

## Understanding the diverse benefits of learning in natural environments

Learning in the natural environment (LINE) affords direct benefits as diverse as educational, health and psychological and indirect benefits ranging from social to financial. Yet, despite increasingly robust evidence of these benefits, many children are losing their connection with nature. Worse still, children in urban environments are particularly disadvantaged<sup>1</sup>. For example, nowadays 10% of children play in the natural environment compared to 40% of adults when they were young<sup>2</sup>. This 'extinction of experience'<sup>3</sup> has a detrimental long-term impact on environmental attitudes and behaviours. A cultural shift is required, both at home and at school, before the situation can be reversed. Such a cultural shift requires commitment from concerned parties and stakeholders; substantial advocacy; a long-term strategy, and an irrefutable and compelling evidence base. This report focuses on the last of these features.

For too long, though, research into the benefits of LINE has failed to address the full range of benefits. Instead, there has been a narrow focus on easily measurable outcomes and a desire to seek simple answers to simplistic questions such as 'does LINE raise standards more than learning in the classroom?' One consequence is that too many children have been denied the rich educational experiences that have been available to others. In the current financial situation, and at a time when the education system is under review, it is opportune to set out the full range of benefits which are available to all students in schools across the country.

This report aims to broaden and deepen our understanding of the nature of the benefits to learning in natural environments. It was commissioned by Natural England on behalf of the Natural Connections project Management Group. This paper complements another document, 'Beyond barriers to learning outside the classroom in natural environments', again commissioned by Natural England and published in December 2010.

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<sup>1</sup> Thomas, G. and Thompson, G. (2004), A child's place: Why environment matters to children.

<sup>2</sup> England Marketing (2009), Report to Natural England on childhood and nature: a survey on changing relationships with nature across generations.

<sup>3</sup> Pyle, R.M. (1978), The extinction of experience.

## Key Findings

(i) The diversity of benefits of LINE offer a potentially compelling rationale for increasing access to LINE for all young people. However, as yet, the findings have not been assembled into a coherent case targeted at key decision makers

(ii) By far the greatest proportion of research findings focus on the impact of LINE on participants' knowledge and understanding. Specifically, students perform better in reading, mathematics, science and social studies and show greater motivation for studying science.

(iii) The estimated annual value of environmental knowledge in 2010 was £2.1 billion (£1.6 billion for GCSE subjects and £0.5 billion for A-Level), to which LINE can make a vital and necessary contribution.

(iv) A broad range of skills ranging from the technical to the social have been identified as outcomes of LINE, particularly when it is integrated with the everyday school curriculum.

(v) Environmental-based education makes other school subjects rich and relevant and gets apathetic students excited about learning.

(vi) Links between contact with the environment and personal health are well-established. Studies have shown that exposure to the natural environment can lower the effects of various mental health issues that can make it difficult for students to pay attention in the classroom.

(vii) Hands-on contact with nature is not only essential for protecting the environment but appears to be a means of cultivating community and enhancing the mental health and wellbeing of children and adults alike.

(viii) Structured activities, such as those commonly occurring in sustainability education, are powerful catalysts for creating a stronger sense of community - both within and beyond school boundaries.

(ix) Teachers benefit from LINE, becoming more enthusiastic about teaching and bringing innovative teaching strategies to the classroom<sup>4</sup>. Schools also benefit from teachers taking more ownership and leadership in school change.

## Recommendations

The Natural Environment sector should take action to:

(i) Assemble, promote and present the breadth of impacts of LINE, thus providing a compelling rationale to funders, schools and parents, with a view to encouraging more equitable access for all students.

(ii) Develop more effective strategies to collect evidence of the full range of benefits and impacts of LINE on individuals, institutions and the wider community within a common framework developed by the sector itself.

<sup>4</sup> The National Environmental Education & Training Foundation (2000), *Environment-based Education - creating high performance schools and students*.

(iii) Share evaluations of the impact of completed and existing educational initiatives more widely with a view to building a clearer picture of the full range of educational and other benefits of LINE as well as providing an opportunity to identify issues and questions for future study. Such sharing would identify the relative effectiveness of initiatives.

### Key terms

The term 'learning in the natural environment (LINE)' encompasses a range of provision, including:

- activities within a school's or college's own buildings, grounds or immediate area;
- educational visits organised within the school day; and
- residential visits that take place during the school week, weekends or holidays<sup>5</sup>.

Natural environments are those which, in contrast to the built environment, contain living and non-living material. They include school grounds, local open spaces, parks, rivers, lakes, forests, coastlines, caves, mountains and the atmosphere.

Fieldwork, for the purposes of this briefing refers to all teaching and learning activities that are carried out in natural environments.

## Benefits to participants of learning in natural environments

The most authoritative survey of research into learning outside the classroom was carried out by Rickinson *et al.* in 2004. The review concluded that: 'Substantial evidence exists to indicate that fieldwork, properly conceived, adequately planned, well taught and effectively followed up, offers learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom'<sup>6</sup>. The Rickinson *et al.* review identified four areas of impact on students: cognitive, affective; social/inter-personal; and physical behavioural.

A recent study to begin to assess the economic benefits of LINE, commissioned specifically to inform this briefing paper from *eftec*, found that the value of LINE in England involves benefits arising from educational attainment, attitudes to other children, awareness of environment and natural science skills, behavioural outcomes and social cohesion, health benefits, school staff morale, and a more attractive school (aesthetically and to prospective parents)<sup>7</sup> (see Appendix 1).

<sup>5</sup> Ofsted (2008), Learning outside the classroom: how far should you go?

<sup>6</sup> Rickinson, M. *et al.* (2004), A review of research on outdoor learning.

<sup>7</sup> *eftec* (2011), Assessing the benefits of learning outside the classroom in natural environments. Final Report for King's College London.

Furthermore, complementarity between these benefits means that the overall value of LINE to society is probably greater than the sum of these parts. The qualitative evidence linking LINE to such benefits is compelling, however, quantitative evidence linking LINE and changes in these benefits is lacking.

Even in the absence of such quantitative links, it is possible to use monetary value evidence to illustrate that LINE's contribution is significant. For example, the costs to society of the problems that are encountered in the absence of health, community cohesion, higher educational attainment and so on range from tens of millions to billions of pounds. Even if LINE has only a very small impact on these costs (e.g. reducing the relevant impacts by 0.1%), its value in reducing costs would be very large – of the order of £10m to £20m per year. Greater percentage reductions in impacts would give proportionately greater reductions of costs.

The benefits accruing from LINE can be reduced remarkably easily by a lack of adequate preparation, weak pedagogy and inadequate follow-up back in school. Fredericks and Childers note that 'Effective field trips require planning, preparation, and follow-through upon returning to school as well as coordination between the host site, school, and chaperones'<sup>8</sup>. Many of the outcomes are inter-related and mutually reinforcing. In a seminal study of the impact of residential fieldwork on upper primary school students, Nundy identified a positive impact on long-term memory due to the memorable nature of the fieldwork setting as well as affective benefits of the residential experience (e.g. individual growth and improvements in social skills)<sup>9</sup>. Perhaps more importantly, Nundy also reported reinforcement between the affective and the cognitive outcomes which resulted in students being able to access higher levels of learning.

Residential fieldwork is capable not only of generating positive cognitive and affective learning amongst students, but this may be enhanced significantly compared to that achievable within a classroom environment. (Nundy, 1999, p. 190)

Nundy's findings are supported by a recent Ofsted report which stated that 'learning outside the classroom contributed significantly to raising standards and improving pupils' personal, social and emotional development'<sup>10</sup>. So, while the benefits listed below are organised into categories, it must be borne in mind that many of them do not occur in isolation and, indeed, a class of 30 students exploring their local surroundings may well have 30 different individual experiences resulting in a complex and hard to measure set of personal outcomes.

The outcomes listed below are organised as follows: Benefits to individual participants (knowledge and understanding; skills; attitudes and behaviours; health and well-being; self-efficacy and self-worth);

<sup>8</sup> Fredericks, A.D. & Childers, J. (2004), A day at the beach, anyone?

<sup>9</sup> Nundy, S. (2001), Raising achievement through the environment: the case for fieldwork and field centres.

<sup>10</sup> Ofsted (2008), Learning outside the classroom. How far should you go?

benefits to teachers, schools and the wider community, and benefits to the natural environment sector.

## **Increasing knowledge and understanding**

**By far the greatest proportion of research findings focus on the impact of LINE on participants' knowledge and understanding. Specifically, students perform better in reading, mathematics, science and social studies and show greater motivation for studying science**<sup>11</sup>. For example, in a comparative study in the USA, Randler *et al.* found that students aged 9-11 who had taken part in conservation action 'performed significantly better on achievement tests' and that pupils 'expressed high interest and well-being and low anger, anxiety, and boredom' compared with students who had been taught using more traditional methods<sup>12</sup>.

The impact of visits to the Eden Project in Cornwall has been reported by Bowker who examined pre- and post-visit drawings of tropical rainforests made by 9-11 year-old children. Bowker reported that the 'post-visit drawings [...] demonstrated far greater depth, scale and perspective than the pre-visit drawings'<sup>13</sup>. In an earlier paper, Bowker (2004) interviewed children (n=72) from eight primary schools about one month after they had been on a one-day school visit to the Eden Project<sup>14</sup>. He noted that the children's 'opinion of plants changed, they understood the link between plants to their own daily lives and took delight in finding out where chocolate came from'. In another study, Hamilton-Ekeke compared three groups of Nigerian school students. Students who were taught ecology by taking them to the school farm, pond, and nearby stream performed better than a matched group who were taught only in the classroom<sup>15</sup>.

The review commissioned from *eftec* found that LINE makes a significant contribution to environmental education in the current UK National Curriculum<sup>16</sup>. Its value is estimated in the forthcoming National Ecosystem Assessment by Mourato *et al.* (2011) through its contribution to greater lifetime earnings associated with educational qualifications in relevant subjects. **The estimated annual value of environmental knowledge in 2010 was £2.1 billion (£1.6 billion for GCSE subjects and £0.5 billion for A-Level), to which LINE makes a vital and necessary contribution.**

## **Developing skills**

**A broad range of skills ranging from the technical to the social have been identified as outcomes of LINE, particularly when it is**

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<sup>11</sup> The National Environmental Education & Training Foundation (2000), Environment-based Education - creating high performance schools and students.

<sup>12</sup> Randler, C., Ilg & Kern, J. (2005), Cognitive and emotional evaluation of an amphibian conservation program for elementary school students.

<sup>13</sup> Bowker, R. (2007), Children's perceptions and learning about tropical rainforests: An analysis of their drawings.

<sup>14</sup> Bowker, R. (2004), Children's perceptions of plants following their visit to the Eden Project.

<sup>15</sup> Hamilton-Ekeke, J.-T. (2007), Relative effectiveness of expository and field trip methods of teaching on students' achievement in ecology.

<sup>16</sup> *eftec* (2011), Assessing the benefits of learning outside the classroom in natural environments. Final Report for King's College London.

**integrated with the everyday school curriculum.** In a major report on the work of outdoor education centres, Ofsted found that participating students ‘develop their physical skills in new and challenging situations as well as exercising important social skills such as teamwork and leadership’<sup>17</sup>. Peacock’s evaluation of the National Trust Guardianship scheme, which involved students making multiple trips to sites, was that participating students developed social skills such as tolerance, caring, group awareness and self-discipline as well as research skills involving understanding and management of the natural environment. Specific skills were developed which ranged from gardening and cooking to using digital cameras and microscopes<sup>18</sup>.

Cowell and Watkins describe the outcomes of a museum outreach programme, ‘Spring Bulbs for Schools’, which was established in Wales in 2006. The scheme involved setting up 160 monitoring sites across the Principality. The authors, one of whom was a project officer and the other a schoolteacher, evaluated the project and found that the students became ‘aware of the world around them and the idea that human activity can have noticeable effects, even on a local scale in the school garden’ adding that ‘the project enabled them to undertake pattern-seeking and observational activities – aspects of scientific enquiry that are often underdeveloped throughout the science curriculum’<sup>19</sup>.

Relatively few studies have looked at the experience of early years education. However, Jones reported on the development of children aged 3-5 on a school programme in Minnesota, USA. Jones noted that the ‘children learn to work collaboratively, socially construct knowledge, and develop social skills while cooperating, helping, negotiating, and talking with others’<sup>20</sup>. Possick reported on a small-scale study involving her kindergarten class and another first-grade class. A month-long project culminated in turning their school hall into a ‘forest’. The project ‘was based on observing, questioning, taking field trips, conducting library research (including the internet) and asking experts’. Possick reports that the children in the two primary classrooms ‘developed skills in forming questions about what they thought they knew, wanted to know, and had learned’<sup>21</sup>.

## Changing attitudes and behaviours

Chawla’s (1998) review of the qualitative and survey literature found that adults who had significant and positive exposure to nature as children—experiences, often with significant adults, that socialize them to view nature in positive and meaningful ways—were more likely to be environmentally sensitive, concerned, and active.<sup>22</sup>

There is abundant evidence of the positive impact of LINE on a range of attitudinal and behavioural dimensions. **Environmental-based**

<sup>17</sup> Office for Standards in Education (Ofsted) (2004), Outdoor Education: aspects of good practice.

<sup>18</sup> Peacock, A. (2006), Changing minds. The lasting impact of school trips.

<sup>19</sup> Cowell, D. & Watkins, R. (2007), Get out of the classroom to study climate change - the ‘Spring Bulbs for Schools’ project.

<sup>20</sup> Jones, N.P. (2005), Big jobs: Planning for competence.

<sup>21</sup> Possick, J. (2007), An artful forest.

<sup>22</sup> Blair, D. (2009), The child in the garden: An evaluative review of the benefits of school gardening.

**education makes other school subjects rich and relevant and gets apathetic students excited about learning**<sup>23</sup>. Research has identified such impacts resulting from a range of experiences including school gardening and environmental improvement; visits to local parks; farm visits and residential visits<sup>24</sup>. Coskie *et al.*, for example, describe the impact of a five-week intervention in which students aged 8-10 were taught how to write a field-guide to identify plants in a small area of woodland near to the school. The authors found that students 'came to understand and care for the natural world in their immediate environment.'<sup>25</sup>

Few studies have looked at long-term impacts of out-of-the-classroom education. An exception is a US study by Pace and Tesi (2004) that involved interviewing four men and four women between the ages of 25 and 31 about their field trip experiences while attending school from K-12 (that is kindergarten through to twelfth grade (age 17-18)). Most of the participants revealed that they experienced 'enhanced camaraderie with fellow students, teachers, and chaperones [accompanying adults]' as a result of their experiences.<sup>26</sup>

In another long-term impact study, Farmer *et al.* (2007) evaluated *Parks as Classrooms*, an environmental education programme in the Great Smoky Mountains National Park, USA. The programme focused on the impact of non-native species and humans on local biodiversity. The primary school participants were aged 9-10. 15 of the 30 students agreed to be interviewed a year after their visit. The authors reported that 'many students remembered what they had seen and heard and had developed a perceived pro-environmental attitude'.<sup>27</sup>

Evaluation of a woodland-survival skills course Warwickshire Children and Voluntary Youth Services ran with Groundwork for young people who are NEET, found they gained more than just measureable skills<sup>28</sup>. As well as developing their confidence, leadership skills, and perseverance, they became more motivated and tolerant of their environment, staff and each other, as well as learning to live away from their families and create their own entertainment.

Sustainable Development Commission (2010). *Improving young people's lives*.

In terms of changing attitudes to studying, Thompson (2004) argues that teachers and principals 'should not overlook the role educational travel

<sup>23</sup> The National Environmental Education & Training Foundation (2000), Environment-based Education - creating high performance schools and students.

<sup>24</sup> Malone, K. (2008), Every experience matters.

<sup>25</sup> Coskie, T., Hornof, M. & Trudel, H. (2007), A natural integration.

<sup>26</sup> Pace, S. & Tesi, R. (2004), Adult's perception of field trips taken within Grades K-12: Eight case studies in the New York Metropolitan Area.

<sup>27</sup> Farmer, J., Knapp, D. & Benton, G. M. (2007), An elementary school environmental education field trip: Long-term effects on ecological and environmental knowledge and attitude development.

<sup>28</sup> Connexions Coventry and Warwickshire (2009), Connexions NEET's Bushcraft Project in partnership with Groundwork - Evaluation Report.

can play in motivating students to achieve'<sup>29</sup>. Using a case study of the middle school in Michigan, USA, Thompson describes benefits to both the students and the school 'that come from linking trips to the science and social studies curricula'.

## Heath and well-being benefits

**Links between contact with the environment and personal health are well-established. Studies have shown that exposure to the natural environment can lower the effects of various mental health issues that can make it difficult for students to pay attention in the classroom.** In particular Kaplan proposes the Attention Restoration Theory – the theory that exposure to nature reduces directed attention fatigue, restoring the ability to concentrate at will<sup>30</sup>. The symptoms of Attention Deficit/Hyperactivity Disorder are less severe when individuals (both children and adults) are regularly exposed to natural outdoor environments<sup>31,32</sup>.

The publication in 2005 of *Last child in the woods*, by Richard Louv, appeared to touch a nerve in the public consciousness in the US and elsewhere. Louv described a 'Nature Deficit Disorder' which was meant to be a way of thinking about a society-wide problem of disconnectedness with the natural environment. The book stimulated the formation of a 'No Child Left Inside' movement which has had substantial success influencing policy makers. Environmental literacy appeared in the US Department of Education budget for the first time in 2010.

Children are more likely to have hands-on contact with the natural environment during their time at primary schools than while they are attending secondary schools. A study in Australia found that hands-on contact with nature in primary school 'can play a significant role in a cultivating positive mental health and wellbeing'<sup>33</sup> The study involved a postal survey of 500 urban Melbourne primary schools, a more in-depth study of 12 schools and interviews with seven 'key industry informants'. Reporting only on the interviews, Maller found that 'hands-on contact with nature in primary school, regardless of the type, is an important means of connecting children with nature and can play a significant role in a cultivating positive mental health and wellbeing'. **Maller concluded that such contact was not only 'essential for protecting the environment' but that it also appeared to be 'a means of cultivating community and enhancing the mental health and wellbeing of children and adults alike'**. Maller found that her respondents identified what she describes as structured and unstructured hands-on activities, and that while structured activities 'result in greater benefits to children's mental health and wellbeing' it was the case that

<sup>29</sup> Thompson, D. (2004), Including travel in your academic plans.

<sup>30</sup> Kaplan, S. (1995), The restorative benefits of nature: Toward an integrative framework.

<sup>31</sup> Taylor, A.F., Kuo, F.E. & Sullivan, W.C. (2001), Coping with ADD - the surprising connection to green play settings.

<sup>32</sup> Kuo, F.E. & Taylor, A.F. (2004), A potential natural treatment for Attention-Deficit/Hyperactivity Disorder: Evidence from a national study.

<sup>33</sup> Maller, C. (2005), Hands-on contact with nature in primary schools as a catalyst for developing a sense of community and cultivating mental health and wellbeing.



‘unstructured activities were thought to be important for connecting children with nature and fostering an interest in the environment that may emerge later in adult life’. **Maller also claims that structured activities, ‘such as those commonly occurring in sustainability education’, were seen as being ‘powerful catalysts for creating a stronger sense of community - both within and beyond school boundaries’.**

Bird highlights the links between mental health and the natural environment.<sup>34</sup> He found over 100 studies supporting the role of the natural environment in ‘attention restoration’ (when indirect attention allows concentration to be held with little or no effort, allowing the brain to restore for more direct attention usage)<sup>35</sup>, as it provided the most effective location for promoting indirect attention.

Sustainable Development Commission (2010). *Improving young people’s lives*.

In 2009, following a study of sustainability education in schools, Ofsted recommended that schools should ‘ensure that all pupils have access to out-of-classroom learning to support their understanding of the need to care for their environment and to promote their physical and mental well-being’<sup>36</sup>

### **Self-efficacy and self-worth**

The mental and physical health benefits are closely linked to other impacts such as improvements in feelings of self-worth and self-efficacy. Swarbrick *et al.* (2004) report on a forest school initiative in Oxfordshire<sup>37</sup>. Although acknowledging that research into the project is in its ‘infancy’, the authors do report that a questionnaire sent to schools, early years settings and individuals using the forest school approach ‘revealed that the project was viewed very favourably by participant adults’, adding that they mentioned the ‘increased ability of quiet children to express themselves, an increase in confidence, and positive participation from disruptive children’. There was also evidence of increased speaking and listening skills during the one-year involvement in the forest school programme.

A child who had severe language difficulties (i.e. needed to attend a speech unit for four sessions a week) was extremely quiet in the nursery environment and seldom initiated conversations with other children or adults. However in the forest environment her speech was clearer and much louder! She also displayed more self-confidence and interacted with a wider circle of peers. In the nursery environment her interactions tended to be on a one-to-one basis.

Swarbrick *et al.* (2004), Self-esteem and successful interaction as part of the forest school project

<sup>34</sup> Bird, W. (2007), Natural Thinking – investigating the links between the natural environment, biodiversity and mental health.

<sup>35</sup> Kaplan, R. & Kaplan, S. (1995), The experience of nature: A psychological perspective.

<sup>36</sup> Ofsted (2009), Education for sustainable development. Improving schools – improving lives.

<sup>37</sup> Swarbrick, N., Eastwood, G. & Tutton, K. (2004), Self-esteem and successful interaction as part of the forest school project.

Amos and Reiss's evaluation of the 2004 London Challenge Residential Initiative, which involved 51 schools from five relatively deprived London boroughs sending groups of 11-14 year-olds to field centres found that pupils 'surpassed their own expectations of achievement during the courses, and both pupils and teachers felt that the general levels of trust in others and the self-confidence shown by the pupils on the courses were higher than in school subjects'.<sup>38</sup>

An unusual and very thorough approach to evaluating the impact of an outdoor experience was reported by Whittington<sup>39</sup>. The participants in this doctoral study were a group of adolescent girls who took part in a 23-day canoe expedition as part of an all-female wilderness programme in Maine, USA. Whittington interviewed the girls twice following the expedition, once 4-5 months afterwards and the second time after 15-18 months had elapsed. Whittington reported that the experience enabled the participating girls to challenge 'conventional notions of femininity in diverse ways' including:

- 1) perseverance, strength, and determination;
- 2) challenging assumptions of girls' abilities;
- 3) feelings of accomplishment and pride;
- 4) questioning ideal images of beauty;
- 5) increased ability to speak out and leadership skills;
- and 6) building significant relationships with other girls. Implications of these results for program planners of all-female programs are discussed.

In a study of a 10-week expedition by 14 young people to Ghana organised by Raleigh International, Beames found that 'Interpersonally, young people developed an increased facility for working and living with people they did not know before'<sup>40</sup>. It was also noted, perhaps unsurprisingly, that participants gained a greater appreciation of the modern conveniences they were accustomed to and learned about the economic and democratic differences between the UK and Ghana. Beames noted that the participants 'developed a certain mental resilience, became more willing to undertake challenges, and gained a greater understanding of themselves'.

Larson examined the effects of an adventure camp programme on the self-concept of 61 adolescents with behavioral problems aged between 9 and 17. Using an experimental/control group design, Larson found that the 31 participants who voluntarily attended an adventure camp demonstrated a statistically significant and positive difference in terms of their self-concept compared to the control group.<sup>41</sup> Similarly, Lan *et al.* reported significant long-term effects of participation in a wilderness programme including greater participant self-actualisation and decreased hopelessness. Lan *et al.* reported that: 'Police recidivist data

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<sup>38</sup> Amos, R. & Reiss, M. (2006), What contribution can residential field courses make to the education of 11-14 year-olds?

<sup>39</sup> Whittington, A. (2006), Challenging girls' constructions of femininity in the outdoors.

<sup>40</sup> Beames, S. (2004), Overseas youth expeditions with Raleigh International: a rite of passage?

<sup>41</sup> Larson, B.A. (2007), Adventure camp programs, self-concept, and their effects on behavioral problem adolescents.

indicated that 42 of 56 youth who had prior convictions did not re-offend in the two years following the wilderness intervention'.<sup>42</sup>

## **Benefits to schools, teachers and the wider community**

**Teachers benefit from LINE, becoming more enthusiastic about teaching and bringing innovative teaching strategies to the classroom<sup>43</sup>. Schools also benefit from teachers taking more ownership and leadership in school change.** Several of the studies mentioned above have already highlighted possible benefits of LINE beyond those felt by the individual. These inter-related benefits include social, economic, health and crime reduction.<sup>44</sup>

Maller, whose study was mentioned above, identifies a number of aims for engaging children in hands-on contact with nature noting its increasing popularity:

Many schools, both in Australia and internationally, are including hands-on contact with nature in their curricula, usually to meet sustainability education, environmental education or science learning objectives. However, other reasons cited for the recent growth in these types of activities include beautification of school grounds, habitat restoration, and to foster qualities of stewardship and nurturing in children.<sup>45</sup> (p. 16)

Another Australian study, this time by Davidson, described the experiences of schools that took part in the Sustainable Schools Initiative. The initiative, which is similar to many other environmental initiatives in the UK and elsewhere, focuses on waste, water, biodiversity/school grounds and energy management.<sup>46</sup>

Stepath reported on the impact of a marine education research project carried out on in 2002/3 on the Great Barrier Reef, Australia. Noting the lack of impact of knowledge on behaviour, Stepath advocates community-based environmental monitoring in conjunction with experiential environmental education which 'can work to improve responsible behavior when used in coordination with a comprehensive education strategy and media campaign'<sup>47</sup>.

One of the most well-know examples of cross-community education aimed at intergenerational mentoring is the Garden Mosaics project. Kennedy and Krasny describe the mission of the project which is 'connecting youth and elders to explore the mosaics of plants, people,

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<sup>42</sup> Lan, P., Sveen, P. & Davidson, J. (2004), A Project Hahn empirical replication study.

<sup>43</sup> The National Environmental Education & Training Foundation (2000), *Environment-based Education - creating high performance schools and students*.

<sup>44</sup> Connexions Coventry and Warwickshire (2009), Connexions NEET's Bushcraft Project in partnership with Groundwork – Evaluation Report.

<sup>45</sup> Maller, C. (2005), Hands-on contact with nature in primary schools as a catalyst for developing a sense of community and cultivating mental health and wellbeing.

<sup>46</sup> Davidson, G. (2005), Sustainable schools: practising what they preach.

<sup>47</sup> Stepath, C. (2004), Awareness and monitoring in outdoor marine education.

and cultures in gardens, to learn about science, and to act together to enhance their community'<sup>48</sup>.

The National Trust's Guardianship scheme involved school-age students paying multiple visits to sites. An evaluation of the long-term benefits of the scheme, which involved over 100 schools, found that they saw great benefits from having a 'classroom in the park'. Headteachers reported a development of 'community spirit' and valuing what was 'in their own back yard' as a result of the scheme.<sup>49</sup> A rarely reported finding was that the scheme resulted in an increased willingness of parents to come into school for events and meetings.

## Benefits to the natural environment community

The evidence suggests that the more that young people engage with the natural environment, the more they appreciate and care for it<sup>50</sup>. Schaaf describes how four classes of primary-aged children engaged with a water quality project. By the end of the year-long project the students had not only learned how to monitor water quality but they had 'raised salmon in the classroom for release into the river'<sup>51</sup>. Few attempts have been made to quantify the impact of LINE on the natural environment or the benefits, financial or otherwise of being providers of education and training in LINE. The economic or environmental benefits of educational providers have not been adequately studied.

## Conclusions

Substantial evidence exists to indicate that LINE, properly conceived, adequately planned, well taught and effectively followed up, offers learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom. Specifically, several studies indicate that students perform better in reading, mathematics, science and social studies and show greater motivation for studying science. A broad range of skills ranging from the technical to the social have been identified as outcomes of LINE, particularly when it is integrated with the everyday school curriculum. Environmental-based education makes other school subjects rich and relevant and gets apathetic students excited about learning.

Links between contact with the environment and personal health are well-established. Studies have shown that exposure to the natural environment can lower the effects of various mental health issues that can make it difficult for students to pay attention in the classroom. Hands-on contact with nature is not only essential for protecting the environment but appears to be a means of cultivating community and enhancing the mental health and wellbeing of children and adults alike. Structured activities, such as those commonly occurring in sustainability education, are powerful catalysts for creating a stronger sense of community - both within and beyond school boundaries.

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<sup>48</sup> Kennedy, A. M. & Krasny, M. E. (2005), Garden Mosaics.

<sup>49</sup> Peacock, A. (2006), Changing minds. The lasting impact of school trips.

<sup>50</sup> Coskie, T., Hornof, M. & Trudel, H. (2007), A natural integration.

<sup>51</sup> Schaaf, S. (2005), How clean is the river?

The estimated annual value of environmental knowledge in 2010 was £2.1 billion (£1.6 billion for GCSE subjects and £0.5 billion for A-Level), to which LINE makes a vital and necessary contribution. Teachers benefit from LINE, becoming more enthusiastic about teaching and bringing innovative teaching strategies to the classroom<sup>52</sup>. Schools also benefit from teachers taking more ownership and leadership in school change.

### **Recommendations**

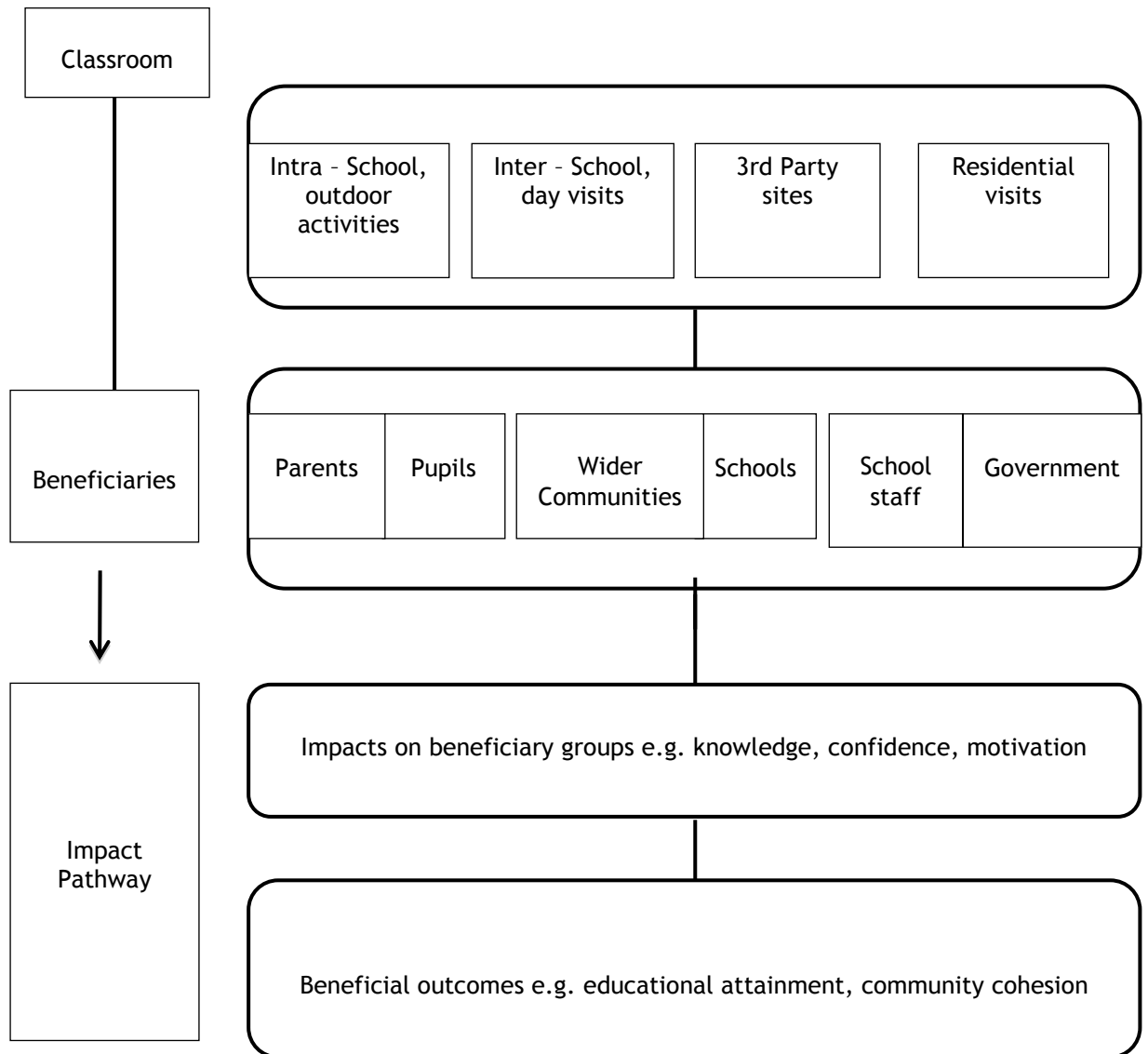
The Natural Environment sector should take action to:

- (i) Promote and present the breadth of impacts of LINE, thus providing a compelling rationale to funders, schools and parents, with a view to encouraging more equitable access for all students.
- (ii) Develop more effective strategies to collect evidence of the full range of benefits and impacts of LINE on individuals, institutions and the wider community within a common framework.
- (iii) Share evaluations of the impact of completed and existing educational initiatives more widely with a view to building a clearer picture of the full range of educational and other benefits of LINE as well as providing an opportunity to identify issues and questions for future study.

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<sup>52</sup> The National Environmental Education & Training Foundation (2000), *Environment-based Education - creating high performance schools and students*.

## Appendix 1: Structure of Benefits From Learning in Natural Environments



The diagram shows a structure of the value of the economic benefits of LINE. It reflects a three-stage process to valuation of non-market goods, namely:

- i. Qualitative assessment, identifying types of benefits;
- ii. Quantitative assessment, attempting to measure the impact pathway for different beneficiaries; and
- iii. Valuation, putting monetary values against the impacts on beneficiaries.

As with many non-market goods, we have good evidence of the existence, strength and complex nature of (i), but very little evidence on (ii). Evidence on (iii) is also lacking – linking to the difficulty of establishing (ii) and proxies such as how much is spent on LINE need to be used, at least for now.<sup>53</sup>

<sup>53</sup> eftec (2011), Assessing the benefits of learning outside the classroom in natural environments. Final Report for King's College London.