

Links between natural environments and learning: evidence briefing

Purpose of briefing

This briefing note is one of a series that summarises evidence of the relationships between the natural environment and a range of outcomes. This briefing focuses on the impacts of learning in natural environments and the impacts of natural environments on learning processes and outcomes. The notes are aimed at: policy makers, practitioners, practice enablers (including Natural England and Natural Resources Wales), local decision makers, and the wider research community. They highlight some of the implications for future policy, service delivery and research. It is intended they will inform practitioner planning, targeting and rationales, but not the identification of solutions or design of interventions. Barriers to access or use of natural environments are not considered in these notes. The other briefings in the series published so far cover physical activity, obesity, physiological health, mental health, and connection to nature. The notes consider evidence of relevance to the UK and outcomes for both adults and children. Please see [EIN016](#) for methodology, glossary and evaluation resources.

Summary statement

There is now a substantial body of evidence which tends to demonstrate a positive association between learning which takes place in the natural environment and delivery of a diverse range of learning processes and outcomes, including cognitive outcomes and attitudinal, social and developmental outcomes in people of all ages. There is less evidence available on individual outcomes, how these are enabled, or whether these outcomes are more likely to be delivered through learning outdoors than in the classroom. There is also a small body of evidence which indicates that a greater quantity of natural environments in or around the living or educational setting is associated with positive learning, behavioural and emotional processes and outcomes. The majority of the evidence relates to children. Our understanding

is limited due to many studies being short term and relatively small scale, and the lack of adjustment for confounders and sources of bias. Evidence for particular population subgroups, outcomes, and delivery approaches is patchy.

Review of the evidence

What are the impacts of natural environments on learning?

There is a sizeable body of evidence, including several reviews, which demonstrates positive associations between multiple forms of learning in the natural environment and a range of educational, social, developmental, and mental or physical health outcomes [1-5]. The majority of evidence regarding the processes and impacts of learning in natural environments relates to school children. Some of

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the evidence is drawn from small scale studies with, in the case of the quantitative studies, little use of control groups or accounting for the multiple sources of potential bias [5].

- School students engaged in learning in natural environments have been found to have higher achievement (in comparison to their peers or projected attainment) in reading, mathematics, science and social studies, exhibiting enhanced progress in Physical Education and drama, and a greater motivation for studying science [1-4]. Longer term and 'progressive' experiences appear to result in the greatest benefits and children with below average achievement tended to make progress in learning outcomes to the greatest degree [4].
- In both adults and children there is evidence that learning in natural environments is associated with the accumulation of social capital and with fostering pride, belonging and involvement in the community [4, 6]. A review of evidence relating to structured sustainability education taking place in the natural environment found it resulted in the promotion of a sense of community within and beyond the school [1].
- Attending Forest Kindergarten or Forest School is associated with more advanced motor skills [7, 8], higher rates of physical activity [9], positive play behaviours [10], a range of observed developmental outcomes [11] and states of good mental health [12] in children.
- A schools based learning programme taking place in the natural environment was associated with some improvements in attendance rates [13]. Further studies have found improved behaviour amongst children at a special needs school, sustained over two months, following learning in the natural environment [4].
- A review concluded that the available evidence indicates, on average, school pupils

participating in adventure learning make approximately three additional months' progress in terms of learning outcomes in comparison to their peers (ages not given) [14], impacts were greatest following courses of over a week in duration.

- Evaluation of the health benefits of the John Muir Award¹ found participants developed more positive attitudes to physical activity (in the short term) [15].

What is the impact of the presence of natural environments around the home or learning environment?

Evidence suggests that a greater amount of natural spaces in or around the learning environment (e.g. the school) is associated with better emotional, behavioural and learning processes and outcomes. There is also some evidence which suggests that a greater proportion of natural environments around the home are associated with improved learning outcomes.

There has been no systematic assessment the importance of the *type* of environment on learning outcomes. However, there is some evidence that certain environments (such as forests or more wild spaces) do appear to afford beneficial experiences and outcomes, this finding may be a result of greater levels of specific research interest in these environments. The evidence is mixed in terms of quality, while some studies account for confounding factors (such as socio-economic status) many have not.

- Evidence from Spain found that greater access to public spaces with both natural and aquatic elements (e.g. ponds) was positively associated with a range of behavioural

¹ The **John Muir Award** is an environmental award scheme for people of all backgrounds and ages and is non-competitive, inclusive and accessible.

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indicators [16] and with cognitive development [17] in school children.

- Greener school environments (such as the presence of natural features in the playground) have been linked with better motor skills [8], psychological restoration [18], and rates of physical activity [19].
- There is some evidence of an association between high levels of 'connectedness to nature' in children aged 10-11 years and higher achievement in English examinations (though not for Maths) [20].
- A review found that the specific use of woods or forests as settings was associated with the acquisition of academic, social and personal skills, increases in confidence and self-esteem, and improvements in physical skills [6].

Do the outcomes vary between different groups of people?

Reviews of the literature suggests that whilst there is a systematic lack of information relating to certain groups, the impacts do seem to differ according to socio-demographic characteristics such as gender, socio-economic status, and age [2]. The evidence suggests that learning in natural environments may be of particular benefit to specific groups such as children suffering mental distress, those with low self-perceived social and personal skills [21], children on the autistic spectrum [3] and those with other special needs [4].

- A study of the use of forest environments in educational settings for boys aged 10-12 years suffering 'extreme mental trauma' found increased levels of trust, exploratory activity and social cohesion [22].
- Use of educational adventure activities in natural environments as a tool to develop resilience in university students was found to be beneficial only for female students [23].

- The use of the natural environment as a setting to deliver formal school lessons (for children aged 6-11 years) was associated with (weak) positive impacts to the mental health of the boys taking part, however no impacts were detected in the girls [24].
- A review found evidence of the potential for school based learning in natural environments to support the delivery of the curriculum, for wider personal, social and health education, and the development of social skills and wellbeing amongst autistic children [3].

What are the impacts of the use of natural environments for learning on inequalities?

There appears to have been little consideration of the impacts of the use of, or presence of natural environments on inequalities in learning outcomes, or in relation to social justice [23]. Available evidence suggests there may be inequalities in participation.

- There is evidence that there is a disparity in *who* participates, with individual studies suggesting that children from poorer families, black and minority ethnic groups, and those with low incomes in adulthood are less likely to have the opportunity to engage in learning in natural environments, potentially widening inequalities [1, 21, 25].
- Evidence suggests that targeted opportunities such as the John Muir Award may provide a route to wider participation for such groups [15].

What is the cost effectiveness of learning in natural environments?

There is currently very little information regarding the cost-effectiveness of learning in natural environment [1].

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Implications for policy, service delivery and research

Policy and service delivery

- The weight of available evidence suggests that learning that takes place in the natural environment results in or is associated with a range of positive outcomes for learners of all ages, though particularly for school children, and should, therefore, be supported [1, 2, 4].
- Extra attention should be paid to supporting participation of those with low incomes [21, 25] to ensure parity in opportunity to participate [3]. Natural environment learning providers and commissioners should continue to ensure participation of underrepresented groups [15].
- Planners and developers could consider the role of greener living and educational settings on learning related outcomes, however it should not be assumed that greenspaces will be used unless appropriate to user needs [26]. The involvement of end-users in a design or modification phase would increase likelihood the space is appropriate for use as a learning context.
- In the development of policies or delivery strategies, greater attention should be paid to clarifying and articulating how the use of the natural environment as a setting for learning is likely to be beneficial this would help define the activity, anticipated outcomes and guide evaluative work [4, 27].

Research

- The existing evidence of positive outcomes supports ongoing efforts to better understand the impacts of learning in natural environments. Future research could focus on exploring cost-effectiveness, outcome delivery in different circumstances, and potential to ameliorate or exacerbate inequalities. There is a need to further consider outcomes for different populations, including adults [6], people with disabilities, without employment or not in education [4]. Research funders should support studies which consider long term outcomes.
- Further research is needed on developing theory of change models and explaining mechanisms linking the environment with learning outcomes [14].
- As many interventions are essentially complex and often part of wider programmes of activity, researchers could consider application of the principles of relevant evaluation guidance to optimise intervention design and understand process and outcomes [28]. There is a need to clarify 'what works, when and for whom' [29]. There is potential to make links with the new [Centre for the Evaluation of Complexity Across the Nexus](#).
- Good quality research and evaluation, using robust methodologies and standardised measurement tools, with rigorous reporting, should continue to be integrated into future interventions.
- Continued engagement within the sector through strategic policy, practice and research hubs, focusing on learning in the natural environments, will facilitate the collation and sharing of existing research, the prioritisation of future research needs and improvement in the alignment between policy, service delivery, practice and research. The Natural England and Historic England led Strategic Research Group for Learning in Natural Environments represents a collaboration of research and

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other partners who are now leading development of a more strategic approach to research in this area.

- Continued engagement within the sector through strategic policy, practice and research hubs, focusing on learning in the natural environment, will facilitate the collation and sharing of existing research, the prioritisation of future research needs and improvement in the alignment between policy, service delivery, practice and emerging research [30].



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