that term.

Some children made very positive links to the creative aspect saying 'Learning outdoors has made a difference by showing me what creative means and has been better than being stuck in the classroom.' (UKS2) and 'It is nice going out and learning about the outside and knowing about the safety and dangers about the beach and going in the island. It helped me know what creative means.' (UKS2)

A number of children were particularly appreciative of the contribution made by the creative partner. The children remarked that the learning was 'engaging' and 'more real'. Of the story teller lower KS2 children commented:

'She made it fun because we were making things and learning as well. It was the best trip in the world.'

'She made it more exciting and she was excellent because she made it more like we were shipwrecked.'

'She made are learning fun and helped us make things but we were still doing normal learning.'

Comments made by some of the children who worked with other experts, that including the marine biologist, said:

Lower KS2

'Because she knows more than the teacher and she doesn't need to look at a book.'

'It did because she knew what she was speaking about and she could say things easily without looking at a book so I could understand her better.'

'Working with a creative partner had been a great experience to everyone. It was nice because the creative partners knew things that are different to what our teacher knows.'

Upper KS2

'It made a difference because if we would not have done recording for music,'

'It helps you to learn together and you get to know more about your partner. He can help you solve a problem if you don't know the answer to it. A creative partner is also there to be your partner in activities and projects.'

'A creative partner has made quite a difference to my learning because it has made me realise how a creative partner can work and has pushed me a bit further in learning.'

'The difference between having them and not is that it's a lot more fun.'

'It's given me a higher understanding of the subject and I'm capable of doing it on my own.'

Teaching and Learning Strategies

As noted previously the majority of children made some reference to the science knowledge learned but there was no explicit reference to enquiry skills. Some responses indicated a desire for less writing but not many compared to the response on the entry questionnaire. This may have been because writing, other than informal recording in most cases, was not a great feature of the coastal visits and because children were focussing on the actual beach day in their responses.

In respect of the actual beach visit the children suggested some changes to make the day better. It was notable that in KS1 and some Lower KS2 children's responses they wished for more time for playing. This was not a feature of the upper KS2 children's responses, though there were many requests for more time for exploration. More time overall was also suggested.

The KS1 children described their understanding in terms of more fun whereas the KS2 children were generally able to articulate what had made their learning better with comments such as:

'Instead of working separately I worked in a group which made a difference.'

'It has helped me to know that you can have more than one teacher and that the more you put in the more good work you produce.'

Finally perhaps most significantly: 'I have learnt that learning is not always boring, it can be exciting too.' (UKS2)

4.2 Analysis of Teachers Exit Questionnaires

Science

When asked how the children benefited when learning was driven by scientific enquiry rather than knowledge there were mixed responses, depending on how much the approach had been used before. The tension between Teacher 1's comment 'For some the idea that there isn't a right answer is liberating as they don't fear getting it wrong' and the view of Teacher 2, who felt 'others needed sure answers and felt let down if they weren't provided' demonstrates a familiar dilemma. This tension was again revealed in comments such as 'others though are more motivated by knowledge – they like finding out 'real facts'' and 'Some children really enjoyed the challenge and were motivated by the process of enquiry'. Two teachers considered it was the confident child who was happy to follow their own ideas and felt they needed to encourage this approach more.

Despite these tensions teachers felt the children are more motivated to learn and find things out through enquiry and that 'Their levels of drive and enthusiasm and engagement were noticeably higher' (T6). This approach enabled more discussion according to teacher 5 and the 'outcomes were successful in the end'. One teacher spoke of her attempt to make the topic focus on enquiry as much as possible. Notably, in the children's evaluations, this was the only school where the children mentioned any enquiry skills.

Most of science knowledge content of the work observed at the beach focussed on those in the National Curriculum strand 'Life and Living Processes'. However one class focused on logging the temperature of the water in different locations. Initially

there was not a clear reason given to the children for doing this but this was developed on the day and in the follow up. Art was often the means to interpret and express science concepts.

Outdoor context

The positive aspects of being outdoors appeared to outweigh any negative, all teachers commenting on the enthusiasm and motivation of the children, again relating to the real context and inspiring situation of the beach. One teacher (T7) remarked that their school regularly engages in outdoor learning contexts and found 'There is clear evidence from our informal observations and assessments that they truly benefit from them.' The beach was recognised as a new learning environment with very rich resources that the children were keen to explore. One teacher mentioned the children were mentally and physically exhausted!

The context of the situation was significant to all teachers and they expressed the value of making the experience real; 'real life experience is always more meaningful and less abstract' (T2) and learning occurred more effectively 'by making things real – put into a context' (T4). Teacher 1 considered 'the real life of the habitats made it make sense – it would otherwise have been too abstract'. One of the teachers who were involved with the beach buggies commented 'In making it real they were able to see and experience the real life problems that the vehicle designer would have. It was felt that the children could develop their own ideas and investigations in a real context.' Teacher 7 also commented on the positive experience 'Having smells and objects to see and touch was brilliant – having examined shells and seaweed in the classroom the day before meant the children were able to take some of that knowledge and go in their own direction when exploring the rock pools.'

All but one teacher mentioned worry about the weather as a negative aspect of the project. Bearing in mind it was an incredibly wet summer this was not surprising! Cost relating to transport was another concern voiced by some. Two other issues emerged mentioned by a minority of teachers: the limited days available at the beach due to tide times and the organisation needed to bring sufficient resources to the beach.

Interestingly only 3 teachers (two from the same school) mentioned risk assessments as problematic; one teacher referring to the time the assessment takes to collate and complete. Guidance was provided about aspects of health and safety at the project initiation, particularly useful was the document "Group safety at water margins" (Teachernet - http://www.teachernet.gov.uk/docbank/_index.cfm?id=3820). An interesting point was made by T8: 'When I consider the positive impact of the use of our creative partner and the beach as an outdoor learning environment it certainly outweighs the initial worries associated with risk assessments and safety – both of which (because they were handled thoroughly, with good EV coordinator advise/support) were not an issue when on location.'

All teachers thought including the outdoors as an integral part of planning was a sustainable way of teaching, though financial restrictions were expressed as the main limiting factor by some. However this does depend on what is considered are suitable locations for outdoor learning. Nevertheless it was felt that the positive aspect outweighed the negative as the outdoors enriches the learning process and brings a meaningful learning environment that the children can interact with at their own level of understanding. Teacher 6 considers it vital as 'It allows children to have a lot more freedom to express themselves and learn through investigation and enquiry rather than being bound by classroom controls.' As a result most of the

teachers said they were going to put a greater emphasis on learning out doors as a whole, incorporating their own school environment into their planning.

Cross-curricular planning and the creative environment

All schools stated that they used cross-curricular planning in some form already though the emphasis for this project was greater. For one school it was a bonus as they had been looking at their long term rolling programme developing it in terms of a creative curriculum. This gave the teacher the opportunity to reflect on what exactly they were trying to do and the purposeful nature of linking subjects. Even so there were still several mentions of how hard cross-curricular planning is, but it was worth it!

Some schools had more holistic views along side their specific curriculum objectives. Teacher 8 described their objectives as wanting 'to provide an educational experience that demonstrated to pupils and practitioners how using the outdoors can enable creative learning' and 'to use the beach as a classroom across the curriculum'. It was felt they achieved these: 'All staff agreed that this approach to work, although physically and mentally demanding (especially on a wet and wild beach), was an enjoyable, valuable, rewarding and enriching way to work' (T8)

Although all the schools were striving to teach the curriculum creatively the project 'gave the extra planning time to really consider the value of what we wanted to achieve' (T5). This same teacher went on to say 'The project gave us the opportunity to bring the curriculum to life, in an imaginative and inspiring way that benefited our learners' whilst admitting 'the planning was probably the part that took the highest effort/time, from me, professionally but the high-quality outcomes speak for themselves.' (T5). In terms of the benefits of the science cross-curricular links were that it gave the children a more grounded experience as the topics and activities had a 'purpose, meaning and significance'.

Not only was the science enhanced through the obvious links of geography but activities incorporating PSHE, painting, role play, music and creative writing which all took place on the beach enhanced the science learning. The majority of teachers followed these links when back in school, as Teacher 7 commented 'We need to make the children realise that you can learn subjects in different ways. We have done this a lot in English as the children don't see it as a 'sit down and write' subject and now we need to do the same for science.' Teacher 6 considered that 'The geography or history topic tends to take preference though, so it would be interesting to raise the profile of science more.'

One teacher made a significant comment that it 'Was nice to feel I was allowed to combine science and art – food chains / Dance and geography – the shaping of the coastline.' (T7). It is interesting to note in today's rhetoric of thematic planning and creative curriculum that perhaps not all schools ready or able yet to engage with this kind of teaching and learning.

Some teachers became more aware of the potential influence on learning with links they made in the planning as they felt some children became 'confused them with what is science, geography, English, Art etc' (T6). This is something the teacher said they would be more aware of for future planning. Teacher 5 commented that some of the children explored the science activities without realising it was science – this had both positive and negative outcomes and led the teacher to consider the purposes of the activities more. This issue was also raised by Teacher 7 realising that she needed to make the children understand the objective in science when in a context of geography, for example. However as stated by Teacher 6 the objectives

and tasks had a clear link to science, so they was not lost in a fully cross-curricular approach to a beach day.

It is worth noting in the discussion only teachers in two schools referred to the skills involved in cross-curricular planning.

Several teachers commented on the use of the actual beach day a positive start to the topic. For example Teacher 7 said 'It was an excellent starting point for the topic and would ideally like to have gone back to another coast to finish it off. The children were able constantly refer back to what they explored and learnt at [the beach]. [It] gave them something concrete to hang on to rather than just a picture etc. I found it easier to draw more cross curricular links from the trip, they seemed to be natural.'

Time was the main issue raised in terms of planning and implementation, with some teachers saying they wished they had planned for a longer time on their project and made it a whole term project rather than half a term. All teachers said they would consider this way of teaching and planning sustainable. This was incredibly encouraging especially when viewed with the teachers concerns about time. Some put a proviso on this, in that they viewed it possible with continued support from the management of the school.

Creativity

All teachers spoke of how they had learnt new skills and developed ideas. Some spoke of working just outside their comfort zones and how they were inspired by 'how the children connected with real hands-on activities' (T1). Even though some of the teachers already considered themselves as creative teachers they still felt that the additional creative inspiration helped them professionally and showed them 'just how far they could take that creativity.' (T8). Even one of the teachers who had worked without a creative partner felt she had demonstrated her creative ability and had grown in confidence.

To enable the children to think and learn creatively the children were encouraged to use and develop their own ideas. This was achieved through a variety of strategies such as encouraging the children ask questions, setting challenges that required original thought, giving them opportunities to work in collaboratively in groups and teams so they could exchange ideas, providing models and starting point so they could develop their ideas. A reflective comment made by Teacher 8:

'I really did think our children were creative thinkers before this project – I though they could understand the creative process and actually knew what being creative was. I was mistaken. I knew what being creative was, as did my classroom staff but my children (despite working in this way previously) were not so aware of what it all meant. The questions in your initial questionnaire threw up all kinds of quandaries from the children and actually got them thinking about how they learn and the content of their curriculum. They began (through lots of speaking and listening & examples) to understand how this approach to learning would heighten their enjoyment of the National Curriculum. Quote from one child "does this mean that even those subjects I'm not so keen on may become fun?" I loved that quote!!! It really brought home the reasons behind this project and how it will help children enjoy their school day!'

Creative partner

There was an overwhelming positive response to working with a creative partner. It was clear that the teachers felt inspired and enriched by the partnership. Expert and specialist knowledge coupled with the creative approaches was stimulating for the teachers. Teacher 1 felt it went wider than the children directly involved in the project as some aspects also affected the whole school; this was echoed by Teacher 2 who thought it was a 'stimulating way to promote literacy through speaking and listening' in a lasting benefit to the whole school.'

Although some teachers initially felt intimidated by their creative partner they all developed a very good and successful working relationship. All the partners adapted their expertise to enable the teachers to draw from them and so to engage with the children. As a mutually beneficial partnership ideas were bounced off each other and details were planned that would not necessarily have been thought of independently. Particular mention was made by some teachers of the help given by the creative partner to link aspects of the curriculum together, especially in a more creative way. The teachers generally felt the children were more stimulated and engaged in their learning because of the creative partner.

All, without exception, said they would use a creative partner again. Some qualified this saying 'it added so much extra depth to the project' (T3). It was clear that the teachers appreciated and valued the extra skills and knowledge the partners shared with them and the children. As noted by Teacher 7 'Her expertise increased children knowledge and understanding and prompted different trails of thought and hypothesis, particularly about the impact of global warming and adaptation'. They also felt that having another person teaching the children about particular aspects of the curriculum brings a different dimension especially when coupled with the creative expertise. Additionally the use of an expert in the field impressed the children and who were eager to follow up questions back in classroom.

One school was obviously concerned about the lack of creative partner. However one of the teachers in that school had taken part in the pilot study the year before and had the opportunity to work with a creative partner, so she was able to build on these experiences.

The only drawback mentioned by one teacher was the planning with the partner that took place in the teachers own time. Although this teacher made it clear this was not an issue for her she felt that for some it may be. Indeed two other teachers commented on the reduced workload.

General Outcomes and Impact

Generally the teachers were happy with the way they had organised the children. This took shape in different ways; pairs, mixed age, mixed ability. As Teacher 7 commented 'the older children were able to use more scientific vocabulary, exposing the younger children to language and being able to understand actually what science bit looks like in real life.' The organisation of all trips enabled the children to have freedom to explore and use their own ideas. Most teachers would use the same beach locality again, it being 'an excellent, safe environment for them to work and learn in.' (T6). One teacher who invited her head teacher along would do the same again so she could assist and see the plans in action! Another teacher was very impressed with the range of ICT equipment that could be used on the beach in a purposeful manner; this was reflected in the children's comments from her school. Inviting the RNLI to brief the children on beach safety was also another aspect that one teacher would retain.

Two teachers who joined with another class would have liked it to have just been their class though appreciated with more numbers it kept the cost down and also recognised the valuable input from the other teacher. Yet another teacher considered extending the experience to other schools within the cluster so reducing the planning and widening the opportunities.

Most teachers had arranged enough help on the day so they were free to move between groups and activities. The teachers who were unable to do this recognised the value of being able to have that freedom on such a day as this. Clearly the two teachers who engaged in the project without a creative partner would have liked to have worked with one.

Five teachers reflected the comments made by the children and thought that more time should have been organised for the children to explore and enquire for themselves. As acknowledged by one teacher this would also give children more responsibility for their own learning.

Some comments were very specific to the teacher's individual experience. One teacher felt that she should have made the learning objectives more explicit whilst also recognising that she should have allowed the children more freedom to explore. Another teacher commented on the organisation of the adults and felt she should have been more explicit in the intended outcomes. It was observed that strong adult intervention and guidance of a group of children during a creative activity had a negative impact. Children did not enjoy the activity as much and when asked to provide an explanation and feedback to the class refused. It was apparent that they did not feel ownership of the outcome.

Impact

To differing degrees individual expectations were realised by all teachers. Those who took part in the project without a creative partner still had very positive outcomes. One teacher who also had taken part in the pilot last year adapted her approach and included two classes of children with a very pleasing outcome. As expressed by Teacher 8:

Yes totally, the intended outcomes were met; the project was creative; the children made progress... this happened because it was thoroughly planned and creative partners were selected carefully. The extended budget and support from CP certainly helped to facilitate this process.

The teachers felt they had been given the opportunity to be more creative and through the experience learn more about creative ways of teaching and linking subjects with purpose. One teacher said she felt more confident to approach planning in this way and it had developed her knowledge of how to bring a cross-curricular project like this together. It was also considered that the profile and enjoyment of science in KS2 was raised.

The positive attitudes of the children to their learning were highlighted in all responses. The children's enthusiastic engagement and obvious motivation was apparent to all teachers. As Teacher 7 observed 'to some degree increased some children's attitude to learning and self confidence – realise they can contribute as well as the other children in their class.'

Some teachers considered the overall aspects of what they might change in their own teaching and commented that they would like to go out even more, Teacher 2 going as far to say 'plan purposeful outdoor activities in every project'. Teacher 7 also commented 'I am currently using the school allotment in science and arranged lots of other trips that filter in to a number of subjects. Reminded me how much fun science can be and should be!'

5.SUMMARY

Returning to the central question of this study:

How does cross curricular teaching in a coastal environment, with a creative partner, impact on the pedagogy of individual teachers and the children's learning of science?

As noted this question was driven by some fundamental assumptions about teacher's pedagogy and how children learn science. Our summary is shaped by these assumptions.

Children learn better in science in a meaningful context when purposeful cross curricular links are made between science and the arts.

- Most of the teachers saw how cross-curricular themes and skills could readily be developed and taught in this way of working so enriching all subjects. Planning cross-curricular in the short term was easier if there was a long-term themed planned or curriculum map in place. This was a whole school issue that not all the schools taking part had addressed at this time. All were positive that the work had raised the profile of science although some wished that their cross-curricular planning had started with science content not geography or history. There appeared to be a tension between science and the humanities when planning in a cross curricular way. Those prioritising science as the most content rich subject seemed to find the process easier.
- Links to English/literacy were readily made and children's high quality speaking listening and writing results indicated the value to this subject area of the cross-curricular planning. Some schools used more formal recording techniques in including writing and drawing but these were vulnerable to the weather. ICT was viewed positively and provided reliable and adaptable ways to record out of doors. Stored data, e.g. sounds, pictures, temperature measurements etc., was then available for future use back at school.
- Overall the most negative aspects of science, from the children's point of view, were the writing and, to a lesser extent, research; notably these aspects were not commented upon by the teachers.
- Although all children recognised some cross-curricular aspects the older children were able to identify the most links. The use of the beach as a classroom for the day with each subject separately taught made the subject coverage most explicit and all the children taking part also recognised the links through the theme. Children showed good knowledge of the aspects of science covered. They also demonstrated good observational skills and were able to express their scientific knowledge, ideas and observations through art. Teachers felt the objectives were met to differing degrees, children had made progress and that the days had made science fun. Most children said the aspect of science covered at the coast was their favourite that term.
- Some used the day at the beach as a starting point others used it as an integral part of the term or half-terms work. On reflection there were some teachers that wished they had allowed more time to build on and follow up the experiences.
- The role of creative partners to support and stimulate the cross-curricular and themed planning was appreciated by the teachers. It was seen as important to plan with the creative partner however it was sometimes difficult to meet face-to-face therefore the use of telephone and email communication was essential.

Children learn better in science when allowed to think and learn creatively.

- There was variation in the responses from teachers when defining creative learning and teaching creatively this was also reflected in the children's responses. However all teachers agreed that creative approaches are seen to enhance the enjoyment of the national curriculum.
- Creativity was developed through challenging the children and encouraging them to be original. Teachers were positive about the planned opportunities for the children to be independent and so direct their own learning; the children also enjoyed this aspect.
- One particular observation highlighted the impact of a much more directed approach when a group was strongly directed and led by an adult. This had a negative effect on the children's enthusiasm and interest and they were reluctant to explain what they had been creating to the rest of the class. It appears to be important to make more explicit the desired outcomes not only to children but also adults involved.
- In contrast the many very practical challenging activities led to high levels of children's motivation and engagement in the learning. Observations and teacher's comments indicated the positive aspects of having a wider range of ages – e.g. when completing a task older pupils organised, lead and motivated younger pupils.
- All the teachers and children were very positive about creative partners. An issue about sustainability was raised due to concerns about the financial aspects of appointing a partner.
- When considering how the days could have been improved many children expressed a desire for more time to explore or play at some point in the day. Teachers and children agreed that the limited time at the beach was restrictive but a difficult issue to overcome.

Children learn better in science when the learning is driven by enquiry rather than knowledge.

- Science was generally popular with all the children before their participation in this project. When asked about what they learned in science this term children talked knowledgably and confidently about the content areas of science but were less clear about the SC1 learning and skills development; very few children offered explicit information about scientific enquiry. The perception of the science from the children was clearly focussed on the knowledge, however teachers placed most emphasis on the child centred approach, relevance and practical investigations. It was unclear whether the children's knowledge based perceptions were due to a lack of the realisation that they were engaging in enquiry. However the need for fun and inspiration in investigations and enquiry matched closely with the children's positive responses to the exploratory and practical aspects of 'doing' science
- In terms of learning children rarely made explicit references to scientific enquiry skills yet all activities observed included development of SC1 skills. Teachers were obviously clear about their intentions for learning through and with scientific enquiry, however the teacher's planning of the days and the activities observed did not always make SC1 objectives clear. These objectives were not always shared with the children. It was interesting to note that although all teachers recognised benefits of enquiry – not all were comfortable with open ended tasks.

These examples above possibly indicate a tension between espoused theory and theory in practice.

- It was evident that the majority of children were of the strong opinion that they liked learning new things and also they wanted to know why they are learning new things. It was also apparent that children would rather find out things for themselves and preferred not to be told the answers. However the strength of this opinion declined as the children became older, notably in upper KS2. It was interesting to note that whilst the overwhelming majority of children in all year groups enjoyed listening to other peoples ideas they were not so confident in sharing their ideas. This disparity was more apparent in upper KS2. In general teachers' believed it is the more confident and able children who like enquiry based science more. This evidently contrasts with the children's views.

Children learn better in science when outdoor learning is an integral part of their experience.

- Overall the data indicates that learning out of doors was very popular with children and after their beach visit many wanted more similar outdoor learning opportunities. The children felt that being out of doors made learning more real and enjoyable. Teachers' views reflected those of the children agreeing that the main benefits of learning outdoors were the use of real contexts, giving genuine meaning to topics and the use of first hand resources. All teachers remarked on the enhanced engagement of the children in their learning.
- Areas of concern raised about the visit to the coast were finance and time. These both have implications for further out door learning. The financing of the school's transport has been proven possible; however creative partner cost could be issue. Lack of time due to length of school day was an issue to some teachers.
- Another concern was the weather; however this worried the teachers more than children. (Only one child explicitly complained about getting wet in rain, notably the same child objected to need to walk between and as part of activities.) Children's only other common concern was that their work would be damaged.
- Overall the negative aspects were outweighed by positives for both the children and teachers. Observations showed that the children and teachers were able to overcome many of the challenges of teaching and learning outdoors. The positive attitudes of the adults and children involved in some of the days were commendable in the face of rain, gales and unseasonably low temperatures. Only one school with reception children was unable to fulfil the visit in the summer term. One school faced high temperatures and danger of sunburn but was fully prepared and this had no ill effects on the children or curtailed any activities. It is important not to underestimate the commitment, time and energy necessary to make this type of work a success. However all teachers think this way of working is sustainable.

Learning science in the outdoor environment will impact on children's learning as a whole and as life long learners.

- Although children did not always articulate team working and sharing ideas as particularly popular overall it was interesting to observe that these all were strengths of their work at the beaches. These skills were specifically developed due to the nature of the challenges set. There were excellent examples of co-operation, leadership, team work and perseverance observed. Teachers gave

examples of children's self-esteem being raised and commented that some individuals able to contribute more than in normal class lessons.

- Children, particularly those in UKS2, appreciated the increased opportunities and benefits of more than one adult expert/teacher/facilitator to support their learning.
- Children's preconceptions of what a 'scientist' is like were challenged for the schools working with Dr Joanna Henley of Sciart Solutions. She also proved that a person can be a polymath, and as a scientist and an artist prompt interesting discussions.

6. CONCLUSION

Outdoor learning at the coast with access to a beach and seashore environment proved to be a popular and successful way to make science both exciting and enjoyable for children. Being out of doors and out of the school environment was recognised as being more 'real' and consequently valued more highly than some classroom or school based activities.

The majority of the content chosen related to 'Life and Living Processes, it would be interesting to use beach visits to focus on further aspects of 'Physical Processes' or 'Materials'. The science knowledge aspects of the activities proved memorable and popular within the creative science activities. All schools endeavoured to make the visits part of a cross-curricular delivery of National Curriculum subject. The subjects covered were obvious to the children when the beach was the classroom for the day and children moved from one subject based activity to another in groups throughout the day. When the activities delivered a mix of objectives the younger children were less able to identify specific subjects. The older, upper key stage 2 children proved more adept at identifying the geography, art, ICT etc that was implicit in their experience. For some classes the way the subjects supported and linked to each other became clearer in the follow-up work back at school. As science provides a direct way to interpret, measure and observe the world, it was a good place to start with the planning the cross-curricular links within a topic or theme linked to the beach visit. The arts provided a very exciting and meaningful way to express science concepts that engaged and motivated the children.

Dillon et al (2005) found that competing curriculum pressures limited the opportunities for extended follow-up work and that children did not see outdoor visits as connecting with their learning. They warned schools and local authorities that they need to recognise 'that it is short-sighted to try to increase the amount of time spent in the outdoor classroom without also seeking to maximise the extent to which such work is integrated with other work in schools.' (Dillon et al 2005, p.3). However in contrast to these findings the teachers involved in this project fully integrated the outdoor experience into their curriculum planning, therefore relating the teaching and learning directly to the outdoor context. Although many novel ideas were used and developed during the projects, by both children and adults, the links were clear and specific to previous learning so served to reinforce and extend rather than operating as a barrier (Dillon *et al* 2006). As well as creative thinking the children clearly engaged with the other aspects of thinking skills, as defined in the National Curriculum (DfES 1999).

Teaching and learning of enquiry skills were implicit throughout the project, yet there appears to be a need to ensure that the skill of investigation and enquiry to be made explicit consistently so children know what science skills are being learned alongside the knowledge aspects.

The initial increased workload of the teachers was rewarded by the high quality of learning and opportunities for developing creative, personal and social skills that the visits facilitated. Some of these skills not only helped the children with their learning but have positive implications within a context of lifelong learning as skills for life. It is noted by Dillon *et al* (2005, p.2) that teachers are specific about the learning outcomes in terms of the curriculum content, and are aware of the broader range of outcomes yet are 'less specific about identifying the wider social and personal outcomes of their planned activities'. This could also be inferred from this study and is an area that warrants further exploration.

The most successful challenges and activities were those where the children felt ownership of their learning, had open-ended tasks and adults facilitating rather than closely guiding their work. It is also clear that to enable this to be successful all the

adults taking part need to understand the aims of the day and the ethos of the work they are supporting.

The creative partners were all highly effective in enhancing the experiences and providing new and exciting ideas to support the teachers' plans. They also provided opportunities to challenge the children and introduced the opportunity to work with an 'expert', In some cases a valuable challenge to children's preconceived ideas of a 'scientist' or 'artist' was possible. It demonstrated how these two disciplines can benefit from each other in an educational and expressive context.

Organising and conducting fieldwork with children, however, is not without its challenges for busy teachers. It takes time and knowledge and issues of health and safety can be daunting, to say nothing of the cost. There were opportunities to involve children in understanding the risks of the beach without letting these impinge on the activities or learning. A particularly good idea employed by one teacher was the use of representatives of the RNLI lifesavers meet and greet the children with a brief safety talk.

It was evident that virtually all the children had positive attitudes to outdoor learning. The beach visits were enthusiastically embraced by the children demonstrating positive associations the children have for that environment. Their experiences did nothing to dispel these feeling and almost every child that took part was extremely positive and keen to do similar visits in the future. The teachers were also keen to pursue how to make their beach visits and work with creative partners a sustainable part of the curriculum – time, money and workload permitting!

In this study it was certainly the case for the majority of children that 'One lesson outdoors is worth seven indoors' (Professor Tim Brighouse).

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