

Forest School

Frances Harris

Email: f.harris@herts.ac.uk

Address: School of Education and School of Life and Medical Sciences, University of Hertfordshire, de Havilland Campus, Mosquito Way, Hatfield AL10 9EU, UK.

Please note, this is the pre-publication version of the paper submitted to the journal. At the time of submission, I was asked to place the review methodology ahead of the main body of the review. Subsequently, the journal changed this policy, so the published version has the introduction first. This involved some changing of formatting, particularly figure and reference numbers, at the proofs stage. Figures are at the end of the paper, after the references.

Abstract

This review aims to summarise existing research on the forest-based pedagogical approach known as forest school as developed in the UK. Modelled on the nature kindergartens of northern Europe, forest school is popular in the UK and is now being practiced or explored in other countries around the world. Drawing on papers specifically researching forest school, identified through the Scopus data base, it identifies and reviews key themes emerging from the literature: research on its development, relationship to classroom teaching and the national curriculum, impact on children's development, and on their relationship to the environment and environmental behaviour. It identifies the challenges and tensions emerging in the practice of forest school, between the performative agenda of schools and the alternative learning approaches embedded in forest school praxis. It summarises the attempts by several authors to develop theoretical models of forest school. It discusses the transferability of this forest education practice to new cultures, environments and educational systems. Finally, it concludes by identifying challenges for further research.

Keywords: Forest school; children and nature; Forest education; Environmental education

Review Methodology:

The identification of papers for this review followed the PRISMA guidelines [1]. It was conducted using the Scopus database, searching for publications using the term "forest

school” in the title¹, written in English, and published from 1994, the period when the practice of forest school was developed in the UK [2]. This identified 65 publications either published or in press, ranging in publication date from 2004 to 2021 (Figure 1). The 65 publications were screened manually for eligibility, and publications were removed based on the following issues: papers which referred to forestry training or ecological restoration; comments and corrigenda; books or book chapters; duplicates. The final list of 46 peer-reviewed academic papers was reviewed. Initial reading identified research foci of the papers (Figure 2). Some papers took a broad overview perspective (classified as holistic), others focussed on one or more research foci. 33 of the papers were empirical, the remaining 13 were review papers, critiques, or explored theoretical models for forest school. Further reading and analysis lead to the identification of aggregate themes for presentation in this review (see Figure 3).

[INSERT Figures 1,2 and 3 here]

1. Introduction: Origins and development of Forest School

Forest school is defined as “An inspirational process that offers children, young people and adults regular opportunities to achieve, and develop confidence and self-esteem through hands-on learning experiences in a woodland environment” [3]. It is underpinned by 6 principles as shown in Figure 4.

[INSERT FIGURE 4]

Forest school is situated at the nexus of a range of interests, including risk and adventure, which are often a part of outdoor learning, child-led and play-based or experiential learning; supporting personal, social and emotional development through development of team working and social skills; building confidence through familiarisation and repetition of tasks; and (re)connecting children to nature [4].

The concept and ethos of forest school draws on the writing and practices of educationalists such as Pestalozzi, Steiner, Froebel, Dewey, Isaacs, Montessori and MacMillan, with their focus on outdoor learning, experiential learning, outdoor kindergartens and play with natural materials [2]. It is modelled on nature kindergartens of northern Europe [2]: the Udeskole of Denmark (established since the 1950s [5], the “in rain or shine” kindergartens of Sweden

¹ There is a wider body of research on nature kindergartens and the role of outdoor learning in early years / foundation stage (EYFS) settings, which may include some forest school settings. However, for the purposes of this review, it was decided to focus specifically on papers which refer explicitly to forest school.

(established since 1985 [5], the Waldkindergarten or nature kindergartens of Germany, as well as the Scandinavian concept of friluftsliv (free air life).

Forest School, as practised in the UK, was developed at Bridgewater College in Somerset in the 1990s, following a visit to Denmark by staff who were inspired by the early years practices observed there [2]. At about the same time, the UK Forestry Commission's Forest Education Initiative (FEI) was set up in 1992, with the aim to "Increase the understanding and appreciation, particularly among young people of the environmental, social and economic potential of trees, woodlands and forests and of the link between the tree and everyday wood products" [6]. As forest school developed in the UK, the Forest School Association (FSA) was set up in 2012 [2] and played a role in ensuring quality and consistency of training via a certified training course and accreditation of training providers and practitioners. In 2015, the FSA reported that 12,000 people had trained as practitioners [7]. By 2017, membership of the FSA had reached 2000, and it estimated that there were 10,000 forest schools operating in the UK [8]. Following its wide use in the UK, the model of forest school practised in the UK is now being transferred to other countries around the world (see section 9).

This review will summarise existing peer-reviewed research on forest school, identifying emerging themes arising from the research, as well as identifying challenges within the practice of forest school which would merit further research.

2. Researching forest school

Academic research on forest school was first published in 2004, with a rising number of publications since then (Figure 1). Many initial reports about forest school provided an introduction and overview of the forest school approach and its perceived impacts or benefits [e.g. 9-12], often targeted at sharing knowledge within the education community, rather than research publications in academic journals.

Two early papers [13,14] arising from an evaluation of forest school carried out by the New Economics Foundation, summarised the forest school approach [14] and drew on some case studies to discuss the impacts of forest school [13] and they remain the most highly cited papers. Their findings indicated that Forest school increases self-esteem and self-confidence; improves social skills; contributes to development of language and communication skills; improves motivation and encourages concentration; contributes to children's knowledge and understanding; and improves physical motor skills. Similarly, other papers take an holistic approach, assessing the many ways in which forest school might be of value to children and schools [15-19]. However other papers focus on specific aspects of forest school provision,

including the centrality of child-led and play based learning within forest school [20] and the associated issues surrounding the pursuit of risk and adventure [21].

The research reviewed here draws on a range of sample sizes, age groups, and methods. Early studies drew on case studies, small samples sizes, and mixed methods approaches [e.g. 10,13,15], sometimes attempting to capture “anecdotal evidence” [13]. Empirical research typically involved relatively small sample sizes (less than 40, often about 20); and some very detailed studies are based on as few as 2 children, or interviews with less than 5 teachers or practitioners [21, 22]. One study observed children and collected data over 8 months [13,14] but more commonly data was collected over a period of 6-12 weeks [e.g. 23, 24]

This review presents the academic research under themes (Figure 3) as follows: the relationship between forest school and the national curriculum (Section 3), the impact of forest school on children’s holistic development (section 4), tensions within forest school practice (section 5), forest school and environmental behaviour (Section 6), attempts to theorise and develop models of forest school (section 7), and the globalisation of forest school (section 8). It concludes by identifying areas for further research.

3. Forest School and the national curriculum.

In the UK, forest school is situated alongside, but not part of, the national curriculum, so delivery of forest school is free from the constraints of the national curriculum and associated assessment, and is a more relaxed learning environment for children, and the session leaders [4]. Practitioners often see themselves as facilitators of learning rather than teachers [25].

Some schools use forest school as an intervention to support science learning. However, in general forest school sessions are not led by the classroom teacher, which limits the ability to directly integrate forest school activities with classroom learning. Furthermore, research with practitioners found that they felt that an outdoor science class was not a forest school session, as the ethos of each was quite different [25]. While many papers acknowledge the potential of forest school to address topics in the national curriculum, the focus is less on teaching curriculum topics and more on other outcomes from forest school. Researchers have identified how forest school can link to the curriculum [24,25] and yet have also identified that supporting subject-specific learning is not the main aim of forest school [25]. Some note that practitioners felt that learning about nature (linking to the science curriculum) was incidental to the greater goals of development of a relationship with nature, and relationships with others [25].

Forest school draws on several different research and practice agendas within the outdoor learning and education sectors [4]. Practitioners may come to forest school via a range of backgrounds, including classroom teachers keen to take their learning outdoors, and those from the outdoor learning or environmental education sectors wishing to engage more with children. Thus, the practice of forest school may draw on a range of conceptual (biophilia (our innate affinity to the natural world), sustainability, nature therapy) and practical (bushcraft, outdoor and adventure education, play-based learning) skills [9, 15, 20, 25, 26, 27]. Forest school training programmes bring together a mix of information about child development, practical skills, and nature education. This can include “play types” [27], signs of well-being [28], “emotional intelligence” [29] and schemas [30]. The central focus is on play-based experiential learning using natural materials draws on Froebel and Dewey.

Principles 3, 4 and 5 of Forest school (see Figure 1) highlight a learner-centred approach, holistic development to foster resilient learners, and learning to assess and take risks. Principles 1 and 2 note that this should be achieved through offering repeated opportunities, in a natural environment, with a view to developing a relationship with the natural world.

4. Personal, social and emotional development at forest school

The value of forest school in supporting children’s personal, social and emotional development and wellbeing, through supporting language development, creativity, social and team work skills, self confidence and self esteem is also noted [4,31,32]. Partly this is attributed to the freedom to allow children to “take what they need” [16]. This can involve working at their own level, gradually developing skills, knowledge or expertise through repetition, away from the targets of the national curriculum [25], engaging in small and repeatable tasks so increasing self esteem, and development social skills through team work [32]. A more supportive learning environment, which includes a less structured pedagogy, more supportive adults, and a philosophy of “small achievable steps” encourages children to engage and grow in confidence [32]. However, these claims are not without their critics [33], who argue that the whole concept of self-esteem is too vague, and that teacher’s may not be able to accurately assess it.

Overall, the impact of forest school on children’s wellbeing (broadly defined) has been of interest, and is likely to be of further interest post-covid, as there is a growing awareness of children’s mental health and wellbeing following the challenges and interruptions to schooling during lockdowns and school closures, and the loss of socialising opportunities especially among very young children. The restorative effects of forest school, particularly for girls, have been noted [23] as has the impact of forest school on the mental health and wellbeing of teenage girls, identifying that it improved mood, confidence, social skills and

relationships [34]. Research with 11 disadvantaged boys noted a positive impact of forest school on self-esteem [35]. It has been proposed that forest school can support children's autonomy, competence and relatedness, drawing on self-determination theory [36]. A comprehensive theory of change for forest school was developed and used to identify impacts of forest school on both primary children and secondary-aged children at a specialist school catering for those with high anxiety and a record of non-attendance at school [16]. The study noted impacts on engagement and enjoyment at schools, relationships with peers, and self-image. Feedback from a survey of schools identified that children who were very quiet or elective mute in the classroom were more vocal outdoors at forest school [32]. In particular, it has been observed that the outdoor learning environment at forest school can be very sportive of children with attention deficit hyperactivity disorder (ADHD) or special educational needs (SEN) in schools: a small-scale study with children with autistic spectrum disorder and severe learning difficulties found that children, parents and teachers all noted positive outcomes in terms of academic, social and practical experiences [22]. The learning space offered by forest school offered freedom from the norms and expectations associated with the indoor classroom environment, which can reduce stress for children with ADHD or on the autistic spectrum [4].

5. Tensions within forest school practice

Forest school is often considered an alternative learning space [4,37-40] which provides a break from normal routines and expectations of the classroom. Tensions arise as teachers and practitioners seek to position themselves between the demands of a national curriculum with performative assessment criteria, and the freedoms which forest school offers [4,25,38], which includes the nature of the relationship and rapport between teachers and children and the more relaxed learning style of child-lead learning [25]. Research suggests that even children can recognise that the goals of forest school and classroom teaching can be divergent, and that children question the value of forest school for traditional academic learning, even while enjoying it [37].

The constraints of the curriculum and accountability agenda potentially limit what children can learn at forest school [41]. Some head teachers view forest school as a risk, concerned that children might learn less when removed from the classroom; others see forest school as an intervention, structured specifically around supporting underachieving children to meet their targets; and others see it as a respite from curriculum and classroom pressures. This highlights the dilemma of whether to use forest school to support pupils in a more holistic and general way to support their ability to learn, or to support specific learning of curriculum goals.

The relationship between teachers and forest school has been investigated. Teachers can be seen as having one of 4 roles with respect to forest school [42]. As 'critical stakeholders' of forest school, they identify it as a useful way of teaching to support raising educational attainment, particularly for those children with additional learning needs. As 'consumers' of forest school, they are bringing in a form of teaching which provides a badge or distinctiveness for the school. But tensions arise when teachers are identified as 'unenlightened': unable to understand the ethos of how forest school is delivered (including the role of risk) and the changes from teaching to facilitation of learning. Finally, the research identifies the potential of seeing teachers as 'agentic': wishing to adapt forest school practices to meet the needs of the particular children and setting at each school. This could lead to further tensions as the FSA seeks to ensure consistency and standardisation of Forest school.

Tensions have also arisen in relation to the roles of teachers and forest school leaders concerning management of risk [21]. A typical forest school may involve fires, tool use, tree climbing, and risky play, therefore a fundamental part of learning at forest school involves children's ability to identify, assess and cope with risk and take "supported risks" [43]. In their comprehensive survey of practitioners and parents they identified 'risk averse' and 'risk permissive' parents and practitioners, as well as those with a more 'measured' response. They also noted that children learned to identify and assess risks, and adopt certain guidelines for activities (e.g. things are more slippery when wet, therefore riskier). Several studies have identified attitudes and management of risk at forest school as a contentious issue, particularly affecting the relationship between practitioners, trained to support the forest school ethos towards risk, and teachers, concerned to meet health and safety regulations [21,44]. Further, there are tensions within individuals regarding their desire to encourage children to take risks, and their fear of consequences (to child, and in terms of liability) should things go wrong [43, 45].

Finally, with the increasing number of people taking on training to become forest school leaders, some concerns have been raised about the ability of a relatively short course to transform people into confident leaders of activities in a forest setting [46].

6. Forest school and environmental behaviour

There is a particular interest in how forest school can support children's connection to nature and place, and the development of pro-environmental behaviour. Forest school is seen as a potential way to address concerns that children are increasingly disconnected from nature [47-51]. Existing research indicates the importance of formative experiences in nature for the development of pro-environmental behaviours [e.g 52-58]. Research on forest school and identified that although fostering relationships with nature and pro-environmental behaviours was one of the aims of forest school, there was little evidence to indicate whether

this was happening [51]. The potential of forest school to contribute to this is recognised, but a lack of data to support this has been identified [38].

The '5 Pathways to nature connection' [59] comprising contact, emotion, meaning, compassion and beauty, may provide ways in which forest school can foster connection to nature [31]. Subsequent research has drawn on a range of methods in addressing this question. An ethnographic study of schools which consciously used forest school sessions to teach science found it was the unstructured, spontaneous encounters with nature which precipitated a more embodied and meaningful engagement with their surroundings, and generated a relationship and sense of care [7]. Practitioners felt that forest school was more focussed on nature engagement than learning about nature: they noted that while some children might initially exhibit destructive behaviours in nature (eg damaging trees) this changed to more caring behaviours over time [25]. Later research identified a potential pathway from first visits to the wood to learning about nature, developing an ethos of care, and developing pro-environmental behaviours while at forest school [60] and concludes "Through regular and repeated activities in a natural setting at forest school sessions, children learn to become more relaxed in the forest school environment, overcome any fears, have fun, connect with nature, have positive experiences, develop an affinity for the location, value nature and seek to protect it" [60 p1224].

The Connection to Nature Index for Parents of Preschool Children has been used to consider the impact of nature nurseries on children aged 1-8 years [61]. The findings indicated that attendance at nature nurseries was linked to nature connection, and that parental nature connection as also an important factor. Similarly, a survey of environmental attitudes amongst children at primary school and noted a positive effect of attendance at forest school [62]. A longitudinal study of 11 disadvantaged (socially, behaviourally, economically) children who enjoyed forest school as a supportive intervention found that they all learned more about nature, becoming "wild experts" in their school, and most showed higher scores on the Connection to Nature index [35].

Only a few papers discuss place attachment. Drawing on experience in Australia where forest school has been offered under the name "bush school", a case study of a single school, involving observation, focus groups with school children, semi-structured interviews with staff and analysis of photographs, reported that students developed a sense of place over time, through place attachment and place meaning [63]. They reported children experience enjoyment and fun, become more comfortable with the setting, develop new social relationships, and an ethos of care for the environment. Research in the UK drawing on semi-structured interviews with forest school practitioners found "forest school space is endowed with value as a space of fun, learning, positive memories and personal development, so becoming a specific place to which children become attached" [60, p1224]

7. Models and theorisation of forest school

It is notable that despite the emerging body of work on forest school, there remains a struggle to provide a clear basis of the model of forest school, its underpinning theories, and a theory of change, against which evaluations of impact can be made. Several papers explore some possible theories which might be applied.

The theory of ecological dynamics has been applied to forest school [27]. Researchers identified the important role of practitioners in being able to recognise and respond to individual children. They suggest that the forest school environment provides affordances to children, and each child will respond to the situation and opportunities according to what they need. They acknowledge that affordances can be affected by 'rate limiters' which include emotional readiness of participants, or practitioners' capacities. Importantly, they recognise that activities and learning at forest school needs to be transferable to other situations, so that steps taken forward at forest school can also be transferred to other situations. A key point in their argument is that a well-designed forest school is not a programme which uniformly develops all children, but instead the presentation of a conducive environment to all children: each will then respond and develop in their own individual way.

Research with practitioners and teachers to co-produce a theory of change model for forest school highlighted the importance of the learner-led pedagogy of forest school (see principle 3) which allowed each child to "take what they need" and benefit in individual ways from forest school [16].

A theory of cultural density has been proposed [40], where cultural density is as "the nature, thickness and dominance of habitus and norms of practice in places" [64, p413]. Referring to the fact that schools are spaces of norms of practice and behaviour, they suggest outdoor learning, particularly if informal, results in a cultural lightness which "opens a space ... to experiment with other ways of being, supporting creative learning" [64 p419]. They do also warn that stronger links between forest school and classroom-based learning (and the performative agenda of the national curriculum) may compromise the light cultural density of forest school. Furthermore, they acknowledge that rigidity in the practise of forest school (in terms of rules / practises and location) may result in the development of cultural density within forest school.

Others consider the relevance of self-determination theory to forest school, and issues of autonomy, competence and relatedness [36]. They argue the aim of teachers is to support children's natural inquisitiveness, or their intrinsic motivation to learn. Choice allows children

to be self-directed in their learning. The forest school leader plays a role as a facilitator who encourages further exploration and creativity. With time, children gain competence, which then reinforces motivation. They also acknowledge the importance of appropriate levels of challenge and risk leading to resilience.

Forest school has also been related to Bronfenbrenner's' bio-ecological model [65] which situates the child at the centre of a series of "systems" from microsystem (family) through meso - school; neighbourhood (exo), macro (culture and chrono (changes over time). When applied to forest school, this theorisation sees the child at the centre of experiences of nature at home; nature based pedagogy in school (ie forest school, among others), opportunities to engage with nature in the lived environment, heritage and history of nature in culture, and changes in access to nature over time. Further, this structure is situated within the Process - Person - Context - Time approach subsequently developed in relation to Bronfenbrenner's bio-ecological model [66-67]. This acknowledges the role of proximal and more distant processes over time; the individual characteristics of each child; the significance of contextual factors such as, among other things, access to greenspace; and time.

Thus, attempts to identify an underpinning theory or model to explain forest school are underway, but have yet to converge towards a common understanding. However, some common findings are emerging. The child-led pedagogy where children can choose what to do, and learn at their own pace, has been identified as important in allowing children to follow individual learning journeys through forest school. The move from teaching to facilitation of learning, is noted. The difference between a classroom environment where a specific curriculum and norms of behaviour are followed is contrasted with the freer, more responsive learning space of forest school where children can be more inquisitive, use the affordances of the natural environment, and behave more freely. A challenge remains to determine whether, and how, skills and interests developed in the forest school setting can be transferred to the classroom setting [16].

8. Globalisation of forest school

Forest school is increasingly being adopted in other countries, supported by training from providers in the UK and modelled on their practise. Research from Canada indicates that forest school has been practiced there for 20 years [68,69] and appears to draw on a mixture of grass-roots development of nature kindergartens [e.g. 70] at some venues, and the exportation of the UK model to Canada in others [71]. Attempts to transfer the UK model to other countries have had mixed reviews, with some authors arguing that a "drag and drop" approach does not work [72], referring to its use in Australia, and that local place based educational practices are more suitable. An adaptation of forest school called "bush school"

is promoted in Australia [e.g. see 63 which explores the potential of this). In Turkey, there are a growing number of researchers, and academic papers, exploring the development of forest school [73,74]. In South Korea, the potential of forest school has been examined in relation to character education [75]. Forest school is also being explored in Malaysia [76] and the United Arab Emirates [77]). As was the case in the UK, early papers from these locations tend to take a more general overview of the potential benefits of forest school, rather than focusing on specific issues.

However, there are challenges to its adoption globally, including the need to adapt forest school to local environments including ecology, climate, educational systems and culture [77]. There have been calls to ensure that this practice reflects indigenous knowledge [7,77, 78], something also recognised in the development of nature kindergarten in other areas of Canada [70].

9. Conclusions: Challenges and further research

Forest school, while widely adopted, remains somewhat of an enigma. While enthusiasts might argue that it is transformational for individual children, there is, as yet, no agreed model of transformational process, or theory of change. This is partly due to the variability of individual forest school provision [10], which depends on the site, children, forest school practitioners and weather, and the wide range of children who engage in the programme.

A further challenge is that the research reviewed draws on a mixture of voices: children, practitioners, teachers, senior-leadership teams, or a mixture of several of these within a single study. Allowing teachers, parents and practitioners to speak for children has its challenges. For example, it has been argued that teachers are unlikely to be able to identify and assess self-esteem in children attending forest school [33]. Researching with children, especially very young children, has its particular challenges [79]. As much of forest school works particularly with children at nursery or early years / key stage 1 level, there is the challenge of collecting any written feedback, be that in the form of questionnaires, pre and post assessments etc [23], and there are further difficulties of using wellbeing measures with children [16]. Research studies focus on short term impacts of forest school, and there is a dearth of longer-term studies which could measure the benefits of forest school on wellbeing, educational attainment, or nature connection over the longer term.

Research on forest school should continue to explore the tensions in its delivery, and how to negotiate those effectively, including the relationship between forest school and teaching of the national curriculum, and how children, parents, teachers and practitioners view risk. The relationship between practitioners and classroom teachers, and the transferability of learning at forest school to the classroom setting, has also been identified as a knowledge gap [27].

The currently widely adopted and promoted model of Forest school has been developed in the UK, for use in a specific ecological, educational and cultural context. Its exportation to other countries merits further exploration. The globalisation of forest school will require innovation to ensure that programmes are responsive to place, environmental issues, and local people's concerns. Already, critiques are arising [72, 76-78], partly due to its lack of engagement with indigenous culture, partly due to different emphases within outdoor learning, in particular the place-based approach to education.

10. References

1. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 2009; 6(7): e1000097. doi:10.1371/journal.pmed1000097
2. Cree J, McCree M. A brief history of the roots of forest school in the UK. *Horiz* 2012; 60: 32-34.
3. Forest Education Initiative. What is an FEI recognised Forest School? 2005 http://www.foresteducation.org/forest_schools.php accessed on 22/08/06
4. Harris F. Outdoor learning spaces: The case of forest school. *Area* 2018;50(2):222-231.
5. Sobel D. Learning to walk between the raindrops: the value of nature preschools and forest kindergartens. *Child Youth Environ* 2014; 24(2): 228-238.
6. O'Brien L, Lovell R. A review of the Forest Education Initiative in Britain. Farnham: Forest Research; 2011.
7. Mycock K. Forest schools: moving towards an alternative pedagogical response to the Anthropocene? *Discourse* 2020;41(3):427-440.
8. McCree M, Cree J. Forest school: core principles in changing times. In: Waite S, editor. *Children learning outside the classroom from birth to eleven*. 2nd ed. London: Sage; 2017. P. 222-232.
9. Knight S. *Forest School for All*. London: Sage; 2011.
10. Davis B, Waite S. *Forest school: opportunities and challenges in the early years*. Plymouth: University of Plymouth; 2005.
11. Borradaile, L., *Forest School Scotland: An evaluation*. Report to Forest School Scotland and the Forest Education Initiative; 2006
12. Knight S. *Forest schools and outdoor learning the early years*. London: Sage; 2009.
13. O'Brien L, Murray R. Forest School and its impacts on young children: Case studies in Britain. *Urban For Urban Greening* 2007;6(4):249-265.
14. O'Brien L. Learning outdoors: The forest school approach. *Educ 3-13* 2009;37(1):45-60.
15. Maynard, T. Forest schools in Great Britain: an initial exploration, *Contemporary issues in early childhood* 2007; 8(4) 320 – 331.

16. Tiplady LSE, Menter H. Forest School for wellbeing: an environment in which young people can 'take what they need'. *J Adventure Educ Outdoor Learn* 2021;21(2):99-114.
17. Slade M, Lowery C, Bland K. Evaluating the impact of Forest Schools: A collaboration between a university and a primary school. *Support Learn* 2013;28(2):66-72.
18. Elliott H. Forest School in an inner city? Making the impossible possible. *Educ 3-13* 2015;43(6):722-730.
19. Mackinder M. Footprints in the woods: 'tracking' a nursery child through a Forest School session. *Educ 3-13* 2017;45(2):176-190.
20. Ridgers ND, Knowles ZR, Sayers J. Encouraging play in the natural environment: A child-focused case study of Forest School. *Child Geogr* 2012;10(1):49-65.
21. Maynard T. Encounters with forest school and Foucault: A risky business? *Educ 3-13* 2007;35(4):379-391
22. Bradley K, Male D. 'Forest School is muddy and I like it': Perspectives of young children with autism spectrum disorders, their parents and educational professionals. *Educ Child Psychol* 2017;34(2):80-96.
23. Roe J, Aspinall P. The restorative outcomes of forest school and conventional school in young people with good and poor behaviour. *Urban For Urban Greening* 2011;10(3):205-212.
24. Murphy MC. 'Exploring the "Construction" strand in the Irish Primary School Visual Arts Curriculum through the Forest School approach'. *J Adventure Educ Outdoor Learn* 2018;18(3):257-274.
25. Harris F. The nature of learning at forest school: practitioners' perspectives. *Educ 3-13* 2017;45(2):272-291.
26. Leather M. A critique of "Forest School" or something lost in translation. *J Outdoor Environ Edu* 2018;21(1):5-18.
27. Sharma-Brymer V, Brymer E, Gray T, Davids K. Affordances guiding Forest School practice: the application of the ecological dynamics approach. *J Outdoor Environ Edu* 2018;21(1):103-115.
28. Laevers F. The Project Experiential Education. Well-being and involvement make the difference. *Early Educ*; 1999: 27
29. Goleman D. *Working with Emotional Intelligence*. London: Bloomsbury 1998.
30. Athey, C. *Extending Thought in Young Children*. 2nd ed. London: Paul Chapman; 2007.
31. Cudworth D, Lumber R. The importance of Forest School and the pathways to nature connection. *J Outdoor Environ Edu* 2021;24(1):71-85.
32. Swarbrick N, Eastwood G, Tutton K. Self-esteem and successful interaction as part of the forest school project. *Support Learn* 2004;19(3):142-146
33. Leather, M. 'It's good for their self-esteem': the substance beneath the label. *Journal of Adventure Education and Outdoor Learning* 2013;12(2): 158-170.
34. Manner J, Doi L, Laird Y. 'That's given me a bit more hope'—adolescent girls' experiences of Forest School. *Child Geogr* 2021;19(4):432-445.

35. McCree M, Cutting R, Sherwin D. The Hare and the Tortoise go to Forest School: taking the scenic route to academic attainment via emotional wellbeing outdoors. *Early Child Dev Care* 2018;188(7):980-996.
36. Barrable A, Arvanitis A. Flourishing in the forest: looking at Forest School through a self-determination theory lens. *J Outdoor Environ Edu* 2019;22(1):39-55.
37. Coates JK, Pimlott-Wilson H. Learning while playing: Children's Forest School experiences in the UK. *Br Educ Res J* 2019;45(1):21-40.
38. Cudworth D. Promoting an emotional connection to nature and other animals via forest school: disrupting the spaces of neoliberal performativity. *Int J Sociol Soc Policy* 2020;41(3-4):506-521.
39. Pimlott-Wilson H, Coates J. Rethinking learning? Challenging and accommodating neoliberal educational agenda in the integration of Forest School into mainstream educational settings. *Geogr J* 2019;185(3):268-278.
40. Waite S, Goodenough A. What is different about Forest School? Creating a space for an alternative pedagogy in England. *J Outdoor Environ Edu* 2018;21(1):25-44.
41. Kemp N, Pagden A. The place of forest school within English primary schools: senior leader perspectives. *Educ 3-13* 2019;47(4):490-502.
42. Kemp N. Views from the staffroom: forest school in English primary schools. *J Adventure Educ Outdoor Learn* 2020;20(4):369-380.
43. Savery A, Cain T, Garner J, Jones T, Kynaston E, Mould K, et al. Does engagement in Forest School influence perceptions of risk, held by children, their parents, and their school staff? *Educ 3-13* 2017;45(5):519-531.
44. Button J, Wilde A. Exploring practitioners' perceptions of risk when delivering Forest School for 3- to 5-year-old children. *Int J Play* 2019;8(1):25-38.
45. Connolly M, Haughton C. The perception, management and performance of risk amongst Forest School educators. *Br J Sociol Educ* 2017;38(2):105-124.
46. Morgan A. Culturing the fruits of the forest: realising the multifunctional potential of space and place in the context of woodland and/or Forest Schools. *J Outdoor Environ Edu* 2018;21(1):117-130.
47. Louv R. *Last Child in the woods*. New York: Algonquin Books; 2005
48. Hunt A, Burt J, Steward D. *Monitor of Engagement with the Natural Environment: a pilot for an indicator of visits to the natural environment by children - interim findings from Year 1 (March 2013 to February 2014)*. Natural England Commissioned Reports, Number 166. Natural England; 2015.
49. England Marketing. *Report to Natural England on Childhood and nature: A survey on changing relationships with nature across generations*. Warboys, Cambridgeshire: England Marketing 2009.
50. Sustainable Development Commission. *Children and nature: A quasi-systematic review of the evidence*. London: Greater London Authority; 2011
51. Smith MA, Dunhill A, Scott GW. Fostering children's relationship with nature: exploring the potential of Forest School. *Educ 3-13* 2018;46(5):525-534.

52. Beery, TH, and Wolf-Waltz, D. Nature to place: Rethinking the environmental connectedness perspective. *J Environ Psychol* 2014; 40:198-205.
53. Chawla L, Cushing F. Education for Strategic Environmental Behaviour. *Environ Educ Res* 2007; 13, 437–452.
54. Collado S, Corraliza JA, Staats H, Ruiz M. Effect of frequency and mode of contact with nature on children's self-reported ecological behaviors. *J Environ Psychol* 2015; 41: 65-73.
55. Ernst J, Theimer S. Evaluating the effects of environmental education programming on connectedness to nature. *Environ Educ Res* 2011; 17(5): 577–598.
56. Kellert SR. Nature and childhood development. In: Kellert SR, editor *Building for Life: Designing and Understanding the Human-Nature Connection*. Washington: Island Press; 2005 p. 63-89.
57. Palmer JA, Suggate J, Robottom I, Hart P. Significant Life Experiences and Formative Influences on the Development of Adults' Environmental Awareness in the UK, Australia and Canada. *Environ Educ Res* 1999; 5(2):181-200.
58. Pretty J, Angus C, Bain M, Barton J, Gladwell V, Hine R, Pilgrim S, Sandercock G, Sellens M. Nature, Childhood, Health and Life Pathways. ICES Occasional Paper 2009-02. Colchester: University of Essex.
59. Lumber R, Richardson M, Sheffield D. Beyond knowing nature: Contact, emotion, compassion, meaning, and beauty are pathways to nature connection. *PLoS ONE* 2017; 12(5): e0177186
60. Harris F. Developing a relationship with nature and place: the potential role of forest school. *Environ Educ Res* 2021;27(8):1214-1228.
61. Barrable, A., and Booth, D. Nature Connection in Early Childhood: A Quantitative Cross-Sectional Study. *Sustain* 2020; 12: 375.
62. Turtle C, Convery I, Convery K. Forest schools and environmental attitudes: A case study of children aged 8-11 years. *Cogent Educ* 2015;2(1).
63. Cumming F, Nash M. An Australian perspective of a forest school: shaping a sense of place to support learning. *J Adventure Educ Outdoor Learn* 2015;15(4):296-309.
64. Waite S. 'Knowing your place in the world': how place and culture support and obstruct educational aims, *Cam J Educ* 2013; 43(4): 413-433
65. Murphy MC. Bronfenbrenner's bio-ecological model: a theoretical framework to explore the forest school approach? *J Outdoor Environ Edu* 2020;23(2):191-205.
66. Bronfenbrenner U, Morris, PA. The Ecology of Developmental Processes. In W. Damon W, Lerner, RM editors. *Handbook of Child Psychology Vol 1, Theoretical Models of Human Development*. West Sussex: John Wiley and Sons, 1998. p. 993 – 1028.
67. Bronfenbrenner U, Morris PA. The Bioecological Model of Human Development. In Lerner RM and Damon WE editors. *Handbook of Child Psychology: Vol 1, Theoretical Models of Human Development*. West Sussex: John Wiley and Sons, 2006 p. 793- 828.
68. Boileau EYS, Dabaja ZF. Forest School practice in Canada: a survey study. *J Outdoor Environ Edu* 2020;23(3):225-240.

69. Dabaja ZF. Reviewing two decades of research on the Forest School impact on children: The sequel. *Educ 3-13* 2021.
70. Elliot E, Krusekopf F. Growing a nature kindergarten that can flourish. *Aus J env Ed* 2018; 34(2): 115-126.
71. MacEachren Z. The Canadian forest school movement. *LEARNing Landscapes* 2013;7(1):219-223.
72. Lloyd A, Truong S, Gray T. Place-based outdoor learning: more than a drag and drop approach. *Journal of Outdoor and Environmental Education* 2018; 21:45–60.
73. Bal E, Kaya G. Investigation of forest school concept by forest school teachers' viewpoints. *Intl Electron J Environ Edu* 2020;10(2):167-180.
74. Dilek Ö, Atasoy V. Forest school applications in pre-school period: A case study. *Intl Electron J Environ Edu* 2020;10(2):195-215.
75. Lee S-, Chung M-. Design and application of character education in forest school program for primary school children. *Information* 2017;20(12):8333-8340.
76. Wahab NA, Goh PS-, Ong E-, Ibrahim MH, Affandi HM. Construction of the forest school framework based on indigenous knowledge in Malaysia. *Cakrawala Pendidik* 2020;39(2):269-278.
77. Takriti R, Wright E, Alhosani N, Schofield, L. Forest School to Desert School: An innovative project in Al Ain, UAE. *Childhood Edu* 2020;96:5
78. MacEachren Z. First Nation pedagogical emphasis on imitation and making the stuff of life: Canadian lessons for indigenizing Forest Schools. *J Outdoor Environ Edu* 2018;21(1):89-102.
79. Harris F. Children and Nature: Measuring Success, *Child Youth Environ* 2010; 20(2): 223-225

Figure 1: Results of search of Scopus database, indicating number of Peer-reviewed academic journal papers published each year with “forest school” in the title.

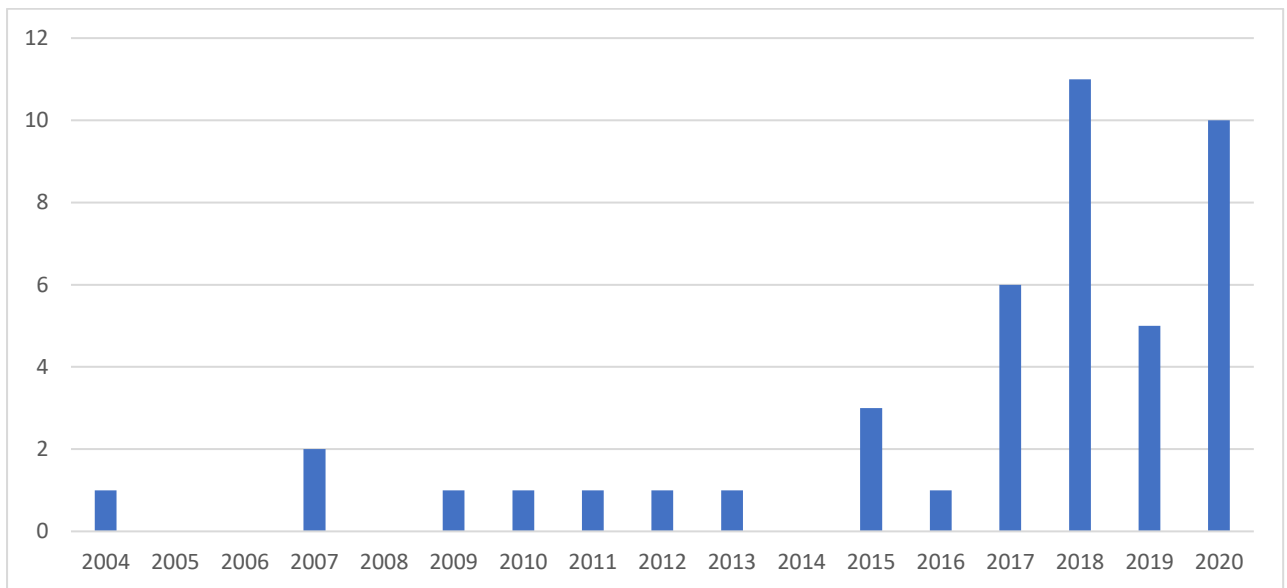


Figure 2: Initial analysis of publications by research topics. Some papers took a broad overview perspective (classified as holistic), others focussed on one or more research foci.

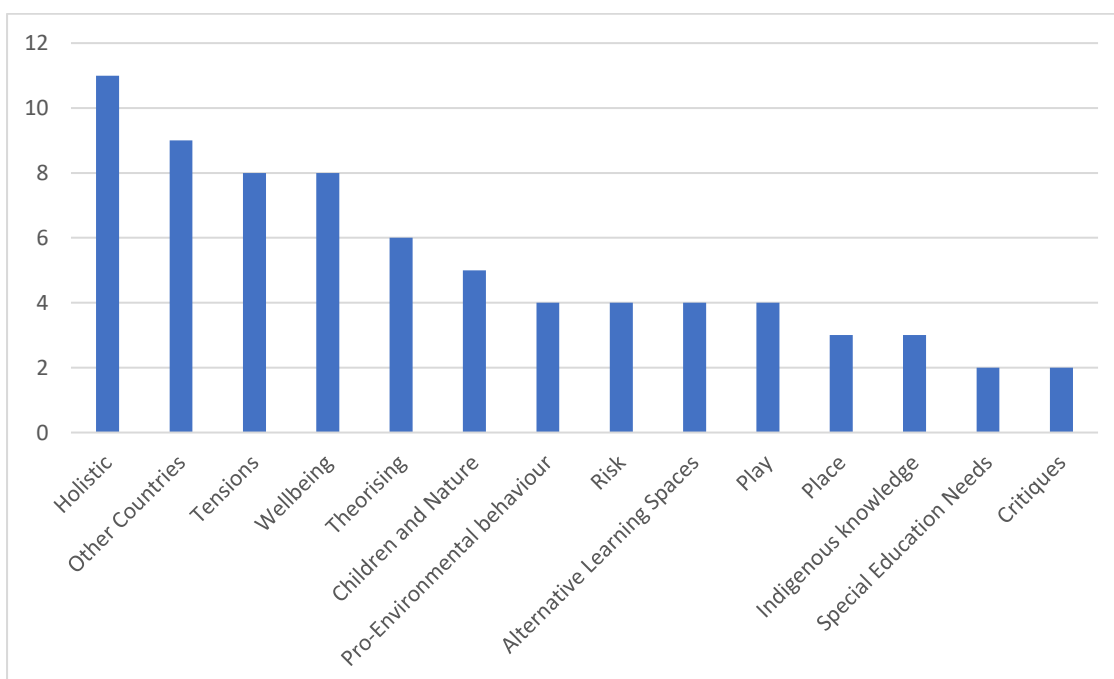


Figure 3: Connection between research foci identified in papers and aggregate themes presented in the review.

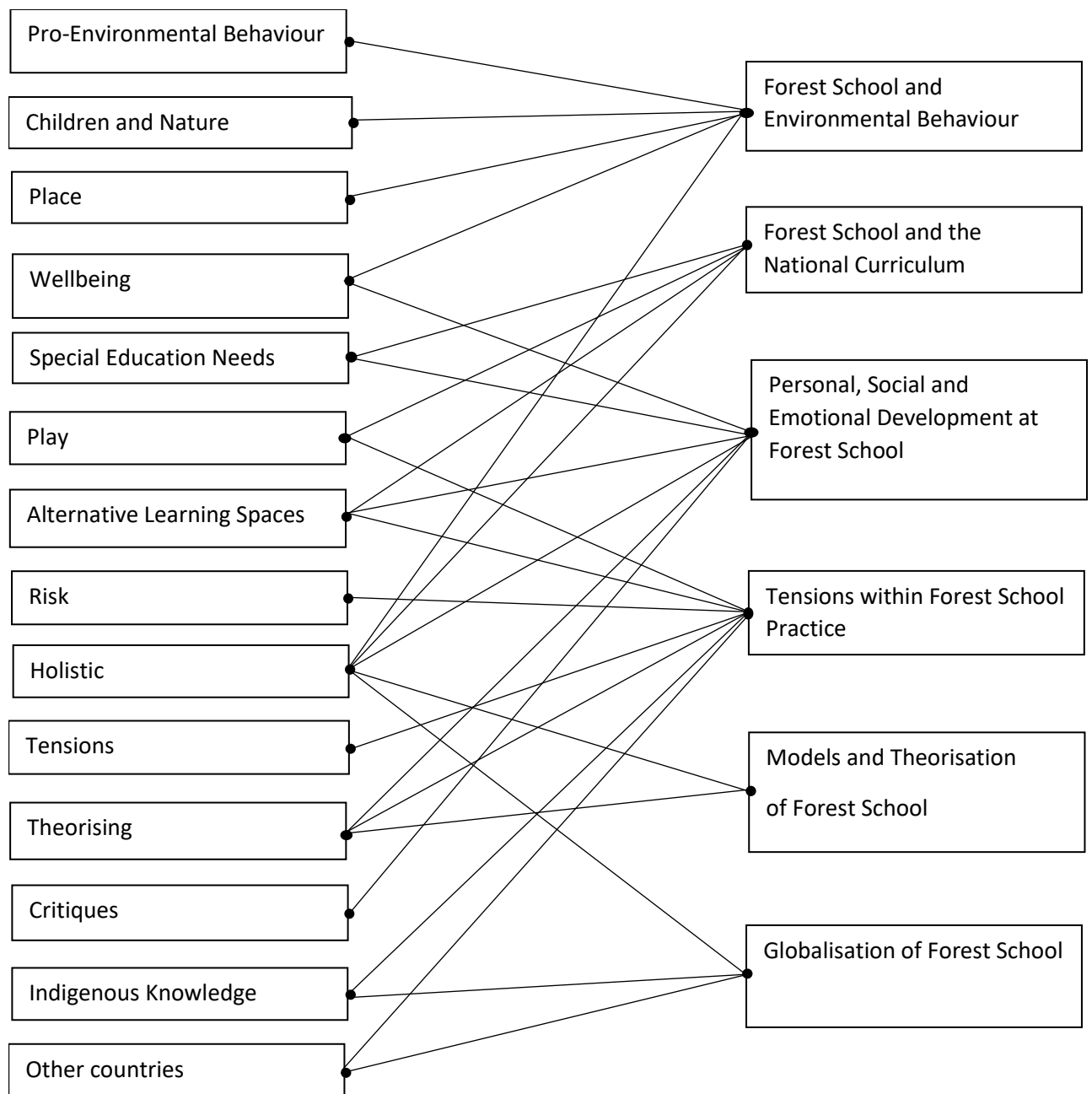


Figure 4: Principles of Forest School

1. Forest School is a long-term process of regular sessions, rather than one-off or infrequent visits; the cycle of planning, observation, adaptation and review links each session.
2. Forest School takes place in a woodland or natural environment to support the development of a lifelong relationship between the learner and the natural world.
3. Forest School uses a range of learner-centred processes to create a community for being, development and learning.
4. Forest School aims to promote the holistic development of all involved, fostering resilient, confident, independent and creative learners.
5. Forest School offers learners the opportunity to take supported risks appropriate to the environment and to themselves.
6. Forest School is run by qualified Forest School practitioners, who continuously maintain and develop their professional practice.

Source: (FSA website <https://forestschoollassociation.org/what-is-forest-school/> accessed 18/6/2021)