The Educational Outcomes of Learning for Sustainability: A Brief Review of Literature

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The Educational Outcomes of Learning for Sustainability: A Brief Review of Literature

A Report for the Scottish Government Learning Directorate

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The views expressed in this report are those of the researchers and do not necessarily represent those of the Scottish Government or Scottish Ministers.

Executive Summary

1.0 The review examines literature relating to the educational outcomes of Learning for Sustainability (LfS), as understood in terms of policy development within and across Scotland. The review is intended to inform further research and also be of value in policy development. Additionally, this overview can inform developments related to curricular reform in Scottish education, and support and foster understanding of process and outcomes relevant to recent growth in Learning for Sustainability (and outdoor learning) throughout the UK and internationally.

1.1 Whilst compiling this literature review a 10-country UNESCO study (2019) was published, which considered the national focus on learning dimensions (specifically, cognitive, social and emotional, and behavioural domains) within Education for Sustainable Development and Global Citizenship Education. The study highlights the need for research which examines specific learning processes and the impact on educational outcomes, which suggests that this Scotland-specific, LfS-focused study is timely and consistent with international research agendas and direction.

1.2 The Learning for Sustainability (LfS) policy context in Scotland is globally unique in that it brings together education for sustainable development (ESD), global citizenship (GC) and outdoor learning (OL) as an integrated holistic concept (Scottish Government, 2012). It is an entitlement of all pupils, a professional registration requirement of the General Teaching Council for Scotland (GTCS, 2019), and currently a priority in Scottish education.

1.3 The specific educational outcomes the Scottish Government deemed relevant to this review are drawn from the 'four capacities'[1] of Curriculum for Excellence (CfE) (Education Scotland, 2008). Consequently, the list below formed the main analytical framework of the review and report:
- impact on confidence of learners
- impact on the personal and social development of learners

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[1] A central focus of Curriculum for Excellence is to help learners to become successful learners; confident individuals; effective contributors and responsible citizens. These are known as the 'four capacities'.

- impact on understanding of citizenship
- impact on attainment
- impact on skills for life and work beyond formal education
- impact on closing the poverty-related attainment gap or reducing inequity within education
- impact on overall school improvement

1.4 A three-phase approach was adopted which included initial searches conducted through EBSCO Host via University of Edinburgh library focusing on six databases using Boolean searches with a combination of keywords with AND/OR operators to produce more relevant results and further targeted searches. All papers reviewed were ranked using a 0 to 4 star rating scale based on relevance, methodology and analysis (with 4 being the top rating).

- *Phase 1: Primary, focused review:* A purposive sampling approach was adopted which drew on a number of primary sources such as databases covering journal articles, books, theses and dissertations. This covered national and international material, grey literature, emerging student work and published, peer-reviewed materials. Full details of the indicative primary searches and the analysis of study quality are outlined in detail below.

- *Phase 2: Secondary, wider review:* The primary review unearthed secondary sources such as reference lists within policy documents, literature that came through searches for other projects, or resources that the authors were aware of through their own work and teaching. Therefore, this phase focused on material drawn from sources beyond the parameters of the primary review.

- *Phase 3: Consultation:* Additionally, a consultation phase with specialist colleagues in the field in Scotland facilitated a review for completeness (of sources used) and accuracy (of interpretation). This process also revealed particular articles pertinent to the study; both relevant to the general discussion, context and overview, and to some aspects of the influence of LfS on attainment.

In summary, following a series of refinements to narrow the searches; including setting inclusion and exclusion criteria, reviewing search parameters, narrowing date ranges and a manual review of abstracts including a quality ranking, the primary database (Phase 1) was reduced to 76 articles, with 51 awarded a

subjective 3 or 4 star rating deeming them relevant for inclusion and a more thorough examination.

1.5 In reviewing these articles it became evident that the term 'Learning for Sustainability' was rarely used by authors. This is unsurprising, as this has a particular meaning in Scottish policy as per above (1.2). Whilst all three of the 'components' of LfS appeared in the literature, the most common term used by authors was 'Education for Sustainable Development' (ESD - and synonyms). This is due to its wide acceptance and it being the term favoured by UNESCO. Whilst the widely acknowledged limitations of 'ESD' led to the development of the concept, definition and adoption of the more holistic term (LfS) used in Scotland, this review must accept the dominance of ESD as a term. Consequently this, and, where appropriate, the other individual terms (global citizenship and outdoor learning) are used in this review to denote the specific focus of an article.

2.0 Following the key analytical framework informed by the specific educational outcomes set by the Scottish Government, it is clear that in terms of broader educational outcomes, the overall findings are significant for both policy and practice as they position LfS as an excellent context through which all aspects of CfE can flourish, enabling learners to develop and display the values and dispositions outlined in its 'four capacities'. Building teacher confidence through pre-service and professional development opportunities will help them recognise and maximise the potential of LfS to contribute to these broad educational outcomes. More specifically, the main findings were:

2.1 **Impact on the personal development of learners:** The complex interdisciplinary and controversial nature of sustainability issues demands that effective Learning for Sustainability pedagogies adopt inclusive, values and personal action-based approaches. As such, LfS can help young people to explore, experience and come to know themselves, their connection to the world around them, and the contributions they can make to society now and for the future. It can engage them in local community issues which can help them to understand the interdependencies between 'their place' and the wider world, and their role within those relationships. Whilst this does not guarantee the personal development of the learner, the process of becoming competent to 'act in the

world', and confident in doing so, is a core intended outcome of LfS and the essence of one of the 'four capacities' that CfE intends young people to develop – that of becoming 'confident individuals'. The literature reviewed highlights the importance of appropriate real-world and outdoor learning environments, and as LfS is congruent with these approaches, it may also have positive benefits for building knowledge and understanding related to academic attainment whilst providing opportunities for learners to flourish across different aspects of their lives.

2.2 **Impact on understanding of citizenship:** Developing the necessary competences and a positive orientation to becoming a 'responsible citizen' as expected by CfE, is closely related to personal development outcomes as it enables young people to think about themselves in relation to broader connections and dependencies between different aspects of life. This can include considering the relationships between people of different backgrounds, nationalities and cultures, and our collective and individual relationships with the natural world. In the context of this review, the literature highlighted the significance of 'systems' (ecological, social etc.) and 'systemic thinking' as core to sustainability, and that this may be a 'threshold concept' allowing deeper understanding and facilitating responsible actions (citizenship) with regard to the natural and social world and issues such as fairness, justice and equity. The value of building relationships with the natural world was prominent in developing understanding and empathy, and real-world contexts, particularly working with partners in the community, were regarded as being of great value in helping learners to address real-world sustainability and a wide range of complex interdisciplinary issues.

2.3 **Impact on academic attainment:** There is evidence that LfS does have an 'impact' on attainment, through the nature of the issues studied (complex, interdisciplinary, consequential, 'real' etc.), the characteristic pedagogies employed, and the value of school community approaches that take sustainability seriously. This is particularly so through outdoor learning, where there is increasingly strong evidence that experiences in nature can boost academic learning, including in subject areas unrelated to the outdoor context. For example, the benefits of time spent outdoors in terms of health and wellbeing, stress reduction, improved mental health and confidence of young

people were reported, all of which are known to support academic attainment. However, whilst impact on academic success is a primary concern of schools and education, many authors caution against a narrow view, arguing that this is one facet of learner development and should be considered in a broader context.

This aligns closely with the emphasis in CfE on good health and wellbeing (alongside literacy and numeracy) as the foundation to all attainment, and as a responsibility of all school staff.

2.4 **Impact on skills for life and work beyond formal education:** The impact of LfS on school attainment reveals the opportunity to develop skills relevant across the life course. Whilst there appears to be limited research into the impact on skills for life and work specifically, it does seem logical that skills developed in formal educational settings are not confined to that context; they translate into skills for life and work beyond formal education. For example, LfS can encourage the development of critical thinking skills. It can help young people to uncover and unpick complex interdisciplinary issues. It can also support creativity, allowing learners to imagine solutions to existing and emerging issues. Learning for Sustainability can therefore offer an opportunity to develop and practice skills necessary to thrive in an increasingly fast-paced, uncertain world.

2.5 **Impact on closing the poverty-related attainment gap or reducing inequity within education:** No literature was found that examined how LfS might specifically address the poverty-related attainment gap. However, it is clear that LfS affords an opportunity to do so indirectly by raising awareness of the relationship between a sustainable future and a more equal society. It can also offer opportunities to address issues of social justice and 'fairness' by enabling learners to engage with local, national and global issues as part of a wider community or as individuals. It is clear from the review that there is a need for more research and practice-informed literature to examine the relationship between LfS and its impact on closing the poverty-related attainment gap or reducing inequity within education.

2.6 **Impact on overall school improvement:** There is a substantial literature on the impact of school culture, management and related internal and external conditions on the efficacy of at least the ESD dimension of LfS. Much of this relates to efforts in general to improve schools and schooling, particularly with attainment in mind. The review highlighted factors which included the

significance of approaches to learning and teaching that respected and engaged learners with the complexity of sustainability issues; the allocation of adequate time and resources to properly engage with and address such complex issues; and the relationships between schools and community, including their learning potential. There was also recognition that in order to teach LfS, teachers need to be given the opportunity to learn through supportive, collaborative professional learning environments, and the time to consider the complexity of sustainability issues and how they relate to local contexts. Therefore, time and resources are required to ensure that LfS is meaningfully embedded.

Few of the articles reviewed focused on the impact of LfS on school improvement; however, a significant international 18-nations study reported the positive transformational potential of such a commitment on teaching and learning. Given the ostensibly accommodating aspirations of CfE (for example the delivery of flexible, personalised and relevant learning experiences that place learners as active participants in the educational experience), it is clear that LfS offers an excellent context for such a commitment to flourish. Further, an LfS-based whole-setting approach offers a way to build a 'learning community', where it is encouraged, supported and expected that teachers and pupils alike are learning and acting towards a sustainable future, whilst motivating and inspiring learners to take greater responsibility for their learning.

3.0 An iterative process was adopted for the review which meant that data arose from the articles which did not fit neatly into the predetermined analytical framework. Extra notes were included in the full report which resulted in a set of specific recommendations for future work and consideration. Notwithstanding the positive educational outcomes of LfS noted above, the following specific recommendations that arose from this additional process are as follows:

- It is clear from the literature that LfS as an integrated holistic concept is under-researched in relation to its main constituent elements (education for sustainable development, global citizenship and outdoor learning). It is important for Scotland, and internationally, that further research is encouraged that considers the impact of policy on practice, and of this on quality education.

- Further exploration of appropriate pedagogies is required to determine the drivers of quality education within the context of LfS practice within and across Scotland.

- A separate review of literature is required to tease out the unique benefits of outdoor learning experiences (e.g. health and wellbeing, stress reduction, improved mental health and confidence of young people) and the ways these may impact on the educational outcomes that are the focus of the present review. For example, outdoor learning has specific significance for pupils who were 'underachieving' and those with 'learning difficulties', highlighting the generally calmer, quieter, outdoor environment and the opportunity for more co-operative, yet self-led learning.

- Sensitive understanding of the educational architecture of each educational setting (for example, school, cluster and region) before moving to embed LfS within those systems is necessary, so that LfS underpins existing structures or helps to reveal constraining or problematic structures.

- Care should be taken to nuance LfS approaches for children given their age and developmental stage, as failure to do so risks demotivating – and indeed depressing or unsettling – learners and may inhibit willingness to review personal values and take appropriate actions.

- There is value in further exploration of the long-term impacts of LfS and sustainability attitudes and behaviours, in terms of the broad understanding of attainment identified in this review. For example, whilst this review did not set out to examine evidence regarding the effectiveness of LfS in developing pro-environmental attitudes and behaviours, it was a clear and significant finding, with studies highlighting the particular importance of fostering emotional connections to nature through time spent outdoors.

- Whilst there were no negative outcomes of LfS identified in the present review, as we embed LfS within and across Scottish education it is important to maintain a transparent and honest account of this process in order to acknowledge that this may be a possibility and that researchers and practitioners should be willing to highlight any equivocal or negative findings. In terms of formal attainment, the status of LfS may usefully be reviewed as a potential driver for change, as this may lead to greater recognition.

- The forthcoming Learning for Sustainability 'Knowledge into Action Briefings', should be publicised and widely disseminated.

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1. Background

1.1 Project Brief

The review examines literature relating to the educational outcomes of Learning for Sustainability (LfS), as understood in terms of policy development within and across Scotland. The review is intended to inform further research and also be of value in policy development. Additionally, this overview can inform developments related to curricular reform in Scottish education, and support and foster understanding of process and outcomes relevant to recent growth in LfS (and outdoor learning) throughout the UK and internationally.

The LfS policy context in Scotland is globally unique in that it brings together education for sustainable development (ESD), global citizenship and outdoor learning as an integrated holistic concept (Scottish Government, 2012). It is an entitlement of all pupils, a professional registration requirement of the General Teaching Council for Scotland (GTCS) (GTCS, 2019), and currently a priority in Scottish education. This approach was research-informed (see Christie and Higgins, 2012a/b and Higgins and Christie, 2018) and has been internationally celebrated through UNESCO recognition and academic review (e.g. Evans et al 2017).

Whilst the review focuses on the significance of LfS and the relationship between educational outcomes, it is difficult to distinguish these exact processes and approaches and extrapolate direct correlation between these two issues. As such we outline our understanding of LfS, attainment and educational outcomes within this opening section and conduct our review using these definitions as guiding parameters. Where possible we make such distinctions between causation and correlation clear in the review and provide both summaries of knowledge and areas for further investigation.

1.2 Definitions

1.2.1 Sustainability

Following a previous review of literature appropriate to Scotland (see Christie and Higgins, 2012a) we define the term 'sustainability' as used in the title from concepts such as 'sustainable development' and 'education for sustainable development'. Depending on the literature, these terms are often used synonymously and in reference to 'environmental education'. For the present review, we consider

sustainable development and education for sustainable development as related concepts, in other words 'education for sustainable development' is the process by which one learns how to act in a sustainable way and therefore contributes to 'sustainable development'. Environmental education is a related concept that refers to the process involved in learning about broader environmental issues (for example systems, concepts, conservation); an outcome of which may be greater knowledge and understanding of 'sustainable development' and pro-environmental behaviours (that is 'environmentally friendly' behaviour).

For the purposes of this review and to provide a sense of the contested nature of terms used in the field, we refer to one of the most widespread early definitions of sustainable development: defined in *Our Common Future*, generally known as 'The Brundtland Report', (World Commission on Environment and Development, 1987, p. 16). This defines sustainable development as "the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs". This is a rather anthropocentric and contested view, in that the Earth and its whole biological community need to be respected as part of an interdependent ecological network. In light of this, we propose that the 'others' referred to in the UNESCO definition (below) must include all life on Earth. Indeed, this tension is one of the reasons for the development of the unique conceptualisation of LfS in Scotland – as outlined below.

With regard to education for sustainable development, UNESCO states that ESD 'aims to help people to develop the attitudes, skills and knowledge to make informed decisions for the benefit of themselves and others, now and in the future, and to act upon these decisions' (UNESCO, 2010, para 3). This again is anthropocentric and so more recently Martin et al (2013) have proposed a succinct definition that goes some way to at least resolving the issue of the inclusion of diversity of life on Earth – ESD can be thought of as 'a process of learning how to make decisions that consider the long-term future of the economy, ecology and equity of all communities' (Martin et al, 2013).

It must also be noted that we acknowledge the tension between those who see 'individual behaviour change as the "holy grail" of the environmental movement' and

those who claim that 'social structures are the main problem and who advocate collective social action' (Kenis and Mathijs, 2012: 45).

1.2.2 Learning for Sustainability

As referred to in the opening paragraph, LfS is a term derived from the One Planet School working group and report (Scottish Government, 2012), and it is currently a priority in Scottish education. It can be understood as an organising concept that relates to global citizenship, sustainable development education and outdoor learning (Scottish Government, 2016[2]). The policy permeates Initial Teacher Education (ITE), GTCS professional standards (GTCS, 2019) and the school inspectorate process through How Good Is Our School? [4th Edition] (HGIOS4) (Education Scotland, 2015a). The definition drawn from the original One Planet School report describes LfS as: 'a whole-school approach that enables the school and its wider community to build the values, attitudes, knowledge, skills and confidence needed to develop practices and take decisions which are compatible with a sustainable and equitable society' (Scottish Government, 2012). It is concerned with every level and type of learning and the provision of quality education for all. The five headline recommendations, accepted by the Scottish Government (2013) are that:

- all learners should have an entitlement to Learning for Sustainability;
- every practitioner, school and education leader should demonstrate Learning for Sustainability in their practice;
- every school should have a whole-school approach to Learning for Sustainability that is robust, demonstrable, evaluated and supported by leadership at all levels;
- school buildings, grounds and policies should support Learning for Sustainability;
- a strategic national approach to supporting Learning for Sustainability should be established.

When we refer to LfS within this review we are referring to this Scottish definition and this particular educational context. We will also refer to the affordances of this approach, by affordances we are referring to the particular relationships that can

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[2] http://www.gtcs.org.uk/professional-standards/learning-for-sustainability.aspx

arise through the bringing together of the learner, the learning opportunity and the environment or contextual condition in which an educational experience takes place.

1.2.3 Poverty-related attainment gap

The Scottish Attainment Challenge was launched by the First Minister in 2015 (Scottish Government, 2019). It focuses on improvement activity in literacy, numeracy and health and wellbeing. It also supports and complements a broader range of initiatives and programmes which aim to ensure that all of Scotland's children and young people reach their full potential.

The £750 million Attainment Scotland Fund consists of a number of different funding streams:

Challenge Authorities
The Challenge Authorities programme provides targeted funding to nine local authorities with the highest concentrations of deprivation. The nine 'Challenge Authorities' are Glasgow, Dundee, Inverclyde, West Dunbartonshire, North Ayrshire, Clackmannanshire, North Lanarkshire, East Ayrshire and Renfrewshire.

Schools Programme
The Schools' Programme supports an additional 74 schools with the highest proportion of pupils living in our most deprived areas outside the nine Challenge Authorities.

Pupil Equity Funding
Pupil Equity Funding is allocated directly to schools and is targeted at closing the poverty-related attainment gap. Every council area is benefitting from Pupil Equity Funding and over 95% of schools in Scotland have been allocated funding for pupils in P1-S3 known to be eligible for free school meals.

Care Experienced Children and Young People
The Care Experienced Children and Young People fund, launched in 2018, provides funding through the Attainment Scotland Fund to all 32 local

authorities. This funding stream is designed to enable local authorities, as corporate parents, to make strategic decisions around how best to improve the attainment of care experienced children and young people from birth to the age of 26.

Evaluation and effectiveness of the interventions will be measured via the National Improvement Framework and other measures.

It is beyond the scope of this review to draw direct comparisons between the Scottish Attainment Challenge and LfS policy, however we highlight indicators of potential educational outcomes or factors related to attainment across the three areas of numeracy, literacy and health and wellbeing.

1.2.4 Educational outcomes

The specific educational outcomes deemed relevant to this review by the Scottish Government are listed below and formed the main analytical framework of the review and report. This structure reflects the four capacities core to Curriculum for Excellence (Education Scotland, 2008):

- impact on confidence of learners
- impact on the personal and social development of learners
- impact on understanding of citizenship
- impact on attainment
- impact on skills for life and work beyond formal education
- impact on closing the poverty-related attainment gap or reducing inequity within education
- impact on overall school improvement

1.2.5 What can we learn from this review?

Conducting this review was no easy task. First, the definitional debate concerning core terms such as 'sustainability', 'education for sustainable development' etc. referred to above has been – and continues to be – vigorous; with the added complication that at its core are values and action issues, which authors contest with a great and understandable sense of urgency. Second, there is an increasingly multi-disciplinary interest in this area of study; meaning the research is maturing, germinating and spreading across and within many fields. Third, due to this growth,

there are a number of theoretical and methodological starting points translated into a range of qualitative and quantitative approaches, which bring further issues; for example, empirical studies are often critiqued for perhaps losing the more intangible, less mechanistic measures of 'educational outcomes'. Therefore, whilst the picture is broad and wide-ranging, the studies do not always or easily reconcile. Fourth, the studies vary in quality so care is needed when assessing both the technical aspects of the research and the definitions employed; for example, terms such as 'nature', 'outdoors' and 'sustainability' are open to subtle interpretation. To account for this variety, each study considered in this review went through a process of quality control to sift out those studies which related to our purpose here; being mindful that papers not necessarily falling neatly within the parameters of our study could also lend something useful to our research.

Given this unique context and our own specific selection process, we present our findings as knowingly starting from an incomplete basis. What we offer is an analysis and summary of the studies we have gathered as a purposively focused introduction. As such at the beginning of each section we offer a research summary based rather more on correlation than causation and potential directions for future research.

1.3 Methodology

We have provided the philosophical and conceptual rationale for this review through the initial background, context-setting and definitional parameters.

Due to the challenges (as outlined in Section 1.2.5) we decided to opt for a more nuanced approach to data collection rather than a more rapid evidence assessment approach. We were less concerned with the number of studies and reviews conducted, and more concerned with the quality, the definitions and the themes emerging from across and within the studies we felt most related to our research intentions. Therefore, we adopted a three-phase approach which included an analysis of study quality.

1.3.1 An Overview

Phase 1: Primary, focused review

We adopted a purposive sampling approach where we drew on a number of primary sources such as databases covering journal articles, books, theses and

dissertations. This covered national and international material, grey literature, emerging student work and published, peer-reviewed materials. Full details of the indicative primary searches and the analysis of study quality are outlined in detail below.

Phase 2: Secondary, wider review

The primary review unearthed secondary sources such as reference lists within policy documents, literature that came through searches for other projects, or resources that we were aware of through our own work and teaching. Therefore, this phase focused on material drawn from sources beyond the parameters of the primary review.

Phase 3: Consultation

Additionally, we held a consultation phase where we referred to specialist colleagues in the field in Scotland to review our work for completeness (sources used) and accuracy of interpretation. We were also directed to particular articles pertinent to our study, both relevant to the general discussion, context and overview, and to some aspects of the influence of LfS on attainment.

1.3.2 The process

Refining the primary (phase 1) search criteria

Initial searches were conducted through EBSCO Host via University of Edinburgh library, focusing on six databases (see Appendix A for full details)[1]:

1. GreenFILE
2. British Educational Index
3. Academic Search Complete
4. Education Source
5. Humanities International Complete
6. Education Resources Information Centre (ERIC)

Boolean searches were conducted using a combination of keywords with AND/OR operators to produce more relevant results. The keywords used were determined following careful consideration of a number of factors; such as awareness of country-

specific terminology, commonly used terms and the relationship between the AND/OR operators.

AND – Using the Boolean Operator AND will narrow your search results. In this case, using AND will retrieve search results containing all keywords, in this case *'educational outcomes', 'school', 'sustainability'.*[3]

OR - Using the Boolean Operator OR will broaden your search results. In this case, using OR will retrieve search results containing either of the keywords, in this case *'attainment', 'education for sustainability', 'learning for* [4]*sustainability', 'outdoor'.*

Further research parameters were included to reduce the volume of records returned. The full inclusion criteria are detailed in Table 1 below.

Table 1 Inclusion Criteria

Topic	Inclusion Criteria
Keywords	"educational outcomes" AND "school" AND "sustainability" OR "attainment" OR "education for sustainable development" OR "Learning for Sustainability" OR "outdoor"
Date range	Search 1 - 1990-2018 Search 2 - 2013-2018 Search 3 - 2013-2018
Publication/Document Type	Scholarly peer-reviewed publications including academic journals, research reports, government reports, periodicals
Language	English
Educational Level	School levels covering age range 3-18

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[3] Taken from guidance provided by https://ncu.libguides.com/researchprocess/boolean
[4] Taken from guidance provided by https://ncu.libguides.com/researchprocess/boolean

Table 2 Search Process

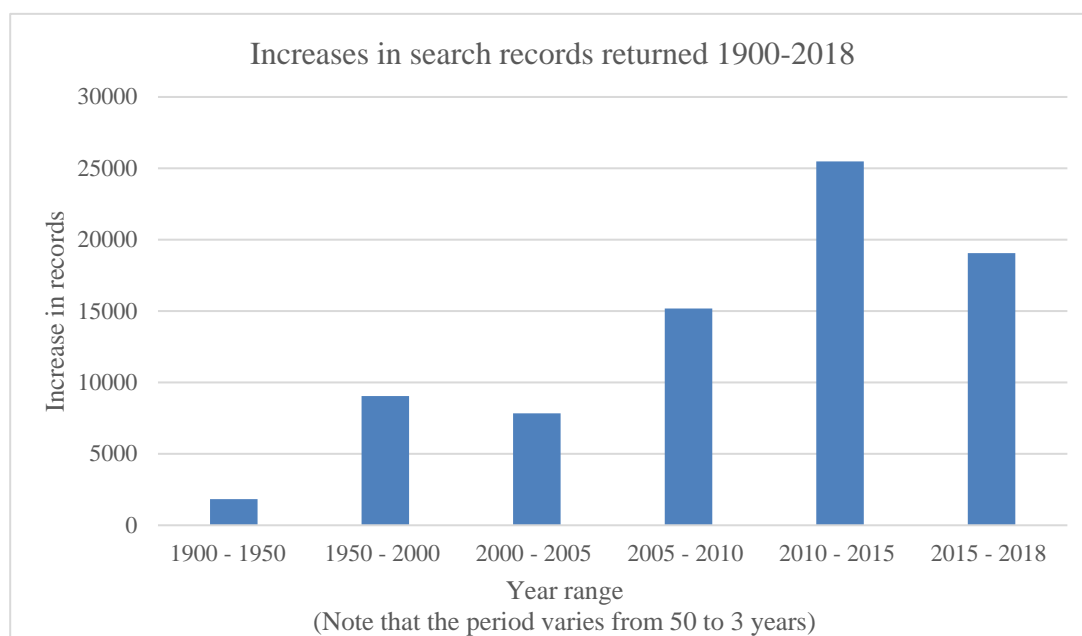|	Date Range	Search Parameters
Search 1	1990-2018	All inclusion criteria used
Search 2	2013-2018	All inclusion criteria used and date range narrowed
Search 3	2013-2018	All inclusion criteria used, date range narrowed and manual search performed to refine the papers returned

Note on the date range included

We conducted searches altering the year from 1990 up until 2018. Whilst the full details, year-by-year, are presented in Appendix B, the following summary in Table 3 and Figure 1 give an indication of the growth in interest and published research in the field. This in turn was significant in our data management processes.

In summary, the total records returned increase from 4,389 in the period up to 1990 to 83,584 records returned by 2018. The detail reveals almost 11,000 records being returned in the period up to 2000 and almost 45,000 records being returned in the past eight years (2010-2018). Over 40% of those records returned (19,063) fall within the three years from 2015-18. This distribution shows the volume of peer-reviewed research conducted since 2000 and specifically within the last decade. This demonstrates the potential scale of the literature review and provides the rationale for limiting the literature search to records returned within 2013-2018 only. Additionally, this timeframe dovetails with our previous literature reviews which were published in 2012 (Christie and Higgins 2012a, b).

Table 3 Growth in Recorded Publications 1900-2018

Date range	Years	Increase of records returned
1900-1950	50 years	+ 1,827 records
1950-2000	50 years	+ 9,046 records
2000-2005	5 years	+ 7,844 records
2005-2010	5 years	+ 15,178 records
2010-2015	5 years	+ 25,488 records
2015-2018	3 years	+ 19,063 records

Figure 1   Increase in Search Records (returned 1900-2018)

Increases in search records returned 1900-2018

Refining the primary database further by narrowing the year search to 2013-2018

When analysed further, the records returned within 2013-2018 span 50 journals (Appendix C)[5]. There may be more publications within the range, however the university database only revealed these titles. Taking that sample, we opted to more closely consider those journals with a high impact factor[6] (see Table 4) and those which we knew held relevant articles. This screening reduced the records returned to 1,392 records returned across 14 journals. We manually reviewed each of these records by title, keywords and abstracts and reduced the total to 76 articles (see Appendix D for a full list of these articles).

Table 4 Impact Factor of Journals Selected

Journal Title	Impact Factor (from data available in 2018)
British Journal of Sociology and Education	1.504
British Educational Research Journal	1.696
Developmental Psychology	2.934
Discourse: Studies in the Cultural Politics of Education	1.902

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[5] See Appendix C for list of journal titles from six databases.

[6] The impact factor is a measure of the frequency with which the average article in a journal has been cited in a particular year. It is used to measure the importance or rank of a journal by calculating the times its articles are cited. The calculation is based on a two-year period and involves dividing the number of times articles were cited by the number of articles that are citable. See https://researchguides.uic.edu/if/impact for further information.

Environmental Education Research	2.595
Environment Research	4.732
International Journal of Educational Development	1.403
International Journal of Science Education	1.325
Journal of Adventure Education and Outdoor Learning	No data
Journal of Experiential Education	No data
Journal of Autism and Developmental Disorders	3.476
Journal of Human Behavior in the Social Environment	No data
Journal of School Health	1.935
Journal of Environmental Education	2.472

Analysis of study quality

As a general rule, journal articles were selected on the basis of whether the focus was in line with the parameters of the review as described previously and if they were deemed robust in terms of a clear research/evaluation dimension.

We used three questions to guide this process:

- Is the research relevant – does it relate to the specific aims of this study?
- Is there a clear, justified methodology?
- Is there a clear analysis?

Each paper in the primary database was ranked accordingly using a four-star scale.

- Good: positive assessment against all three questions
- Fair: positive assessment against most of the questions; no negative assessments
- Unclear: unclear quality in accordance with all the questions
- Poor: negative assessment against one or more of the questions

See Tables 5 to 7 for details and totals. The star rating appears alongside the papers in the database as held in Appendices D, E and F.

Table 5 Results of Analysis of Study Quality (primary search – Appendix D)

Quality	Star Rating	Number of Studies
Good	****	15
Fair	***	28
Unclear	**	14
Poor	*	10
Not relevant		10

We have based this quality analysis process on a system employed by Gill (2014) who adopted and produced a simplified version of a framework created by Bell et al (2008).

Phase 2: Broad Search: Miscellaneous records and articles

During the process of refining the formal literature searches (search 1 and 2 described above) and given our expertise and knowledge of the field, we have been able to gather a number of articles and research literature that have informed the formal literature review. These are listed in Appendices D and E and we applied the same star rating process to them.

Table 6 Results of Analysis of Study Quality (miscellaneous papers - Appendix E)

Quality	Star Rating	Number of Studies
Good	****	0
Fair	***	1
Unclear	**	3
Poor	*	1
Not relevant		9

Table 7 Results of Analysis of Study Quality (personal knowledge - Appendix F)

Quality	Star Rating	Number of Studies
Good	****	5
Fair	***	2
Unclear	**	4
Poor	*	0
Not relevant		0

In summary, 102 journal articles were accessed, and 51 were awarded a 3 or 4 star rating. The full list of journal articles accessed is available within Appendices D, E and F.

It should be noted that there are some key articles that pre-date the period under review and, where appropriate, these are cited in the narrative. There is also additional literature relating to the methodology, general conceptual issues and analysis, and this is cited where appropriate. All references cited in these general discussions (whether from our own broader reading or the literature search conducted for the present study) are included in the reference list of these articles which is included below and before the appendices.

Thematic Analysis

We have adopted a thematic approach to the data analysis. The tender document (Appendix G) outlined the research specification, detailing the seven educational outcomes of interest and the key research questions to be addressed.

The specific educational outcomes deemed relevant to this review by the Scottish Government were:

- impact on confidence of learners
- impact on the personal and social development of learners
- impact on understanding of citizenship
- impact on attainment
- impact on skills for life and work beyond formal education
- impact on closing the poverty-related attainment gap or reducing inequity

within education

- impact on overall school improvement

The outcomes were related to the research questions posed in the tender document which were:
- What kind of impact does LfS have (positive or negative) and what is the level of that impact?
- How and why are these impacts achieved? This could include but not be limited to:
    - the engagement and/or experience of learners studying LfS
    - the relevance of LfS to 'real world' challenges commonly encountered outside education
    - the extent to which LfS can support delivery of other areas of the curriculum
    - the extent to which LfS aids the development of skills and knowledge commonly used beyond education and in later life and work
    - the influence of curriculum structure on the prevalence of LfS
    - the knowledge of teachers or education practitioners in the field of LfS
    - the physical environment of an educational setting
    - any other barriers or facilitators to the delivery of LfS

1.4 Limitations

This review was restricted to articles written in English. Whilst English is an international norm for academic publications, we acknowledge that this restriction may have excluded pertinent material.

We further acknowledge that by focusing the review through the databases we have identified and by setting the search parameters and refining in the way that we did, we may not have captured material located in specialist publications of other disciplines. The search will also have been partially limited by the specific terminology used in the context of LfS in Scotland, namely ESD, global citizenship and outdoor learning. However, by including the second phase wider review, we attempted to mitigate for that as far as was possible within time and budgetary constraints.

1.5 Ethical considerations

All data was sourced from peer-reviewed databases existing within the public domain via the University of Edinburgh library system. As University of Edinburgh staff we operate all research under the university's Ethical Guidance Framework.

2. General impressions of the literature

Reading the articles generated by the searches led us to develop some overall impressions. Whilst the following is not supported by direct references to specific articles, it is indicative of some important findings and themes that we go on to describe in more detail in the sections below. We also feel it is important to note the absence of research, or perhaps the limitation that it was not situated in relation to the Scottish educational context.

We were asked to focus on LfS as the generic term, as it is both adopted in policy and practice in Scotland and relatively common internationally. However, as we have noted elsewhere (Higgins & Christie, 2018), and is evident in Scottish education policy documentation, this term has a particular conceptual frame in Scotland – linking ESD, global citizenship and outdoor learning. As such we found the searches provided a range of articles that focused on or made specific reference to one or more of these terms, but with the emphasis being on ESD. In the sections below, we use the terms LfS rather than ESD, as the latter does not specifically include an expectation of outdoor learning in its execution. Notwithstanding that, outdoor learning does frequently emerge as a significant theme in many articles, and this is discussed below and raised again in Section 3.7.

A high proportion of the papers show how LfS (and ESD) approaches have an impact on attitudes to sustainability. Whilst this was not an area we were expected to review, it is entirely understandable that word searches with the parameters employed would produce a high number of papers that linked these ideas. We include a brief note on this in Section 3.7.5.

Relatively few articles focus on how LfS may impact attainment directly, though as will be evident below, a number refer to the impact on *aspects of learning and schooling* that are attainment-related.

Similarly, a number refer to positive changes in school culture etc. and others to the development of higher order skills (e.g. critical thinking), 'skills for life' etc.

One of the dominant themes in a number of the papers is the role of the outdoors in general and outdoor learning in particular in attainment. Whilst this is again not the specific focus of the present review, we have noted this in the sections below. Nonetheless, there is a clear theme emerging from this work – that learning outdoors does have a positive impact on learning. See for example recent articles by Kuo et al (2018, 2019) and Higgins et al (2018) – the more recent article by Kuo and colleagues being a significant review of the literature. In particular there is increasingly strong evidence that experiences in nature can boost academic learning, including in subject areas unrelated to the outdoor context. Further, the benefits of time spent outdoors in terms of health and wellbeing, stress reduction, improved mental health and confidence of young people were reported; all of which are known to support academic attainment.

Further, there is a growing wealth of research around the broader benefits of the 'outdoors' in relation to, but not exclusive to, disciplines related to public and private greenspace (Richardson et al, 2017), health and wellbeing (Tillman et al, 2018 focus on mental health in particular), stress reduction (Wells and Evans, 2003; Chawla et al, 2014) school greenspace design (Browning and Rigolon, 2019), and physical activity (Thompson Coon et al, 2011; Lachowycz and Jones, 2011) that has not formed part of this review but should be borne in mind.

Additionally, whilst this review did not set out to examine evidence regarding the effectiveness of LfS in developing pro-environmental attitudes and behaviours, it was a clear and significant finding, with studies highlighting the particular importance of fostering emotional connections to nature through time spent outdoors. These perspectives should be noted as they bring a particular weight of evidence to the fundamental role of outdoor learning and time spent outdoors.

It is clear that in terms of broader educational outcomes, the overall findings are significant for both policy and practice as they position LfS as an excellent context through which all aspects of CfE can flourish, enabling learners to develop and display the values and dispositions outlined in its 'four capacities'. Building teacher

confidence through pre-service and professional development opportunities will help them recognise and maximise the potential of LfS to contribute to these broad educational outcomes.

3. Educational outcomes of Learning for Sustainability

3.1 Impact on the personal development of learners

(Including impact on confidence and personal and social development of learners)

Summary of findings

The complex interdisciplinary and controversial nature of sustainability issues demands that effective Learning for Sustainability pedagogies adopt inclusive, values and personal action-based approaches. As such, LfS can help young people to explore, experience and come to know themselves, their connection to the world around them, and the contributions they can make to society now and for the future. It can engage them in local community issues which can help them to understand the interdependencies between 'their place' and the wider world, and their role within those relationships. Whilst this does not guarantee the personal development of the learner, the process of becoming competent to 'act in the world', and confident in doing so, is a core intended outcome of LfS and the essence of one of the 'four capacities' that CfE intends young people to develop – that of becoming 'confident individuals'. The literature reviewed highlights the importance of appropriate real-world and outdoor learning environments, and as LfS is congruent with these approaches, it may also have positive benefits for building knowledge and understanding related to academic attainment whilst providing opportunities for learners to flourish across different aspects of their lives.

Learning for Sustainability is predicated on an inclusive, values and personal action narrative; consequently, it is intended to involve everyone (teacher and learner, and indeed wider communities) in the learning process. It is premised on open-ended pedagogy which brings everyone into the learning process and values that engagement as a continual process of curiosity, exploration and community development; structured but often without specific outcomes or a targeted end-goal in sight. As the issues explored in sustainability are often complex, interdisciplinary, controversial, uncertain, and frequently referred to as 'wicked' (Rittel and Webber, 1973), the knowledge of a teacher or resource is, by definition, limited and perhaps even limiting; hence a pedagogy that recognises and expects active learner involvement is essential. Approaching student learning in this way recognises the potential for personal development through the process, and also the potential emotional hazards in highlighting seemingly intractable global problems (see Uzzell,

Rutland and Whistance, 1995; Bixler et al, 1994 and Breuning et al, 2015 for discussions on biophobia, action-paralysis and ecophobia).

Kadji-Beltran et al (2017: 1027) highlight the issue of discussing controversial issues and their work reveals that 'conflicts of interest are an indispensable element of ESD that helps pupils make value judgements, engage in public debate, acquire action competence and take action'. They are quite clear that a marginalisation, taming or avoidance of these issues results in a weaker version of ESD and a superficial implementation, which ultimately does not lead to the same depth and quality of education. Hedefalk et al (2015) describe how one teacher wanted to give children the opportunity to experience situations that were 'troubling' (for example, seeing plastic in rivers where they know ducks are swimming, fish are living, frogs are breeding) so that children are able to say 'this is not good, how can we make a difference?' (2015: 983). The intention was not to cause distress but to afford an opportunity for young children to think critically, 'to make value judgements by comparing one way of acting with another way in which they want to act' (ibid: 983). This is a process of problem identification, decision–making and then encouragement to enable learners to consider how to make and, if possible to, make changes in society through meaningful projects that help them act on their considered value judgements.

In a significant review of the impact of 'development education' and ESD interventions in schools, O'Flaherty and Liddy (2018) highlighted a number of studies which report statistically significant outcomes, with others highlighting positive outcomes including knowledge, skills, attitudes, ethics, and actions arising, including both 'hard' and 'soft' measurement outputs, from exams and knowledge tests through to ethics and values measures. Whilst the academic attainment facets are discussed in Section 3.4, the findings on personal development (values) are significant here.

Whilst not a specific focus of the present review, it should be noted that outdoor learning has a long-standing claim to impact on personal development of learners, and this is increasingly supported by a growing literature which highlights the role of learner engagement, responsibility-taking, group and residential work and active pedagogy. Of particular relevance to 'closing the attainment gap' is a recent

empirical study of Scottish high school pupils (Scrutton, 2015) which presented evidence that pupils who perceive themselves as having relatively poor personal and social skills appear to gain most benefit and then lose the least post-experience. This was a small-scale study but one that could be expanded to include greater diversity and geographical reach.

In contrast to the approaches that have positive impacts, there are warnings in the literature that whilst ESD, LfS and global citizenship education stress the importance of active and participatory learning methodologies, the approaches taken in schools often fail to employ these. For example, in their review of 44 papers, McCormack and O'Flaherty (2010) highlight that despite positive exceptions (research based in an NGO overseas volunteer programme, and an outdoor education setting) the majority reported on work completed in traditional learning environments such as lecture theatres and classrooms. The dependency on 'traditional learning sites' is contrary to the inclusion of active and participatory learning, which is central to developing learners' efficacy in relation to global issues, their action-competence and by extension their personal development. Similarly, Witoszek (2018) argues that a neo-liberal framework for ESD (with its emphasis on the 'three pillars' environmental, social and economic) lacks a strong positive narrative and inhibits the potential of ESD to a sense of empowerment amongst learners. This may in turn limit the potential of ESD taught in 'traditional learning sites' to impact positively on personal development.

3.2 Impact on understanding of citizenship
(Including relationships/care for human & non-human world, socio-ecological relationships, community relationships etc.)

Summary of findings

Developing the necessary competences and a positive orientation to becoming a 'responsible citizen' as expected by CfE, is closely related to personal development outcomes as it enables young people to think about themselves in relation to broader connections and dependencies between different aspects of life. This can include considering the relationships between people of different backgrounds, nationalities and cultures, and our collective and individual relationships with the natural world. In the context of this review, the literature highlighted the significance of 'systems' (ecological, social etc.) and 'systemic thinking' as core to sustainability, and that this

may be a 'threshold concept' allowing deeper understanding and facilitating responsible actions (citizenship) with regard to the natural and social world and issues such as fairness, justice and equity. The value of building relationships with the natural world was prominent in developing understanding and empathy, and real-world contexts, particularly working with partners in the community, were regarded as being of great value in helping learners to address real-world sustainability and a wide range of complex interdisciplinary issues.

It is a given that the concept of citizenship, and indeed active participation, is core to the purposes of LfS. In the Scottish context this includes an expectation of discussion and development of relevant values, and a personal action orientation. This in turn necessarily relates to an ethic of care for others (including other species – even if solely from an instrumental 'ecosystems services' perspective), and the broader community. At the heart of such considerations is, as Sandri (2013) points out, that all such dimensions operate within 'systems' and that systems and systemic thinking are core to sustainability. This approach is partly based on Land and Meyer's (2010) notion of threshold concepts[7], and Sandri (2013) argues that 'seeing systems as the threshold concept for sustainability is useful for understanding the processes of Learning for Sustainability'. Further, teaching sustainability through systems helps address authentic issues, which may be an important additional mechanism that may impact on attainment and, perhaps equally significantly, help learners to address real-world sustainability and a wide range of complex interdisciplinary issues in the future.

Socio-ecological relationships with the natural world (also referred to as the non-human, more than human, other than human world) feature significantly in the literature. For example, Broom (2017) identifies relationships between early experiences in nature with values and actions as adults, and emphasises the significance of outdoor learning experiences being structured for sustainability and environmental awareness, which are nurtured through evidence of environmental care, discussions, reflection and critical thinking. Broom (2017: 41) indicates that it is important to acknowledge the depth of this relationship and cites the originator of the

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[7] In a recent special issue on the topic Land and Rattray (2017: 63) summarise this succinctly as 'the notion that, in all disciplines, there are certain concepts, or certain learning experiences, which are akin to passing through a portal, permitting the learner to enter new conceptual territory in which things formerly not perceived are brought into view'.

'Biophilia Hypothesis', E. O. Wilson (1984), who suggested that "environmental ecological consciousness is theorized to connect to ecological identity and relates to an individual's deep reflection on, connection to, and engagement with the natural environment". The indications are that Wilson's concept – essentially that time in nature helps develop an ethic of care – may have a sound basis important in developing a sense of systemic understanding and global citizenship.

The broader benefits of socio-ecological relationships are increasingly widely reported; for example in an in-depth literature review of 35 papers, Tillmann et al (2018) found that time in nature influences mental health positively with over half the findings (53 of 100) confirming statistically significant positive benefits of time in nature (the remaining findings were positive but not significant, with the exception of one paper which reported a single finding suggesting nature had a negative effect on children's mental health) (Balseviciene et al, 2014).

Whilst these benefits are undoubtedly of value, they do not address the question of whether time in nature promotes academic learning. This has become an issue of growing international interest across several disciplines (e.g. education, psychology, health) with, for example, significant recent articles by Kuo et al (2018, 2019) and some evidence from Scotland (Higgins et al, 2018). The more recent of the articles, by Kuo and colleagues (2019), is a significant recent review in which they argue that there is 'converging evidence of a cause-and-effect relationship'. Whilst at present it is only possible to hypothesise mechanisms, the authors state with confidence that such benefits are evident and statistically valid. One indication, from Dieser & Bogner's (2016) comparative empirical study of cognitive knowledge and achievement (n=289), was that young people's cognitive achievement was fostered by 'hands-on-centred' environmental education. So, it may be that such practical learning experiences, which are widespread in the teaching of LfS and in outdoor environments, are significant in the success of this approach.

Returning to the notion of attainment as citizenship, Kadji-Beltran (2017: 1022) reinforces the role of partnerships and relationships with the community as 'an integral part of future-orientated education, as pupils should work with real challenges in a range of real-world contexts'. Further they suggest that civil capacity

is built by developing and strengthening decision-making skills, critical thinking and exploration skills (2017: 1023).

3.3 Impact on academic attainment
(Relates to traditional understandings – linked to school subject areas etc.)

> **Summary of findings**
>
> There is evidence that LfS does have an 'impact' on attainment, through the nature of the issues studied (complex, interdisciplinary, consequential, 'real' etc.), the characteristic pedagogies employed, and the value of school community approaches that take sustainability seriously. This is particularly so through outdoor learning, where there is increasingly strong evidence that experiences in nature can boost academic learning, including in subject areas unrelated to the outdoor context. For example, the benefits of time spent outdoors in terms of health and wellbeing, stress reduction, improved mental health and confidence of young people were reported, all of which are known to support academic attainment. However, whilst impact on academic success is a primary concern of schools and education, many authors caution against a narrow view, arguing that this is one facet of learner development and should be considered in a broader context. This aligns closely with the emphasis in CfE on good health and wellbeing (alongside literacy and numeracy) as the foundation to all attainment, and as a responsibility of all school staff.

There are limited studies of the impact of LfS specifically on attainment. A particularly relevant study was the Education Scotland (2015b) study (as discussed previously), which found that schools that committed to LfS – and, where possible, capitalised on outdoor learning opportunities – found 'enhanced learning, motivation and readiness to learn' amongst pupils. This was reflected in the comparative study by Laurie et al (2016), which found similar results internationally, and noted that these attributes of the schools and learners 'coincide(d) with higher order skill levels in the PISA tests', and that consequently 'ESD and PISA are synergistic in many ways'.

There was a greater body of interesting and varied literature considering the topic of outdoor learning and attainment specifically. A particularly useful study conducted by Quibell et al (2017), stimulated by the increasing gap in educational attainment between high- and low-achieving children in primary schools, considered the link to social disadvantage and the often subsequent long-term detrimental effects on

learning. Their study positioned outdoor learning (a central component of LfS) as a means of addressing this gap by 'providing a structured curriculum-based outdoor learning programme for primary school children: Wilderness schooling'[8] (2017: 572). They focused on attainment in terms of performance in English reading, English writing, and maths, and collected data at three time-points: pre-intervention, post-intervention and a 6-week follow up. They studied a sample of Wilderness-schooled (n=223) and conventionally schooled (n=217) students. Results showed that children in the Wilderness School increased attainment across all areas significantly. This correlates with previous studies by Christie et al, (2015), more reviews by Kou et al (2019) and elsewhere in this report.

Interestingly, Quibell et al (2017) suggest that attainment is one factor to be considered alongside or nested within a broader 'theory of change', and this is where LfS affords an opportunity to extend outdoor learning programmes to offer further opportunities to build on these immersive and sensitising experiences, and bring them into a curricular environment that supports positive change over the longer term. Such approaches provide a means of ensuring there is progression and coherence between and across outdoor experiences, whether longer-term residential overnight programmes, shorter day trips, or within rural or urban settings; and as young people progress through education from early years to secondary and tertiary settings. Such thinking challenges a more static conception of attainment as a level to be reached or a target to be achieved, and pushes us to imagine a more fluid, personalised notion that progresses throughout a learner's life-course at different rates and in response to different factors both within and beyond school. This is of course in close alignment with the philosophy and purposes of Curriculum for Excellence.

O'Flaherty and Liddy (2018: 1034) problematise the use of the term 'impact' and measures of impact, noting that a traditional understanding 'aligns with ideals of measurement and evidence to support the impact or effect of a particular treatment with a particular group', reflecting a more positivist epistemology. They suggest it needs to be conceptualised in a much broader way, suggesting impact 'as change in knowledge, skills, attitudes, ethics, actions arising, including both hard and soft

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[8] This programme was off-site involving an outdoor learning programme held over six weeks - see Quibell et al (2017) for full details.

measurement outputs, from exams and knowledge tests through to ethical/values measures' (2017: 1033).

A research study conducted by Breuning et al (2015: 279) provides compelling evidence to support the value of outdoor learning as a way to think critically; as their work found that there were 'potential connections between an open and supportive environment and the development of critical thinking and reflection in students'. This link to critical thinking is not new; Ernst (2014), McCloskey, (2016), Griffiths and Murray (2017) and others have raised similar issues. Griffiths and Murray (2017: 47) further suggested that critical thinking alongside other pedagogical strategies that 'require students to pay whole-hearted (or loving) attention to the world and to make engaged connections with it', were important alongside space to nurture these skills, so that we are not only thinking in terms of critiquing what exists but re-imagining what is possible. Further, they suggest that such 'responsive and proactive pedagogies' demand space; not just time within the school day but 'space for a response to what matters, and openness to minding about it', ultimately giving 'students the chance to participate in re-making the world with whole-hearted understanding' (2017: 47). Garrison et al (2015) echo this by stating that 'we cannot deal with the environmental problems through thinking patterns that have created them in the first place', rather we need to move beyond critical thinking that 'confines itself to simply choosing among pre-existing alternatives instead of imagining or creating new desirable values' (2015: 200).

Such future-orientated environments encourage dialogue between teacher and learner on important environmental, personal or controversial issues (Breuning et al, 2015) which builds on points raised in Section 3.1 on personal and social development, as well as Section 3.3 where the case was made for a school ethos that fosters open and honest conversation and a supportive culture.

3.4 Impact on skills for life and work beyond formal education

Summary of findings

The impact of LfS on school attainment reveals the opportunity to develop skills relevant across the life course. Whilst there appears to be limited research into the impact on skills for life and work specifically, it does seem logical that skills developed in formal educational settings are not confined to that context; they translate into skills for life and work beyond formal education. For example, LfS can encourage the development of critical thinking skills. It can help young people to uncover and unpick complex interdisciplinary issues. It can also support creativity, allowing learners to imagine solutions to existing and emerging issues. Learning for Sustainability can therefore offer an opportunity to develop and practice skills necessary to thrive in an increasingly fast-paced, uncertain world.

At this point in the review it is clear that the impact and outcomes related to ESD extend beyond standardised assessment and relate to skills for life which, in turn, reach beyond formal education and apply across the life-course. These skills can be understood as relating to critical thinking, problem solving, adaptability, resourcefulness, and inter- and intra-personal social skills. Many of these have been discussed already in previous sections and do not warrant further review here.

One point to note, however, is a more philosophical perspective to skills for life and work offered by Sandri (2013). Her research refers to threshold concepts and systems as outcomes or skills that are applicable across all ages, which, once considered, can influence worldviews from that point forward. She refers to Land and Meyer (2010) and their presentation of three aspects of the threshold framework which begins with: *transformation* – once you grasp the threshold concept you adopt another worldview and the process is largely irreversible; *integration* – the concepts are usually transversal and can allow you to cut across other disciplines and fields or at least view those disciplines differently too; *troublesome* – they can be tricky to understand at the outset but once understood they can challenge existing worldviews.

One of the ways in which teachers and learners can engage with sustainability issues and these threshold concepts is to adopt a systems-thinking approach. Systems thinking is based on the idea that to make sense of the complexity of the

world, we need to look at issues holistically and in terms of relationships, rather than reducing it into its many parts which we consider in isolation (Ramage and Shipp, 2009; Capra, 1996). These more philosophical potential outcomes and impacts of LfS offer shifts in thinking that will inform an individual's life and work beyond formal education. Interdisciplinary learning and outdoor learning in particular offer logical opportunities to ground these approaches and engage young people in teaching and learning that emphasises transformative action rather than didactic transmissive approaches. For example, a recent doctoral study (Mattu, 2016) considered the role of interdisciplinary learning and outdoor learning within the context of Curriculum for Excellence. Her work focused on food and farming and, following a mixed-method study of school visits to farms (primary 2-3/children aged 6-7), she demonstrated that the visits afforded links to a range of experiences and outcomes such as: expressive arts, health and wellbeing, languages and literacy, mathematics and numeracy, religious and moral education, sciences, social studies and technologies. Interestingly she noted that 'curricular links beyond those specified directly by teachers, such as with 'enjoyment' as a principle of curriculum design, were identified' (p. 261). This contextualised account demonstrates one way in which outdoor and interdisciplinary learning, alongside a creative and holistic approach to curriculum design and delivery, affords a rich and authentic educational experience that covers curricular learning and broader principles of curricular design.

3.5 Impact on closing the poverty-related attainment gap or reducing inequity within education.

Summary of findings

No literature was found that examined how LfS might specifically address the poverty-related attainment gap. However, it is clear that LfS affords an opportunity to do so indirectly by raising awareness of the relationship between a sustainable future and a more equal society. It can also offer opportunities to address issues of social justice and 'fairness' by enabling learners to engage with local, national and global issues as part of a wider community or as individuals. It is clear from the review that there is a need for more research and practice-informed literature to examine the relationship between LfS and its impact on closing the poverty-related attainment gap or reducing inequity within education.

There was limited literature covering closing the poverty-related attainment gap or reducing inequity within education as related to LfS specifically. As this review is

primarily focused on LfS and its impact, there was no scope to include poverty-related attainment gap literature that did not include LfS. We did find literature rooted in LfS that linked to disadvantage and subsequent long-term effects on learning (see Quibell et al, 2017) and this has been discussed within Section 3.4 and related to the heading of attainment more generally.

One point to note here is that often LfS is misunderstood as being solely linked to an environmental agenda and the social justice, human-focused aspect of LfS is either assumed or indeed not surfaced. LfS offers a range of ways to engage, challenge and progress issues of inequity, disadvantage, justice and community cohesion by highlighting such issues at a local and global level and by offering ways to engage and take action within villages, towns and cities in which the school is located. This is linked to issues raised in Section 3.2 with regard to citizenship and working with and in respect of other communities. We recognise the need to produce literature to examine these issues and to continue to draw attention to and illustrate this often implicit aspect of LfS. To this end, authors of this report are involved in writing a forthcoming chapter for a revised edition of Arshad et al (2012) Social Justice Re-examined (see Leask et al, 2019).

3.6 Impact on overall school improvement
(Including whole-school/teacher leadership/ethos/school culture etc.)

Summary of findings

There is a substantial literature on the impact of school culture, management and related internal and external conditions on the efficacy of at least the ESD dimension of LfS. Much of this relates to efforts in general to improve schools and schooling, particularly with attainment in mind. The review highlighted factors which included the significance of approaches to learning and teaching that respected and engaged learners with the complexity of sustainability issues; the allocation of adequate time and resources to properly engage with and address such complex issues; and the relationships between schools and community, including their learning potential. There was also support for the need for teachers to learn through supportive, collaborative professional learning environments that recognise that they too have to address the complexity of sustainability issues in order to teach them. However, time and resources are required to ensure that LfS is meaningfully embedded; ensuring

everyone has space to fully explore some of the complex issues covered by LfS and consider how they apply in their local contexts.

Few of the articles reviewed focused on the impact of LfS on school improvement; however, a significant international 18-nations study reported the positive transformational potential of such a commitment on teaching and learning. Given the ostensibly accommodating aspirations of CfE (for example the delivery of flexible, personalised and relevant learning experiences that place learners as active participants in the educational experience), it is clear that LfS offers an excellent context for such a commitment to flourish. Further, an LfS-based whole-setting approach offers a way to build a 'learning community', where it is encouraged, supported and expected that teachers and pupils alike are learning and acting towards a sustainable future, whilst motivating and inspiring learners to take greater responsibility for their learning.

Whilst much of the literature focused on the impact of the school, teacher attitudes and competence on the development of learners' knowledge, skills, attitudes and values relating to and through LfS, there are indications that LfS can have positive effects on school culture. Of particular significance here are two articles. The first is the Education Scotland (2015b) 'Conversations about Learning for Sustainability' report which, although essentially an informal study of schools (at all levels) that had made a commitment to LfS, found the approach was aligned with pupil attainment, school culture, staff satisfaction, and reputation in the community. The second is the UNESCO-commissioned 18-nations report to which the Scottish study (Education Scotland, 2015b) contributed, conducted by Laurie et al (2016) which found that: 'ESD contributes in many ways to quality education in primary and secondary schools. Teaching and learning transforms in all contexts when the curriculum includes sustainability content.' It also reinforces points raised earlier (see Section 3.4) where we highlight that sustainability education offers a holistic approach that encourages personal and social skills, qualities and capacities to flourish. This aligns with Laurie et al (2016: 1) who found that sustainability education 'promotes the learning of skills, perspectives and values necessary to foster sustainable societies'. The UNESCO report also signals alignment between LfS and interdisciplinary learning as they identified a 'need to integrate ESD across all subjects' and that to do so it was important to 'provide professional development for teachers to ensure ESD policy implementation and to adopt ESD management practices to support ESD in

the curriculum'. Given the holistic philosophy of LfS and the emphasis on whole-school approaches to embedding and enacting these principles, it seems clear that LfS offers a way to implement and move forward the action points arising from this important UNESCO 18-nations study (Laurie et al, 2016).

In terms of LfS delivery, the majority of research on sustainability education focuses on implementation and student outcomes, and limited attention has been given to school leadership and school organisation. To address this gap Mogren and Gericke (2017a, b) conducted a two-part empirical mixed-methods study of existing practices in 10 highly 'ESD-active' (their term) upper secondary schools in Sweden. The study revealed 26 quality criteria used to guide effective sustainability education. These criteria distilled into four main principles: collaborative interaction and school development; student-centred education; co-operation with local society and pro-active leadership and continuity. They also highlight three important areas of work (drawn from the ESI [Environment and Schools Initiative] Network) based on work by Breiting, Mayer and Mogensen, 2005):

1. learning and teaching – which relates to the way education is organised by teachers to create a school culture that promotes student engagement with complex issues from multiple perspectives;
2. school policy and organisation – which relates to the allocation of adequate time and resources to ensure that sustainability education is adopted in ways that build on student and teacher engagement; and
3. the external relations of schools – which concerns the school's collaborations with society.

Of these three 'areas of work' and the four principles they distilled from their original 26, the two features which relate most clearly to school culture and ethos, and this section of the report in particular, are those to do with 'school policy and organisation', 'external relations and pro-active leadership'. The criterion for pro-active leadership was described in the study by the following remark that, 'far-reaching plans promote the establishment of common ground, which makes us good role models' (p. 984). This suggests a form of leadership based on principles of 'collective learning and implemented through the gradual progression' in a way that brings everyone along through consensus, sharing and understanding (p. 984). Mogren and Gericke go on to describe this as a process of collective learning where solutions are found among the employed teachers and other staff rather than being

sought from outside the school organisation (2017a: 985). Whilst this is a fair approach we would draw on other studies here (for example Smith, 2016; Aguayo and Eames, 2017) that show the value in working in partnership with organisations for development, knowledge and specific training to support and reinforce the leadership and progress of a school. Fundamental to any development work is having a clear vision and common goal, which in the case of LfS means having a solid understanding across and throughout the school of its policy context, purpose and significance. It has been noted that a clear understanding of LfS is not consistent across education, in Initial Teacher Education or schools (Nicol et al, 2019; Christie et al, 2019), and this is not unique to Scotland. Mogren and Gericke's (2017a: 987) findings reveal that 'shared understanding can be hard to implement; with some school leaders [in Sweden] highlighting overcoming resistance to ESD as an essential quality criterion'. There is a danger of failure here, as leadership may become overly strong in an attempt to ensure LfS is taken forward (likely encountering resistance), and tight adherence to the values of shared leadership which does not manage to overcome the resistance or tension exerted by those who do not see the value in LfS. For further discussion on these issues of developing shared understanding and the barriers and opportunities that exist in terms of moving LfS from policy into practice, see the LfS-focused special issue of Scottish Educational Review (2019).

Green and Somerville (2015: 832) reinforce these points stating that sustainability education is 'constituted in the relationship between teachers, students and community members and the immaterialities of local places, and partnerships extended into communities and places beyond the school'. Therefore, a whole-school approach draws on relationships within and beyond the school. However, challenging existing architectures and structures within school culture and organisation is not easy, as often they are embedded and held *in situ* due to 'material-economic or social-political arrangements and orders', and, as Green and Somerville note, the 'overarching argument is that until the architectures that hold existing practices in place are changed, teachers will remain reluctant to engage in sustainability education' (2015: 834). This highlights the need to work with teachers as well as educational leaders to develop opportunities that encourage and enable teachers to understand, develop and enact the LfS policy that exists, and also the need to work with teachers 'where they are', in the sites and spaces in which they teach; and indeed to work with curricula, to understand the possibilities and

opportunities these afford alongside the challenges they experience. This argument has been comprehensively supported by Laurie et al (2016: 1) as their study indicated the need 'to provide professional development for teachers to ensure the ESD policy implementation, and to adopt ESD management practices to support ESD in the curriculum'.

There is concern amongst teachers regarding increasing workloads, changing policy contexts and a range of other demands. Consequently there is a danger that LfS becomes 'content to be delivered' rather than an approach that underpins all aspects of education (Christie et al, 2019; Nicol et al, 2019), leading to superficial engagement and a sanitised introduction to some of the key challenges and controversial issues of our time (as noted by Kadji-Beltran et al, 2017, and others). Recent research (D'Souza, 2012; Atkinson and Wade, 2013; Wade, 2015; Mogren et al, 2018) has researched whole-school approaches that help and support teachers to better understand and therefore be better positioned to introduce political and cultural dimensions of sustainable development issues, and to help in developing collaborations with local communities. Most notably, Mogren et al (2018) highlight that 'the implementation of a holistic vision is the most important quality criterion' and that this vision needs to be recognised in the 'evaluation, planning and execution of teaching (p. 18). This notion of a praxis-orientated, interdisciplinary, holistic approach to implementation, rather than an awards-based system that fell into the hands of one or two individuals, was key to success. They note clearly that 'all individuals at all levels are important catalysts for ESD action and progress' (p. 18).

Core to bringing all school staff (and pupils) on board is the cultivation of an ethos that supports each individual to develop the confidence, skills, knowledge and understanding necessary to engage. Kadji-Beltan et al (2017: 1028) note the importance of developing a mentoring system for those teachers who are more experienced to work alongside those who need to develop confidence in these areas. Clearly this is an important aspect of any form of professional development for teachers, but particularly so in the context of new areas of knowledge and understanding introduced as professional responsibilities resulting from policy commitments – as is the case with LfS in Scotland. Following Kadji-Beltan et al's (2017) approach, it is evident that whilst there may be a need for more formal skills and knowledge development, this should be developed within an ethos and culture that supports, nurtures and coaches others across the school to share in the

development of these practices and approaches. It is not a quick-fix or a short-term solution; the development of LfS needs thoughtful care to enable people to engage with it, to work through vulnerability in these spaces, and to find the confidence to bring it into their everyday practice as a way of thinking, being and doing.

3.7 Additional Notes

The analytical framework for this review was based on the research questions as provided in the tender document (See Appendix G), however as we engaged with the literature we entered into a more iterative process whereby notable issues arose from the data which did not fit neatly into these pre-determined categories. Notes on these are included in this section to ensure we represent, as far as is possible, the literature as reviewed.

3.7.1 A note on the role of outdoor learning

The focus of this review has been LfS as underpinned by education for sustainable development, global citizenship, and outdoor learning. We have woven in literature that perhaps favoured, or was written from, the disciplinary perspective of any one of these three components; we did not privilege any one aspect, reflecting the LfS philosophy. However, during the literature review process it became clear that there is a distinct and increasing wealth of information related to the sensory immersive experiences afforded by learning out-of-doors, across a range of contexts (cities, parks, local and rural spaces) and from a range of disciplines, for example health and wellbeing, psychology, physical activity, greenspace, landscape architecture and design – as noted in Section 2. Whilst some of that work has been woven into this review there remains a wealth of evidence that distinctly relates to the unique affordances of learning outdoors. Of further and specific relevance to the review is the growing evidence that learning outdoors, even if this is not relevant to the subject being studied, is beneficial for academic learning and hence likely to be of benefit in academic attainment. This is discussed briefly in Sections 2 and 3.3.

> **Recommendation:** A separate review of literature is required to tease out the unique and mutually reinforcing benefits of outdoor learning experiences identified in the literature (learning for sustainability, academic attainment, health and wellbeing, interdisciplinary learning etc.).

3.7.2 A note on appropriate pedagogies for quality education

As noted in Section 3.1 and as raised by other authors such as in the 18-nations UNESCO study by Laurie et al (2016), by Nikel and Lowe (2010) and others, there is a need to develop appropriate pedagogies to ensure quality education. Nikel and Lowe devised a model of quality education which 'identified seven conceptual dimensions; which are effectiveness, efficiency, equity, responsiveness, relevance, reflexivity, and sustainability' (2010: 595). Whilst in the present review we have not developed an explicit relationship to their model, we were guided by their thinking in terms of broader notions of quality that go beyond a linear, input-output model of education, that quality should be considered as 'process rather than product', and the need for contextual relevance that recognises the tensions between different dimensions on different systemic levels (Nikel and Lowe, 2010: 594). In terms of LfS there is no standardised, universal approach; rather, teaching and learning should be rooted in appropriate pedagogies guided by quality education. Further, we recognise that whilst this review focuses on attainment, quality education is fundamental to this, however 'attainment' is understood, so we must proceed with quality in mind.

Further, in terms of both global agreements and Scottish Government policy, it is important to note that quality education is one of the UN Sustainable Development Goals (SDG 4. Quality Education) which aligns with the philosophy, structure and purpose of the LfS implementation report – Vision 2030+ (Scottish Government, 2016). Whilst the importance of 'quality education' is widely acknowledged as a core driver, we feel a clearer exploration of what this means in terms of LfS at a national level (particularly given its centrality to the UN SDGs) and what might be the appropriate pedagogies required to ensure its successful delivery.

Recommendation: Further exploration of appropriate pedagogies is required to determine the drivers of quality education within the context of LfS practice within and across Scotland.

3.7.3 A note on national and contextual differences

This review focused primarily on national literature but the scope was extended to include international literature to ensure the most relevant studies were included. The majority of individual studies took place within a single country, whilst a number compared case studies across a range of national contexts. However, the literature reviews we consulted generally did not highlight the specific locations of each study

considered. Our intention was never to provide a country-by-country, or region-by-region analysis; rather we were looking for pedagogical principles, approaches and broad educational outcomes surfacing across a range of contexts. Nonetheless, we believe there is value in working at a national level specifically to consider the nuances and individual structural, socio-economic, indigenous and cultural aspects that undoubtedly exert an influence on those teaching, leading and learning. We also recognise the subtle difference between geographical regions, between schools and within classrooms. We are reminded of the 'educational architectures' raised in Section 3.3 (Green and Somerville, 2015) that exist and how we must work in accordance with those implicit or explicit frameworks to challenge, discuss and collaborate as to embed LfS across and within these systems.

As we finalised this report a major study was published by UNESCO (2019), which addressed the issue we raise above – namely that comparative national studies would shed light on the potential of LfS to support a range of important learning outcomes. The UNESCO study investigated the degree to which three dimensions – cognitive, social and emotional, and behavioural learning – are 'prioritised in commitments to ESD and GC education' (p. 8) throughout formal education in 10 countries selected from UNESCO's five key regions of the world. The review presents detailed findings across developmental stages in each nation studied, and whilst there were national differences, there were similarities, such as the emphasis on social and emotional development through GC, and a greater emphasis on the cognitive dimension through ESD. The report concludes (p. 37) by stating the importance of holistic learning and whole-school approaches, including extra-curricular activities, the opportunities within the immediate learning environment beyond school and the need for close linkages between school and community'. Whilst the study did not explore the third dimension of LfS, outdoor learning *per se*, these statements point to the significance of such out of school experiences in supporting the learning dimensions which were the focus of the 10-country study.

> **Recommendation:** There needs to be sensitive understanding of the educational architecture of each school, cluster and region before moving to embed LfS within those systems, so that LfS underpins existing structures or helps to reveal constraining or problematic structures.

3.7.4 A note on age differences

Similar to the note above on national and contextual differences, we did not divide the review into age-appropriate sections, nor did we discuss LfS in terms of early years, primary or secondary education settings specifically. We were keen to keep the review focused on pedagogical approaches more generally and we were interested in the outcomes and impact rather than the specifics of delivery. It is when we move from the broad principles to the specifics of delivery that differentiation becomes more relevant. However, we do want to add a cautionary note that irrespective of age and stage there is the potential to overwhelm young people when introducing and discussing 'wicked' problems, especially when the story conveyed is bleak, and disaster appears to be looming. It is clear that the full story needs to be told, however there may be more or less appropriate ways to convey information, promote awareness, engage learners and move to action that does not paralyse or generate despair in young people. We raised this in Section 3, and it is discussed by others such as Bixler et al (1994) and Strife (2012).

> **Recommendation:** Care must be taken to nuance LfS approaches for children given their age and developmental stage; failure to do so risks demotivating – and indeed depressing – learners and may inhibit willingness to review personal values and take appropriate actions.

3.7.5 A note on LfS and sustainability attitudes and behaviours

As noted in Section 2, it is to be expected that literature searches with the parameters employed would produce a high number of papers that discussed the efficacy of approaches to LfS on attitudes, values and behaviours related to sustainability. These have been subject to numerous international reviews (e.g. see articles cited here by Hedefalk et al, 2015; O'Flaherty and Liddy, 2018), and it is not our purpose to summarise these here. However, as has been noted in most of the sections above, there is general agreement that the pedagogies appropriate to LfS and that are successful in stimulating reflections on and orientations towards personal actions, are those identified as significant in raising attainment.

Recommendation: There is value in further exploration of the long-term impact of LfS on sustainability attitudes and behaviours in terms of the broader understanding of attainment identified in this review.

3.7.6 A note on the reporting of negative findings

One of the common observations regarding literature searches is that they tend not to uncover negative findings. This is primarily the result of an unwillingness amongst researchers to report such findings in the first place, and then for journals to publish them. We encountered no papers that specifically highlighted negative results, though within a number of the articles, particularly the empirical ones, there were some examples.

So, one question we asked ourselves was, is there a valid hypothesis that LfS could have a negative impact on attainment? There is no suggestion of this in the literature surveyed, and in terms of broad attainment outcomes such as development of personal qualities to act as an informed citizen etc. it seems unlikely that there would be. However, it seems reasonable to conclude that if schools place great emphasis on attainment in formal exams which do not reflect the value of or focus on LfS, then, given the generally positive findings and associations with attainment etc. outlined above, learners may be disadvantaged. This argument aligns closely with that of Kuo et al (2019) where they issue the challenge, that given its demonstrable efficacy, why education does not generally take place outdoors. Whilst it is beyond the scope of the present review to delve too deeply into this, it is important to recognise that national qualifications and the formal assessments they depend on are drivers for syllabus content as much as the other way round. Whilst we have not reviewed the national qualifications for content, it is at least reasonable to ask if this may be a real limitation on the capacity of LfS to be recognised *as* attainment. Whilst we are not advocating LfS as a specific qualification, put simply, if LfS were woven into and assessed through national qualifications it would clearly contribute directly to attainment. This is at least something to consider with regard to the status of LfS as an approach to learning with cross-curricular applicability, and an entitlement for all learners in Scotland, and yet, as we have found in a recent study, it is not universally perceived as a priority (see Christie et al, 2019).

Recommendation: Whilst there were no negative outcomes of LfS identified in our review, as we embed LfS within and across Scottish education it is important to maintain a transparent and honest account of this process, to acknowledge that this may be a possibility and that researchers and practitioners should be willing to highlight any such findings. In terms of formal attainment, the status of LfS may, as an approach to teaching and learning woven throughout all curricular areas, usefully be reviewed as a potential driver for change, which in turn may lead to greater recognition.

3.7.7. A note on current and forthcoming LfS Research into Action Briefings

At the time of writing we are concurrently developing a series of LfS Research (and Knowledge) into Action Briefings with colleagues across Moray House School of Education, University of Edinburgh and LfS Scotland. The forthcoming briefings update an earlier series published in 2016[9] which relate to, support and underpin much of the content covered within this literature review.

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[9] Research into Action Briefings available to download here: http://learningforsustainabilityscotland.org/2017/08/research-into-action-briefings-available-now-to-download/).

The 2016 published set of LfS Research into Action Briefings are:

- Learning for Sustainability and Attainment in Schools *[LfS Research Briefings No. 1, Christie, B; Higgins, P. (2016)]*

- The Impact of Outdoor Learning on Learning for Sustainability in Schools. *[LfS Research Briefings No. 2, Christie, B; Higgins P. (2016)]*

- The Impact of Outdoor Learning on Attainment and Behaviour in Schools. *[LfS Research Briefings No. 3, Christie, B; Higgins P.(2016)]*

- Learning for Sustainability – Effective Pedagogies. *[LfS Research Briefings No. 4, Christie B; Higgins P. (2016)]*

- The UN Decade of Education for Sustainable Development (UNDESD) 2005--2014 and Beyond. A Retrospective Review *[LfS Research Briefings No. 5, Christie, B; Higgins P. (2016)]*

The forthcoming briefings, at this stage, are expected to include:

- Learning for Sustainability and Attainment in Schools

- The Impact of Outdoor Learning on Learning for Sustainability in Schools

- The Impact of Outdoor Learning on Attainment and Behaviour in Schools

- Learning for Sustainability – Effective Pedagogies

- Learning for Sustainability – Developing Young Workforce

- Learning for Sustainability and Food

- Learning for Sustainability and STEM (STEAM)[10]

- Exploring controversial issues (in relation to Learning for Sustainability)

- Interdisciplinary approaches and Learning for Sustainability

- Learning for Sustainability – Pedagogy of Buildings and Grounds

- Learning for Sustainability – Whole School Approach

Recommendation: Publicise and widely disseminate forthcoming Learning for Sustainability Knowledge into Action Briefings.

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[10] STEM = Science, Technology, Engineering and Maths / STEAM = Science, Technology, Engineering, Art and Maths

4. Concluding comments

4.1 This review examined literature relating to the educational outcomes of Learning For Sustainability as understood in terms of policy development within and across Scotland. Whilst the review process revealed a number of positive outcomes, it has in turn confirmed that there are a limited number of studies focusing on LfS specifically rather than its individual features (education for sustainable development, global citizenship and outdoor learning). This dearth of literature forced us to broaden the scope of our review to consider notions of outcome and attainment more broadly and to search using the individual concepts nested within LfS. When we loosened the parameters we found a substantial increase in the number of studies returned under these more general headings (in particular in ESD), especially within the last five years and a notable increase in the number of studies returned related to outdoor learning across a range of disciplines. These findings were not unsurprising as we were aware of general growth in research interest in the field. With regard to outdoor learning, there was growing interest amongst researchers from a range of disciplinary perspectives (e.g. psychology). However, research taking place specifically in the context of LfS within Scotland was scarce. There are a range of postgraduate dissertations and doctoral studies currently under way, and a number recently completed in the field, and these will bring greater insight and weight to the existing research. So too will the forthcoming LfS-focused special issue of the Scottish Educational Review, with contributions covering, amongst other things, LfS within Initial Teacher Education institutions and the issue of teacher enactment of LfS policy. Additionally, there are a number of practitioner enquiry studies and related practical resources being developed by in-service teachers which will bring further insight at a praxis-orientated level. This increase in research activity and output is welcomed and must be continued in order that a community of LfS practice is developed to demonstrate the range of opportunities, challenges and pedagogical approaches within schools across Scotland.

4.2 The notion of educating for and about sustainability is widespread internationally. Many countries have sustainability woven throughout their curriculum and educational policy (see for example Green and Sommerville, 2015 and Morgan and Gerike, 2017 a, b). What persists as unique within

Scottish education is our commitment to outdoor learning as a core and central part of teaching and learning, and more recently as a facet of Learning for Sustainability. This commitment to learning beyond the classroom – within local communities, urban and wild spaces – affords an opportunity to enact and ground the fundamental aspects of LfS. For example, it offers young people the opportunity to see and experience the processes that sustain life at first-hand; not only to hear, learn and talk about democracy and change, but to step outside into the places in which they live as active citizens and critically engage in issues that they and their families experience. Alongside this it affords teachers and learners the opportunity to bring many aspects of the taught curriculum to life through active participation in interdisciplinary lessons. Literacy, numeracy, sciences, languages and many other aspects of the curriculum can be woven into short, day-long or residential experiences. Such essential experiences afford huge potential for interdisciplinary learning; enriching and cultivating skills for life and work that impact far beyond formal educational settings.

4.3 Further, such interdisciplinary learning opportunities – both indoors and outdoors – offer ways to consider the planetary biogeochemical processes that sustain life, the limits to our potential to interfere with these, and how we might develop an ethic of care and respect for our planet. Essentially, this offers a holistic view of learning and teaching that creates opportunities to engage in deep questioning that provokes each of us to consider what it means to live well, and how we may continue to do so whilst facing contemporary complex global challenges. These are difficult issues for educators to broach and address with their learners, but we live in a time where the circumstances in Scotland at least, are favourable. Firstly, young people are demanding that we pay attention to these global issues, and are receptive to us doing so; secondly, we have an accommodating educational policy architecture (Curriculum for Excellence) that supports and encourages vital skills in critical thinking and discourse; and thirdly, as this review has shown, our unique and progressive Learning for Sustainability policy offers coherent ways forward that engage learners, teachers, whole schools and communities in purposeful and transformative ways.

5. References

Aguayo C. & Eames C. (2017). Community partnerships in sustainability education research. In R. McNae & B. Cowie (Eds.), *Realising Innovative Partnerships in Educational Research. Educational Partnerships and Collaborations*. Rotterdam: Sense Publishers.

Arshad, R., Pratt, L., & Wrigley, T. (2012). *Social justice re-examined*. New York: Trentham Books.

Atkinson, H. & Wade, R. (2013). Education for Sustainable Development and Political Science: Making Change Happen. *Policy & Practice: A Development Education Review,* 17, 46-69.

Balseviciene, B., Sinkariova, L., Grazuleviciene, R. Andrusaityte, S., Uzdanaviciute, I., Audrius Dedele, A., & Nieuwenhuijsen, M. (2014) Impact of residential greenness on preschool children's emotional and behavioral problems. *International Journal of Environmental Research in Public Health.* 11, 67, 57–70.

Bell, S., Hamilton, V., Montarzino, A., Rothnie, H., Travlou, P. & Alves, S. (2008). *Greenspace and quality of life: A Critical Literature Review*. Research Report by OPENspace for Greenspace Scotland, Stirling: Greenspace Scotland.

Bixler, R., Carlisle, C., Hammitt, W. & Floyd M. (1994). Observed fears and discomforts among urban students on field trips to wildland areas. *Journal of Environmental Education*. 26, 1, 24–33.

Breitling, S., Mayer, M., & Mogensen, F. (2005). Quality Criteria for ESD Schools. *In Austrian Federal Ministry of Education* (Ed.). Vienna.

Broom, C. (2017). Exploring the relations between childhood experiences in nature and young adults' environmental attitudes and behaviours. *Australian Journal of environmental education*. 33(1), 34-47.

Browning, M. and Rigolon, A. (2019). School green space and its impact on academic performance: A systematic literature review. *Int. J. Environ. Res. Public Health 16*, 429-451.

Breunig, M., Murtell, J. and Russell, C. (2015). Students' experiences with/in integrated Environmental Studies Programs in Ontario, *Journal of Adventure Education and Outdoor Learning,* 15:4, 267-283, DOI: 10.1080/14729679.2014.955354.

Capra, F. (1996). *The web of life: A new scientific understanding of living systems*. New York: Anchor Books.

Chawla, L., Keena, K., Pevec, I. & Stanley, E. (2014). Green schoolyards as havens from stress and resources for resilience in childhood and adolescence. *Health Place*. 28, 1–13.

Christie, B. & Higgins, P. (2012a). *The impact of outdoor learning experiences on attainment and behaviour: A brief review of literature.* Forestry Commission Scotland/University of Edinburgh. Forestry Commission Report 11/2012 [review funded by Forestry Commission Scotland].

Christie, B. & Higgins, P. (2012b). *The impact of outdoor learning experiences on attitudes to sustainability: A brief review of literature.* Field Studies Council/University of Edinburgh. Field Studies Council Report 06/2012 [review funded by Field Studies Council].

Christie, B., Beames, S., & Higgins, P. (2015). Context, culture and critical thinking: Scottish secondary school teachers' and pupils' experiences of outdoor learning. *British Educational Research Journal. 42*(3), 417–437. https://doi.org/10.1002/berj.3213.

Christie, B, Higgins, P, King, B, Collacott, M, Kirk, K & Smith, H. (2019). From rhetoric to reality: Examining the policy vision and the professional process of enacting Learning for Sustainability in Scottish Schools, *Scottish Educational Review*, 51(1).

Dieser, O., & Bogner, F. X. (2016). Young people's cognitive achievement as fostered by hands-on-centred environmental education. *Environmental Education Research*, *22*(7), 943–957. https://doi.org/10.1080/13504622.2015.1054265.

D'Souza, D. (2012). The power of partnerships to achieve EFA-ESD SYNERGY. In: *Tales of HOPE 111: EFA-ESD linkages and synergies,* Japan: ACCU.

Evans, N. (S)., Stevenson, R., Lasen, M., Ferreira, J-A. & Davis, J. (2017). Approaches to embedding sustainability in teacher education: A synthesis of the literature. *Teaching and Teacher Education* 63, 405-417.

Education Scotland. (2008) *Curriculum for Excellence. Building the Curriculum 3: A Framework for Learning and teaching.* Retrieved November 24, 2019, from https://education.gov.scot/Documents/btc3.pdf.

Education Scotland (2015a). *How Good is Our School*? (4th edition). Retrieved 20 March 2019, from https://education.gov.scot/improvement/documents/frameworks_selfevaluation/frwk2_nihedithgios/frwk2_hgios4.pdf.

Education Scotland (2015b) *Conversations about Learning for Sustainability.* Retrieved 20 March 2019, from https://education.gov.scot/improvement/practice-exemplars/conversations-about-learning-for-sustainability/.

Ernst, J. (2014). Early childhood educators' use of natural outdoor settings as learning environments: an exploratory study of beliefs, practices, and barriers. *Environmental Education Research*, *20*(6), 735–752. https://doi.org/10.1080/13504622.2013.833596.

Garrison, J., Östman, L., & Håkansson, M. (2015). The creative use of companion values in environmental education and education for sustainable development: exploring the educative moment. *Environmental Education Research*, *21*(2), 183–204. https://doi.org/10.1080/13504622.2014.936157.

General Teaching Council for Scotland (GTCS) (2019). Professional standards. Retrieved 5 April 2019, from https://www.gtcs.org.uk/professional-standards/learning-for-sustainability.aspx.

Gill, T. (2014). The benefits of children's engagement with nature: a systematic literature review. *Children, Youth and Environments* 24(2): 10- 34. Retrieved 1 June 2019, from http://www.jstor.org/action/showPublication?journalCode=chilyoutenvi.

Green, M. & Somerville, M. (2015). Sustainability education: researching practice in primary schools, *Environmental Education Research*, 21, 6, 832-845, DOI: 10.1080/13504622.2014.923382.

Griffiths, M. & Murray, R. (2017). Love and social justice in Learning for Sustainability, *Ethics and Education*, 12,1, 39-50, DOI: 10.1080/17449642.2016.1272177.

Hedefalk, M., Almqvist, J., & Östman, L. (2015). Education for sustainable development in early childhood education: a review of the research literature. *Environmental Education Research*, *21*(7), 975–990. https://doi.org/10.1080/13504622.2014.971716.

Higgins, P. & Christie, B. (2018). Learning for Sustainability. In: *Scottish Education (5th Edition)*. Editors: Bryce, T., Humes, W., Gillies D. and Kennedy A. p. 554-564. Edinburgh: Edinburgh University Press.

Higgins, P., Thompson, D. & Rawcliffe, P. (2018). *Learning outside the classroom boosts educational attainment.* Scottish Natural Heritage Science Newsletter, Issue 23, p. 7-9. Perth: Scottish Natural Heritage.

Kadji-Beltran, C., Christodoulou, N., Zachariou, A., Lindemann-Matthies, P., Barker, S., & Kadis, C. (2017). An ESD pathway to quality education in the Cyprus primary education context. *Environmental Education Research*, *23*(7), 1015–1031. https://doi.org/10.1080/13504622.2016.1249459.

Kenis, A. & Mathijs, E. (2012). Beyond individual behaviour change: the role of power, knowledge and strategy in tackling climate change. *Environmental Education Research*, 18,1, 45-65.

Kuo, M., Browning, M. & Penner, M. (2018). Do lessons in nature boost subsequent classroom engagement? Refueling students in flight. *Frontiers in Psychology.* 8, 22-53.

Kuo M., Barnes M. & Jordan C. (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology* (10) 305.

Lachowycz, K. & Jones, A. (2011). Greenspace and obesity: a systematic review of the evidence. *Obesity Reviews.* 12, 5, 83-9. doi: 10.1111/j.1467-789X.2010.00827.x.

Land, R., & Meyer, J. (2010). Threshold concepts and troublesome concepts: Dynamics of Assessment. In: R. Land, J.H.F. Meyer, & C. Baillie (Eds.), *Threshold concepts and transformational learning* (pp. 61-79). Rotterdam: Sense Publishers.

Land, R. & Rattray, J. (2017). Threshold Concepts and Conceptual Difficulty – Guest Editors' Preface. *Practice and Evidence of Scholarship of Teaching and Learning in Higher Education Special Issue.* 12(2). pp. 63-80.

Laurie, R., Nonoyama-Tarumi, Y., McKeown, R. & Hopkins, C. (2016). Contributions of ESD to Quality Education: A Synthesis of Research. *Journal of Education for Sustainable Development*, 10, 2, 1-17.

Leask, K., Christie, B., Murray, R., & King, B. (2019) Learning for Sustainability: Our collective future depends on it. In: R. Arshad, L. Pratt, & T. Wrigley, (forthcoming). *Social Justice re-examined (2nd ed)*. Trentham Books.

Martin, S., Dillon, J., Higgins, P., Peters, C. & Scott, W. (2013). Divergent Evolution in Education for Sustainable Development Policy in the United Kingdom: Current Status, Best Practice, and Opportunities for the Future. S*ustainability*, 5, 4, 1522-1544.

Mattu, L. M. (2016*) Farm visits: interdisciplinary outdoor learning for primary school pupils and Scotland's Curriculum for Excellence.* PhD thesis. University of Glasgow. http://theses.gla.ac.uk/7715/.

McCormack, O., and J. O'Flaherty. 2010. "An Examination of Pre-service Teachers' Attitudes towards the Inclusion of Development Education into Irish Post-primary Schools." Teaching and Teacher Education: *An International Journal of Research and Studies.* 26 (6): 1332–1339.

McCloskey, S. (2016). Are we changing the world? Reflections on Development Education, activism and social change. *Policy and Practice, a Development Education Review,* 22, 110–130.

Mogren, A., & Gericke, N. (2017a). ESD implementation at the school organisation level, Part 1 – Investigating the quality criteria guiding school leaders' work at recognized ESD Schools. *Environmental Education Research.* doi:10.1080/13504622.2016.1226265.

Mogren, A. & Gericke, N. (2017b). ESD implementation at the school organisation level, Part 2 – Investigating the transformative perspective in school leaders' quality strategies at ESD schools, *Environmental Education Research,* 23:7, 993-1014, DOI: 10.1080/13504622.2016.1226266.

Mogren, A., Gericke, N. & Scherp, H. (2018): Whole school approaches to education for sustainable development: a model that links to school improvement, *Environmental Education Research*, DOI: 10.1080/13504622.2018.1455074.

Nicol, R., Rae, A., Murray, R., Higgins, P., & Smith, H. (2019). Moving beyond the printed word of policy to practice: An exploration into the conditions in which Learning for Sustainability might flourish in initial teacher education. *Scottish Educational Review.*

Nikel, J. & Lowe. J. (2010). Talking of fabric: a multi-dimensional model of quality in education. *Compare: A Journal of Comparative and International Education* 40, 5, 589–605. doi:10.1080/03057920902909477.

O'Flaherty, J. & Liddy, M. (2018). The impact of development education and education for sustainable development interventions: a synthesis of the research, *Environmental Education Research*, 24, 7, 1031-1049, DOI: 10.1080/13504622.2017.1392484.

Quibell, T., Charlton, J., & Law, J. (2017). Wilderness Schooling: A controlled trial of the impact of an outdoor education programme on attainment outcomes in primary school pupils. *British Educational Research Journal, 43*(3), 572–587. https://doi.org/10.1002/berj.3273.

Ramage, M., & Shipp, K. (2009). *Systems thinkers.* London: The Open University & Springer.

Richardson, E., Pearce, J., Short, N., & Mitchell, R. (2017). The role of public and private natural space in children's social, emotional and behavioural development in Scotland: A longitudinal study. *Environmental Research*, *158*, 729–736. https://doi.org/10.1016/j.envres.2017.07.038.

Rittel, H. & Webber, M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences, 4*: 155-169.

Sandri, O.J. (2013). Exploring the Role and Value of Creativity in education for Sustainability. *Environmental Education Research* https://doi.org/10.1080/13504622.2012.749978.

Scottish Government (2012). *Learning for Sustainability – Report of the One Planet Schools Ministerial Advisory Group*. Retrieved 19 June 2019, from https://education.gov.scot/improvement/Documents/One-planet-schools-report-learning-for-sustainability.pdf.

Scottish Government. (2013). *Learning for Sustainability: The Scottish Government's response to the Report of the One Planet Schools Working Group.* Retrieved 9 March 2019, from https://education.gov.scot/improvement/learning-resources/A%20summary%20of%20learning%20for%20sustainability%20resources.

Scottish Government (2016). *Vision 2030+ Concluding report of the Learning for Sustainability Implementation Group.* Retrieved June 19, 2019, from https://education.gov.scot/improvement/documents/res1-vision-2030.pdf.

Scottish Government (2019). *Scottish Attainment Challenge.* Retrieved June 19, 2019, from https://education.gov.scot/improvement/learning-resources/scottish-attainment-challenge/.

Scrutton, R. A. (2015). Outdoor adventure education for children in Scotland: quantifying the benefits. *Journal of Adventure Education & Outdoor Learning*, *15*(2), 123–137. https://doi.org/10.1080/14729679.2013.867813.

Smith, R. (2016). Building sustainable professional learning communities: Relational affordances. In: Brodie K and Borko H (eds) *Professional Learning Communities in South African Schools and Teacher Education Programmes.* Cape Town, HSRC Press.

Strife, S. (2012). Children's Environmental Concerns: Expressing Ecophobia*. Journal of Environmental Education*, 43, 1, 37-54. DOI: 10.1080/00958964.2011.602131.

Tillmann, S., Tobin, D., Avison, W. and Gilland, J. (2018). Mental health benefits of interactions with nature in children and teenagers: a systematic review. *Journal of epidemiology and community health*. 72, 958-66.

Thompson Coon, J., Boddy, K., Stein, K., Whear, R., Barton, J., & Depledge, M. (2011). Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors? A systematic review. *Environmental Science & Technology*, 45, 5, 1761-1772. DOI: 10.1021/es102947t.

UNESCO (2010). *Education for Sustainable Development in the UK*. London: UK National Commission for UNESCO.

UNESCO (2019). Educational content up close: Examining the learning dimensions of Education for Sustainable Development and Global Citizenship

Education. Paris: UNESCO. Retrieved from:

unesdoc.unesco.org/ark/48223/pf0000372327

Uzzell, D. L., Rutland, A. & Whistance, D. (1995). Questioning Values in Environmental
Education. In Y. Guerrier, N. Alexander, J. Chase y M. O'Brien. *Values and the
Environment*. Chichester: Wiley.

Wade, R (2015). Learning Pedagogy and Sustainability: the challenges for education
policy and practice. In H. Atkinson and R. Wade. *The Challenge of Sustainability:
Linking Policy education and learning.*
DOI:10.1332/policypress/9781447306467.003.0003.

Wells, N. & Evans, G. (2003). Nearby Nature: A Buffer of Life Stress among Rural
Children. *Environment and Behaviour.*
https://doi.org/10.1177/0013916503035003001.

Wilson, E. O. (1984). *Biophilia.* Harvard University Press.

Witoszek, N. (2018). Teaching sustainability in Norway, China and Ghana:
challenges to the UN programme. *Environmental Education Research*, *24*(6), 831–
844. https://doi.org/10.1080/13504622.2017.1307944.

World Commission on Environment and Development (1987). *Our Common Future:
Report of the world commission on environment and development*. (The Brundtland
report). United Nations. Retrieved 8 June 2019, from http://www.un-
documents.net/our-common-future.pdf.

Appendix A Description of Databases Considered Within the Primary Search

GreenFILE
GreenFILE covers the connections between the environment and a variety of disciplines such as agriculture, education, law, health and technology.

British Educational Index (BEI)
Compiled and edited at the University of Leeds, BEI provides details about the contents of various literature sources: over 300 education and training journals published in the British Isles, similar report and conference literature, and texts.

Academic Search Complete
Academic Search Complete *offers* an enormous collection of full-text journals, providing users access to critical information from many sources unique to this database. In addition, it includes peer-reviewed full text for STEM research, as well as for the social sciences and humanities. Scholarly content covers a broad range of important areas of academic study, including anthropology, engineering and law.

Education Source
This database is a merger of databases from EBSCO and H.W. Wilson. It covers all levels of education – from early childhood to higher education – as well as all educational specialities, such as multilingual education, health education and testing.

Humanities International Complete
Humanities International Complete is an essential resource for students, researchers and educators interested in all aspects of the humanities, with worldwide content pertaining to literary, scholarly and creative thought. Humanities International Complete is a valuable collection for libraries looking to provide comprehensive coverage of the humanities with full-text content.

ERIC
Education Resources Information Centre (ERIC) is an online library of education research and information, sponsored by the Institute of Education Sciences (IES) of the U.S. Department of Education.

Appendix B Records Returned 1990-2018

Figure 1 Records Returned 1990-2018

As the database search provides records from the current year back as far as the parameters request, this table needs to be viewed from that perspective. Hence, when the search began in 2018 there were 6,426 records returned, in 2019 there were 6,576 records. Hence the total number of records in the database of 2018 and 2019 was 12,621. As will be evident there is a steady annual increase in records every year from 2001 to 2018. To avoid overly detailed data presentation, records prior to 2000 are shown as 5 year, 25 year and 50 year periods as appropriate.

Year	Cumulative Records Returned (from present back to the year indicated)	Increase
1900	83,584	287
1950	82,814	770
1975	82,035	779
1990	79,195	2,878
1995	77,105	2,052
2000	73,768	3,337
2001	72,778	990
2002	71,695	1,083
2003	70,179	1,516
2004	68,283	1,896
2005	65,924	1,359
2006	63,321	2,603
2007	60,539	2,782
2008	57,389	3,156
2009	54,116	3,267
2010	50,746	3,370
2011	46,766	3,980
2012	42,011	4,755
2013	36,848	5,163
2014	31,169	5,679
2015	25,258	5,911
2016	19,197	6,061
2017	12,621	6,576
2018	6,195	6,426

Appendix C Fifty Journal Titles Covered in the 2013-2018 – Searches 2 and 3

PLOS ONE
Science of the Total Environment
Building & Environment
Atmospheric Environment
Environmental Education Research
American Journal of Public Health
Environment International
Environmental Research
Computers in Human Behavior
Children & Youth Services Review
Environmental Science & Technology
Renewable Energy: An International Journal
Journal of the Academy of Nutrition & Dietetics
Journal of Adventure Education & Outdoor Learning
Journal of Community Health
Solar Energy Materials & Solar Cells
Environmental Health Perspectives
Journal of Nutrition Education & Behavior
Renewable & Sustainable Energy Reviews
Social Indicators Research
International Journal of Sustainability in Higher Education
Journal of Experiential Education
Economics of Education Review
Pediatrics
Journal of Child & Family Studies
Developmental Psychology
British Educational Research Journal
Social Forces
International Journal of Educational Development
Journal of Environmental Education
Journal of Youth & Adolescence
World Development
Education Economics
Personality & Individual Differences
Child: Care, Health & Development
Learning & Individual Differences
Journal of Family Issues
British Journal of Sociology of Education
International Journal of Aging & Human Development
International Journal of Science Education
Journal of Autism and Developmental Disorders
Journal of School Health
International Journal of Language and Communication Disorders
Journal of Human Behavior in the Social Environment

Discourse: Studies in the Cultural Politics of Education
Journal of Ethnic & Migration Studies
Pertanika Journal of Social Sciences and Humanities
College Student Journal
Urban Studies (SAGE Publications Ltd)
Journal of Development Studies

Appendix D Primary Search (76 papers comprising the primary database)

*Rating	Paper	Notes
	Glackin, M. (2018). 'Control must be maintained': exploring teachers' pedagogical practice outside the classroom. *British Journal of Sociology of Education*, *39*(1), 61–76. https://doi.org/10.1080/01425692.2017.1304204	OL – not relevant
	O'Brien. K., & Lomas, T. (2017). Developing a Growth Mindset through outdoor personal development: can an intervention underpinned by psychology increase the impact of an outdoor learning course for young people? *Journal of Adventure Education & Outdoor Learning*, *17*(2), 133–147. https://doi.org/10.1080/14729679.2016.1232199	OL Mindset interventions – PSD course
	Van Poeck, K. (2015). Education as a response to sustainability issues. Practices of environmental education in the context of the UN Decade of Education for Sustainable Development. *Environmental Education Research*, *21*(4), 649. https://doi.org/10.1080/13504622.2014.958651	Belgian policy focus
	Lewis, E. (2014). Education for sustainability at a primary school: from silos to systems thinking. *Environmental Education Research*, *20*(3), 432–433. https://doi.org/10.1080/13504622.2013.833593	Thesis summary
	Braun, T., Cottrell, R., & Dierkes, P. (2018). Fostering changes in attitude, knowledge and behavior: demographic variation in environmental education effects. *Environmental Education Research*, *24*(6), 899–920. https://doi.org/10.1080/13504622.2017.1343279	OE focus – review of OE programme. Complex web of drivers that influence environmental literacy and responsible behaviour. Four country comparison. Predictors – country, rural/urban
	Shephard, K., & Brown, K. (2017). How democratic is higher education for sustainable development? *Discourse: Studies in the Cultural Politics of Education*, *38*(5), 755–767. https://doi.org/10.1080/01596306.2016.1150254	HE – not relevant to current study
	Morrier, M. J., & Ziegler, S. M. T. (2018). I wanna play too: Factors related to changes in social behavior for children with and without autism spectrum disorder after implementation of a structured outdoor play curriculum. *Journal of Autism & Developmental Disorders*, *48*(7), 2530–2541. https://doi.org/10.1007/s10803-018-3523-z	ASN/OL – limited relevance to current study

	Najjar, D., Spaling, H., & Sinclair, A. J. (2013). Learning about sustainability and gender through Farmer Field Schools in the Taita Hills, Kenya. *International Journal of Educational Development*, 33(5), 466–475. https://doi.org/10.1016/j.ijedudev.2012.06.004	ESD – gender equality
	Nordén, B. (2018). Learning and teaching sustainable development in global-local contexts. *Environmental Education Research*, 24(5), 772–773. https://doi.org/10.1080/13504622.2016.1217399	GL/ESD. Impact on SDGs. Abstract not clear.
	Nazir, J. (2016). Using phenomenology to conduct environmental education research: Experience and issues. *Journal of Environmental Education*, 47(3), 179–190. https://doi.org/10.1080/00958964.2015.1063473	Phenomenology
*	Kil, N. (2016). Effects of vicarious experiences of nature, environmental attitudes, and outdoor recreation benefits on support for increased funding allocations. *Journal of Environmental Education*, 47(3), 222–236. https://doi.org/10.1080/00958964.2015.1111188	OL – experiences of nature changed attitudes and experiential benefits
*	Hill, A., & Brown, M. (2014). Intersections between place, sustainability and transformative outdoor experiences. *Journal of Adventure Education & Outdoor Learning*, 14(3), 217–232. https://doi.org/10.1080/14729679.2014.918843	More OL focus – place and intentionality towards sustainability
*	Biasutti, M. (2015). An intensive programme on education for sustainable development: the participants' experience. *Environmental Education Research*, 21(5), 734–752. https://doi.org/10.1080/13504622.2014.921805	OL/ESD – older/young adults/ university or CLPL. Nature park in Croatia. Study with young professionals. Results showed the relevance of the setting and the methods applied to develop environmental awareness and skills.
*	Waite, S., Bølling, M., & Bentsen, P. (2016). Comparing apples and pears?: a conceptual framework for understanding forms of outdoor learning through comparison of English Forest Schools and Danish udeskole. *Environmental Education Research*, 22(6), 868–892. https://doi.org/10.1080/13504622.2015.1075193	OL/'Forest' and Udeskole. Connection to nature …
*	McNaughton, M. J. (2014). From Acting to Action: Developing Global Citizenship Through Global Storylines Drama. *Journal of Environmental Education*, 45(1), 16–36. https://doi.org/10.1080/00958964.2013.804397	ESD/Drama/Global citizenship education – relationships developed during drama contribute a unique pedagogical dimension to ESD/GCE
*	Scrutton, R. A. (2015). Outdoor adventure education for children in Scotland: quantifying	Empirical study of PSD. Pupils who perceive themselves as

	the benefits. *Journal of Adventure Education & Outdoor Learning*, *15*(2), 123–137. https://doi.org/10.1080/14729679.2013.867813	having relatively poor personal and social skills appear to gain most benefit and then lose the least
•	Gress, D. R., & Shin, J. (2017). Potential for knowledge in action? An analysis of Korean green energy related K3–12 curriculum and texts. *Environmental Education Research*, *23*(6), 874–885. https://doi.org/10.1080/13504622.2016.1204987	ESD – impact in geography on actions. No link with the attainment. Geography curricula has potential for green energy content and knowledge into action.
*	McClain, C., & Vandermaas-Peeler, M. (2016). Social contexts of development in natural outdoor environments: children's motor activities, personal challenges and peer interactions at the river and the creek. *Journal of Adventure Education & Outdoor Learning*, *16*(1), 31–48. https://doi.org/10.1080/14729679.2015.1050682	OL focus. Motor skills and risk awareness in the outdoors.
*	Murray, P., Goodhew, J., & Murray, S. (2014). The heart of ESD: personally engaging learners with sustainability. *Environmental Education Research*, *20*(5), 718–734. https://doi.org/10.1080/13504622.2013.836623	Focus on Higher Education. Undergraduate students. Relationship between ESD and values. Extra-curricular element.
*	Tal, T., & Peled, E. (2017). The philosophies, contents and pedagogies of environmental education programs in 10 Israeli elementary schools. *Environmental Education Research*, *23*(7), 1032–1053. https://doi.org/10.1080/13504622.2016.1153047	ESD – unclear pedagogy is in Israel. Lead to ambiguity in approaches etc.
**	Zamani, Z. (2016). 'The woods is a more free space for children to be creative; their imagination kind of sparks out there': exploring young children's cognitive play opportunities in natural, manufactured and mixed outdoor preschool zones. *Journal of Adventure Education & Outdoor Learning*, *16*(2), 172–189. https://doi.org/10.1080/14729679.2015.1122538	OL/Pre-school – positive impacts of natural environments
**	MacQuarrie, S., Nugent, C., & Warden, C. (2015). Learning with nature and learning from others: nature as setting and resource for early childhood education. *Journal of Adventure Education & Outdoor Learning*, *15*(1), 1–23. https://doi.org/10.1080/14729679.2013.841095	OL/ECE – not LfS focused. Nature as a resource for learning. Compares kindergartens in Scotland and two Nordic countries. Nature as a setting, resource, educator.
**	Sjöblom, P., & Wolff, L-A. (2017). "It wouldn't be the same without nature" The value of nature according to Finnish upper secondary school	OL/Early years – value of nature maintained into high school -

	students. *Journal of Environmental Education*, *48*(5), 322–333. https://doi.org/10.1080/00958964.2017.1367637	positive impacts of natural environments. Finnish context
**	Goldenberg, M., & Soule, K. E. (2015). A four-year follow-up of means-end outcomes from outdoor adventure programs. *Journal of Adventure Education & Outdoor Learning*, *15*(4), 284–295. https://doi.org/10.1080/14729679.2014.970343	OL – lasting impact – 4 years after an OB/NOLS course – impacts mostly on PSD.
**	Andersson, P. (2018). Business as un-usual through dislocatory moments - change for sustainability and scope for subjectivity in classroom practice. *Environmental Education Research*, *24*(5), 648–662. https://doi.org/10.1080/13504622.2017.1320704	ESD – tension between instrumental and emancipatory educational objectives. Value of dislocatory moments, and thinking and acting independently
**	Jegstad, K. M., & Sinnes, A. T. (2015). Chemistry Teaching for the Future: A model for secondary chemistry education for sustainable development. *International Journal of Science Education*, *37*(4), 655–683. https://doi.org/10.1080/09500693.2014.1003988	ESD and chemistry education. Mutually beneficial. Secondary education study.
**	Winks, L. (2018). Discomfort in the field--The performance of nonhuman nature in fieldwork in South Devon. *Journal of Environmental Education*, *49*(5), 390–399. https://doi.org/10.1080/00958964.2017.1417219	OL and role of disruption/uncertainty/discomfort. Vignettes. Co-production of place through interaction with non-human nature. Development of environmental sensitivity. Possible mechanism.
**	Ernst, J. (2014). Early childhood educators' use of natural outdoor settings as learning environments: an exploratory study of beliefs, practices, and barriers. *Environmental Education Research*, *20*(6), 735–752. https://doi.org/10.1080/13504622.2013.833596	OL/Early years – educators' beliefs in the value of outdoor learning were countered by beliefs regarding the barriers – walking, time, weather and safety.
**	Aguilar, O. M. (2018). Examining the literature to reveal the nature of community EE/ESD programs and research. *Environmental Education Research*, *24*(1), 26–49. https://doi.org/10.1080/13504622.2016.1244658	ESD/EE Community Programmes. Literature review 1994-2013. Successful programmes may be rooted in community issues, involve multiple community partners, collaborative and civic action, incorporated reflection on social institutions and power dynamics.
**	Lavie Alon, N., & Tal, T. (2015). Student Self-Reported Learning Outcomes of Field Trips: The pedagogical impact. *International Journal of*	OL. Strongest influence on three self-reported development domains (cognitive, affective, and behavioural, and the extent

	Science Education, 37(8), 1279–1298. https://doi.org/10.1080/09500693.2015.1034797	of the students' socio-economic group), was the guide's storytelling.
**	Atencio, M., Tan, Y. S. M., Ho, S., & Ching, C. T. (2015). The place and approach of outdoor learning within a holistic curricular agenda: development of Singaporean outdoor education practice. *Journal of Adventure Education & Outdoor Learning*, 15(3), 181–192. https://doi.org/10.1080/14729679.2014.949807	OL – urban place-based approach in Singapore
**	Lysgaard, J. A., & Simovska, V. (2016). The significance of "participation" as an educational ideal in education for sustainable development and health education in schools. *Environmental Education Research*, 22(5), 613–630. https://doi.org/10.1080/13504622.2015.1029875	Approach to ESD and health education. Participation as an educational ideal and teaching strategy
**	Becker, P. (2015). To be in the garden or not to be in the garden—that is the question here: some aspects of the educational chances that are inherent in tamed and untamed nature. *Journal of Adventure Education & Outdoor Learning*, 15(1), 79–92. https://doi.org/10.1080/14729679.2014.908514	OL/Gardens. Philosophical
**	Edwards, J. (2013). Towards effective socially critical environmental education: stories from primary classrooms. *Environmental Education Research*, 19(2), 258–259. https://doi.org/10.1080/13504622.2012.736477	Eleven teachers – working with young pupils – active participants in the social processes from which environmentally sustainable practices are improved.
***	Jørgensen, K.-A. (2016). Bringing the jellyfish home: environmental consciousness and 'sense of wonder' in young children's encounters with natural landscapes and places. *Environmental Education Research*, 22(8), 1139–1157. https://doi.org/10.1080/13504622.2015.1068277	OL/Early years. Relationship between a child's multi-sensory experiences and the development of environmental consciousness. Importance of local practices taking children into nature.
***	Schindel, A., & Tolbert, S. (2017). Critical caring for people and place. *Journal of Environmental Education*, 48(1), 26–34. https://doi.org/10.1080/00958964.2016.1249326	Caring role of teachers important in developing relationships between people and place
***	Braun, T., & Dierkes, P. (2017). Connecting students to nature – how intensity of nature experience and student age influence the success of outdoor education programs. *Environmental Education Research*, 23(7), 937–949. https://doi.org/10.1080/13504622.2016.1214866	OL. Nature connectedness. Significant improvement in environmental behaviour. Intensity duration and age are all-important. Outdoor learning programmes promote nature connectedness. Empirical study of one and five-day programmes

		– the longer it was more effective. Seven to 9-year old pupils performed the stronger shifts towards nature.
***	Christie, B., Beames, S., & Higgins, P. (2016). Context, culture and critical thinking: Scottish secondary school teachers' and pupils' experiences of outdoor learning. *British Educational Research Journal, 42*(3), 417–437. https://doi.org/10.1002/berj.3213	OL – impact on critical thinking skills. Maths and Geography teachers and students. In secondary school curriculum.
***	Grimwood, B. S. R., Gordon, M., & Stevens, Z. (2018). Cultivating Nature Connection: Instructor Narratives of Urban Outdoor Education. *Journal of Experiential Education*, *41*(2), 204–219. https://doi.org/10.1177/1053825917738267	OL – Nature connection. In and through urban OL programmes. Three 'spatial metaphors' creating space for nature connection, engaging that space, broadening that space. Teacher perspective
***	Ampuero, D., Miranda, C. E. ., Delgado, L. E. ., Goyen, S., & Weaver, S. (2015). Empathy and critical thinking: primary students solving local environmental problems through outdoor learning. *Journal of Adventure Education & Outdoor Learning*, *15*(1), 64–78. https://doi.org/10.1080/14729679.2013.848817	OL/ESD – Significance of *empathy strategies* – significant benefit in creating a 'sustainable citizenry'. Primary. Chile. *Does ESD have an impact because it stimulates/demands approaches to education/teaching that are good practice anyway?* Empathy, critical thinking, primary school focus.
***	Paulus, S. C. (2016). Exploring a pluralist understanding of Learning for Sustainability and its implications for outdoor education practice. *Journal of Adventure Education & Outdoor Learning*, *16*(2), 117–130. https://doi.org/10.1080/14729679.2015.1121504	OL for LfS. Pluralism – individual and multiple identities. Three themes – learning as transformation, as participation and about identities and places. Designed programme for LfS that enables learners to explore location and space.
***	Sellmann, D. (2014). Environmental education on climate change in a botanical garden: adolescents' knowledge, attitudes and conceptions. *Environmental Education Research*, *20*(2), 286–287. https://doi.org/10.1080/13504622.2013.870130	ESD – impact of climate change education had positive impact on teenagers' attitudes.
***	Silverman, J., & Corneau, N. (2017). From nature deficit to outdoor exploration: curriculum for sustainability in Vermont's public schools. *Journal of Adventure Education & Outdoor Learning*, *17*(3), 258–273. https://doi.org/10.1080/14729679.2016.1269235	OL/ESD. Successful strategies used for environmental education – place-based education, hands-on exploration and free-choice learning. Not new ground.
***	Ideland, M., & Malmberg, C. (2015). Governing 'eco-certified children' through pastoral power:	Discourse analysis used to analyse 'pastoral power'

	critical perspectives on education for sustainable development. *Environmental Education Research*, *21*(2), 173–182. https://doi.org/10.1080/13504622.2013.879696	(through books, games, etc.). Frames ESD in neo-liberal ideology – with 'eco-certified children' being 'constructed' through 'personal guilt and global threats'.
***	Izadpanahi, P., Elkadi, H., & Tucker, R. (2017). Greenhouse affect: the relationship between the sustainable design of schools and children's environmental attitudes. *Environmental Education Research*, *23*(7), 901–918. https://doi.org/10.1080/13504622.2015.1072137	School design and ESD. Sustainable design in schools improves environmental attitudes of children. Children, parents, teachers studied. Used New Ecological Paradigm Scale.
***	Price, A. (2015). Improving school attendance: can participation in outdoor learning influence attendance for young people with social, emotional and behavioural difficulties? *Journal of Adventure Education & Outdoor Learning*, *15*(2), 110–122. https://doi.org/10.1080/14729679.2013.850732	OL and attendance (SEBD). Link between attendance and attainment. Students with SEBD showed improved attendance with OL. Is this a link? Maybe OL/ESD is more engaging – if so then attendance may increase and attainment may follow?
***	Kadji-Beltran, C., Zachariou, A., & Stevenson, R. B. (2013). Leading sustainable schools: exploring the role of primary school principals. *Environmental Education Research*, *19*(3), 303–323. https://doi.org/10.1080/13504622.2012.692770	Leadership for ESD. Enabling approach. Encouraging teachers to engage in ESD. Collaborative approaches mentioned several limitations. Professional development needed. Empowering staff. Encouraging critique approaches and exploring alternative possibilities for curriculum pedagogy and policy.
***	Kopnina, H., & Cherniak, B. (2016). Neoliberalism and justice in education for sustainable development: a call for inclusive pluralism. *Environmental Education Research*, *22*(6), 827–841. https://doi.org/10.1080/13504622.2016.1149550	ESD – critique of neo-liberal and anthropocentric approaches. Argues for pluralism where social justice is not prioritised over interests of more than humans. Refers to Brundtland.
***	Munge, B., Thomas, G., & Heck, D. (2018). Outdoor Fieldwork in Higher Education: Learning From Multidisciplinary Experience. *Journal of Experiential Education*, *41*(1), 39–53. https://doi.org/10.1177/1053825917742165	OL – fieldwork in HE – has benefits in terms of engagement outreach and professional competencies. Some weaknesses – e.g. equity.
***	Mannion, G., Fenwick, A., & Lynch, J. (2013). Place-responsive pedagogy: learning from teachers' experiences of excursions in nature. *Environmental Education Research*, *19*(6), 792–809. https://doi.org/10.1080/13504622.2012.749980	OL/Place. Impact on environmental attitudes. Place responsive OL. Enhanced by collaboration, planning visits, and excursions with pupils. Explicit intention to use place/environment to improve human/nature relations.

***	Bento, G. & Costa, J. A. (2018). Outdoor play as a mean to achieve educational goals - a case study in a Portuguese day-care group. *Journal of Adventure Education & Outdoor Learning*, *18*(4), 289–302. https://doi.org/10.1080/14729679.2018.1443483	OL – Early years, Portuguese study. Focus on play/development and skills. Contact with nature. OL contributes to educational goals.
***	Roesch, F., Nerb, J., & Riess, W. (2015). Promoting Experimental Problem-solving Ability in Sixth-grade Students Through Problem-oriented Teaching of Ecology: Findings of an intervention study in a complex domain. *International Journal of Science Education*, *37*(4), 577–598. https://doi.org/10.1080/09500693.2014.1000427	Problem orientated teaching of ecology. Improve specific components of experimental problem solving ability that small effect on transfer.
***	Stevenson, K. T., Peterson, M. N., Carrier, S. J., Strand, R. L., Bondell, H. D., Kirby-Hathaway, T., & Moore, S. E. (2014). Role of Significant Life Experiences in Building Environmental Knowledge and Behavior Among Middle School Students. *Journal of Environmental Education*, *45*(3), 163–177. https://doi.org/10.1080/00958964.2014.901935	Significant life experiences and environmental knowledge behaviour. Role of influences. Positive associations between your role model and time outdoors with subsequent pro-environmental behaviour. Strongest predictors of environmental knowledge and behaviour were student/teacher ratio and county income levels respectively. Life experiences appear less important than promoting small class sizes.
***	Jordan, K., & Kristjánsson, K. (2017). Sustainability, virtue ethics, and the virtue of harmony with nature. *Environmental Education Research*, *23*(9), 1205–1229. https://doi.org/10.1080/13504622.2016.115768	Harmony with nature – theoretical argument – virtue ethics.
***	Wistoft, K. (2013). The desire to learn as a kind of love: gardening, cooking, and passion in outdoor education. *Journal of Adventure Education & Outdoor Learning*, *13*(2), 125–141. https://doi.org/10.1080/14729679.2012.738011	OL/gardening – impact on desire to learn. Control groups – increase from baseline after intervention – pre- post-6-weeks
***	Olsson, D., & Gericke, N. (2017). The effect of gender on students' sustainability consciousness: A nationwide Swedish study. *Journal of Environmental Education*, *48*(5), 357–370. https://doi.org/10.1080/00958964.2017.1310083	Gender gap in sustainability consciousness – increases from 12 to 19. 2,413 pupils. Swedish study
***	Olsson, D., Gericke, N., & Chang Rundgren, S.-N. (2016). The effect of implementation of education for sustainable development in Swedish compulsory schools – assessing	ESD schools have a small positive effect in grades 6-8 but negative in grade 9. Swedish

	pupils' sustainability consciousness. *Environmental Education Research*, 22(2), 176–202. https://doi.org/10.1080/13504622.2015.1005057	study – highlighting negative findings.
***	Zijlema, W. L., Triguero-Mas, M., Smith, G., Cirach, M., Martinez, D., Dadvand, P., … Julvez, J. (2017). The relationship between natural outdoor environments and cognitive functioning and its mediators. *Environmental Research*, *155*, 268–275. https://doi.org/10.1016/j.envres.2017.02.017	Proximity to nature benefits cognitive function. Mechanism not clear.
***	Nordén, B. (2018). Transdisciplinary teaching for sustainable development in a whole school project. *Environmental Education Research*, *24*(5), 663–677. https://doi.org/10.1080/13504622.2016.1266302	Transdisciplinary collaborative teaching. Nine teachers' experiences.
***	Malberg Dyg, P., & Wistoft, K. (2018). Wellbeing in school gardens - the case of the Gardens for Bellies food and environmental education program. *Environmental Education Research*, *24*(8), 1177–1191. https://doi.org/10.1080/13504622.2018.1434869	OL – impact of green space in developing a positive perception of school, wellbeing from being outside in school garden, positive relations with animals and plants, long-term impact not evident
***	Dieser, O., & Bogner, F. X. (2016). Young people's cognitive achievement as fostered by hands-on-centred environmental education. *Environmental Education Research*, *22*(7), 943–957. https://doi.org/10.1080/13504622.2015.1054265	OL – National Park – on cognitive knowledge and achievement – n=289 – comparative study
****	Kadji-Beltran, C., Christodoulou, N., Zachariou, A., Lindemann-Matthies, P., Barker, S., & Kadis, C. (2017). An ESD pathway to quality education in the Cyprus primary education context. *Environmental Education Research*, *23*(7), 1015–1031. https://doi.org/10.1080/13504622.2016.1249459	ESD and Quality Education. ESD and its connection with real-life has a relationship with quality education. ESD can reinforce QE that teachers need support with regard to the political and cultural dimensions SD issues collaborations with local communities and assessments.
****	Beery, T., & Jørgensen, K. A. (2018). Children in nature: sensory engagement and the experience of biodiversity. *Environmental Education Research*, *24*(1), 13–25. https://doi.org/10.1080/13504622.2016.1250149	OL/Early Years and biodiversity. Semi-structured interviews with adults in Sweden were analysed for understanding of the sensory experience of childhood in nature. A second study of direct observations of children's play in an outdoor kindergarten in Norway were analysed. The two studies were brought together

		for shared analysis. Analysis supports the idea that the experience of biodiversity childhood interaction with variation in diversity of living and non-living items from nature allows children important learning opportunities including of biodiversity understanding.
****	Hedefalk, M., Almqvist, J., & Östman, L. (2015). Education for sustainable development in early childhood education: a review of the research literature. *Environmental Education Research*, 21(7), 975–990. https://doi.org/10.1080/13504622.2014.971716	ESD and Early Childhood Education. Major review of literature 1996-2013. Discusses: 1. How ESD is defined by researchers, 2. The results of major research enquiries, 3. Evidence for young children acting for change in relation to sustainability. During the period studied 'the research has evolved from teaching children and facts about the environment and sustainability issues to educating children to act for change' This is important as it may provide a means of explaining why ESD may be valuable in developing learning and *acting* skills.
****	Nazir, J., & Pedretti, E. (2016). Educators' perceptions of bringing students to environmental consciousness through engaging outdoor experiences. *Environmental Education Research*, 22(2), 288–304. https://doi.org/10.1080/13504622.2014.996208	OL/ESD – effect on environmental consciousness. This is based on connecting to the environment, fostering care for the environment, and building agency for the environment. 'Educating for environmental consciousness also requires providing people with deeply engaging experiences that afford authenticity, multi-dimensionality and serendipity'. This study shows how these features 'can work to raise environmental consciousness by creating epiphanies or moments when sudden expansions of the self, realization and empowerment become possible'.
****	Mogren, A., & Gericke, N. (2017). ESD implementation at the school organisation level, part 1 – investigating the quality criteria guiding school leaders' work at recognized ESD schools. *Environmental Education*	ESD and school leadership. Twenty-six 'quality criteria' emerged from study of school principals. Swedish. Summarised as four themes: Collaboration, student-centred

	Research, *23*(7), 972–992. https://doi.org/10.1080/13504622.2016.1226265	education, co-operation with local society, pro-active leadership.
****	Mogren, A., & Gericke, N. (2017). ESD implementation at the school organisation level, part 2 – investigating the transformative perspective in school leaders' quality strategies at ESD schools. *Environmental Education Research*, *23*(7), 993–1014. https://doi.org/10.1080/13504622.2016.1226266	ESD and school leadership. Leaders interviewed. Empirical – mixed methods. Transformative – three distinct quality strategies – strong focus on transformative approach.
****	Fägerstam, E. & Blom, J. (2013). Learning biology and mathematics outdoors: effects and attitudes in a Swedish high school context. *Journal of Adventure Education & Outdoor Learning*, *13*(1), 56–75.	OL. Increased attainment in biology and maths. Learning these outdoors has positive cognitive and effective impact. Thirteen-15 year olds. Five-month study – retention. But a 2013 study so on the edge of the review dates.
****	Breunig, M., Murtell, J., & Russell, C. (2015). Students' experiences with/in integrated Environmental Studies Programs in Ontario. *Journal of Adventure Education & Outdoor Learning*, *15*(4), 267–283. https://doi.org/10.1080/14729679.2014.955354	Environmental Studies Programmes on engagement, responsibility, real-world, authenticity. Three case studies. Ontario
****	Green, M., & Somerville, M. (2015). Sustainability education: researching practice in primary schools. *Environmental Education Research*, *21*(6), 832–845. https://doi.org/10.1080/13504622.2014.923382	Teacher education/CLPL on willingness to teach sustainability. Relationships and pedagogies (problem solving, enquiry learning, children 'lead the way') important. Australia.
****	Witoszek, N. (2018). Teaching sustainability in Norway, China and Ghana: challenges to the UN programme. *Environmental Education Research*, *24*(6), 831–844. https://doi.org/10.1080/13504622.2017.1307944	ESD is in decline globally – neo-liberal competition influences the decline, Lack of a positive narrative one mobilising story reduces the attractiveness of sustainability ideals and inhibits very empowering potential. Maybe LfS has the potential to bring about positive change in both learning and action for sustainability, but three pillars don't help as they play into a neo-liberal mentality. However maybe engagement with the outdoors can re-balance
****	Garrison, J., Östman, L., & Håkansson, M. (2015). The creative use of companion values in environmental education and education for sustainable development: exploring the educative moment. *Environmental Education*	(Approaches) Values – companion values (teacher and student) deliberating together – may be a mechanism for bringing about educational impact fostered particularly

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	Research, *21*(2), 183–204. https://doi.org/10.1080/13504622.2014.936157	through the kinds of approaches used in LfS
****	O'Flaherty. J., & Liddy, M. (2018). The impact of development education and education for sustainable development interventions: a synthesis of the research. *Environmental Education Research*, *24*(7), 1031–1049. https://doi.org/10.1080/13504622.2017.1392484	Development education and ESD – *Review Paper*. Literature review. Measures of assessment of learning and impact on learners.
****	Richardson, E. A., Pearce, J., Shortt, N. K., & Mitchell, R. (2017). The role of public and private natural space in children's social, emotional and behavioural development in Scotland: A longitudinal study. *Environmental Research*, *158*, 729–736. https://doi.org/10.1016/j.envres.2017.07.038	OL/Greenspace – and SEB development. Neighbourhood natural space may reduce SEBD for 4-6 year olds. May be related to attainment. Closeness to nature may lead to improved cognitive function.
****	Quibell, T., Charlton, J., & Law, J. (2017). Wilderness Schooling: A controlled trial of the impact of an outdoor education programme on attainment outcomes in primary school pupils. *British Educational Research Journal, 43*(3), 572–587. https://doi.org/10.1002/berj.3273	OL on attainment – control groups – increase from baseline after intervention – pre- post-6-weeks. Statistically valid study with control groups. Positive effects continued after the intervention.
****	Banerjee, R., Weare, K., & Farr, W. (2014). Working with "Social and Emotional Aspects of Learning" (SEAL): associations with school ethos, pupil social experiences, attendance, and attainment. *British Educational Research Journal, 40*(4), 718–742. https://doi.org/10.1002/berj.3114	Whole-school approaches (SEAL) on attainment. Ethos. Semi-structured observation & interview. Multiple schools (49) 2,242 children.

Appendix E Secondary Search (14 articles comprising the secondary database)

*Rating	Paper	Notes
	Maloni, M. J, & Paul, R. (2011). A Service Learning Campus Sustainability Project. *Decision Sciences Journal of Innovative Education*, *9*(1), 101–106. https://doi.org/10.1111/j.1540-4609.2010.00297.x	
	Summerfield, L., & Wells, S. (2018). Essential Learning for Sustainability: Gifford Pinchot's lessons for educating leaders today. *Journal of Sustainability Education*, 1. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eue&AN=127664435&site=ehost-live	
	Alvarez, A. & Rogers, J. (2006). Going 'out there': learning about sustainability in place. *International Journal of Sustainability in Higher Education*, *7*(2), 176–188. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eue&AN=21342397&site=ehost-live	
	Najjar, D., Spaling, H., Sinclair, A. J., & Dina Najjar, H. S. and A. J. S. (2013). Learning about sustainability and gender through Farmer Field Schools in the Taita Hills, Kenya. *International Journal of Educational Development*, *33*(5), 466–475. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=bri&AN=BEI.220825&site=ehost-live	Included above – ESD – gender equality.
	Moyer, J., Sinclair, A., & Diduck, A. (2014). Learning for Sustainability Among Faith-Based Organizations in Kenya. *Environmental Management*, *54*(2), 360–372. https://doi.org/10.1007/s00267-014-0289-8	
	Jónsdóttir, Á. (2015). Teaching and Learning for Sustainability: An Icelandic practice-based research. *International Journal of Education through Art*, *11*(3), 391–406. https://doi.org/10.1386/eta.11.3.391pass:[_]1	
	Schneider, H. D., Livitz, I. E., & Schneider, D. (2013). Sustainable Learning for Sustainability. *Journal of Organisational*	

	Transformation & Social Change, *10*(2), 124–147. https://doi.org/10.1179/1477963313Z.0000000009	
	Murakami, C. D. (2013). Learning Gardens and Sustainability Education: Bringing Life to Schools and Schools to Life. *Science Education*, *97*(2), 333–335. https://doi.org/10.1002/sce.21039-	
	Lake, D., Fernando, H., & Eardley, D. (2016). The social lab classroom: wrestling with—and learning from—sustainability challenges. *Sustainability: Science, Practice & Policy*, *12*(1), 76–87. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=8gh&AN=117499466&site=ehost-live	
*	Fleming, M., & Dawson, R. (2013). Outdoor learning and sustainability education. *School Science Review*, *95*(351), 61–66. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=bri&AN=92804044&site=ehost-live	Examples of science in OL and OL in the community. Article based on conference presentation
**	Edwards, S., & Cutter-Mackenzie, A. (2013). Pedagogical play types: what do they suggest for learning about sustainability in early childhood education? *International Journal of Early Childhood*, *45*(3), 327–346. https://doi.org/10.1007/s13158-013-0082-5	ECE for sustainability. Considers play type with engagement with biodiversity concepts in ways most likely to support knowledge construction.
**	Owens, C., Sotoudehnia, M., & Erickson-McGee, P. (2015). Reflections on teaching and Learning for Sustainability from the Cascadia Sustainability Field School. *Journal of Geography in Higher Education*, *39*(3), 313–327. https://doi.org/10.1080/03098265.2015.1038701	Field study for sustainability. Links practical work with critical reflection – and its effects on student perceptions.
**	Affeldt, F., Tolppanen, S., Aksela, M., & Eilks, I. (2017). The potential of the non-formal educational sector for supporting chemistry learning and sustainability education for all students – a joint perspective from two cases in Finland and Germany. *Chemistry Education: Research & Practice*, *18*(1), 13–25. https://doi.org/10.1039/c6rp00212a	Practical science learning in university and research labs. Sustainability issues provide valuable contexts for chemistry learning – both formal and non-formal.

***	Bamber, P., Bullivant, A., Glover, A., King, B., & McCann, G. (2016). A comparative review of policy and practice for education for sustainable development/education for global citizenship (ESD/GC) in teacher education across the four nations of the UK. *Management in Education (Sage Publications, Ltd.)*, *30*(3), 112–120. https://doi.org/10.1177/0892020616653179	Teacher education focused. Mentions implications for standards and pedagogy. No mention of OL – just SED/GC.

Appendix F Additional Papers from Personal Knowledge (11 papers)

*Rating	Paper	Notes
**	Andersson, K. et al (2013). Effects of education for sustainable development (ESD) on teacher education students. *Sustainability*. (5) 5135-5125.	Focus on teacher education. Large-scale Swedish study demonstrates positive effects on attitudes (e.g. effects on almost all attitudes and perceptions including personal responsibility in relation to SD and willingness to contribute to SD compared with no noticeable effect in the control group). Positive change not based on pre-existing experience for orientations. Some implications for broader learning outcomes, potentially at other ages.
**	Kalsoom, Q. & Khanam, A. (2017). Inquiry into sustainability issues by preservice teachers: a pedagogy to enhance sustainability consciousness. Journal of cleaner production, (164), 1301-1311.	The authors employed action research coupled with enquiry-based learning. This study was conducted for women in teacher education in Pakistan. The final year students were asked to conduct the empirical investigations into sustainability issues and these and research-based discussions enhanced their understanding and sustainability consciousness, indicating the transformative potential of the enquiry-based learning.

		They make a nice point about complexity of ESD – "sustainability consciousness, an expected outcome of ESD, is a complex of cognitive and affective learning".
**	Varga, A. et al (2007). Developing teacher competencies for sustainable development through reflection: the environment and school initiatives project. *Journal of education for teaching*, 33(2) p. 241– 256	The authors argue that as change is a key element in sustainable development, reflection should be a key aspect of such learning and should be encouraged. Whilst the study is focused primarily on teacher education it is interesting and may be useful.
**	Higgins, S., Hall, E., Wall, K., Woolner, P. & McCaughey, C. (2005). The impact of school environments: literature review. Published by the Design Council and the Centre for learning in teaching, School of Education, University of Newcastle.	Useful study of the design features of schools and their effectiveness.
***	Higgins, P., Thompson, D., and Rawcliffe, P. (2018). Learning outside the classroom boosts educational attainment.	OL-focused. Evidence drawn from Scotland and USA studies – the latter based on a sound research design – conducted by psychologists (who referred to a 'nature advantage'). Attainment was not restricted to 'outdoor' subjects like geography – but maths etc. too.
***	Kollmus, A. & Agyeman, J. (2002). Mind the Gap. Why do people act environmentally and what are the barriers to pro environmental behavior? Environmental education research. 8(3). 239-260.	Multiple factors influence environmental behaviours. "Most researchers agree that only a small fraction of pro-environmental behaviour can be

		directly linked to environmental knowledge and environmental awareness" (250). In a reference to Chawla (1998) they state that amongst environmental educators "during childhood, the most influential were experiences of natural areas and family; going to lessons and early adulthood education and friends were mentioned most frequently, enduring adulthood it was pro-environmental organisations." The authors provide proposed model and structure on p. 257.
****	Laurie, R., Nonoyama-Tarumi, Y., McKeown, R. & Hopkins, C. (2016). Contributions of ESD to Quality Education: A Synthesis of Research. *Journal of Education for Sustainable Development*, 10 (2), p. 1-17.	International study – 18 nations comparative, including Scotland. Found that "ESD contributes in many ways to quality education in primary and secondary schools. Teaching and learning transforms in all contacts when the curriculum includes sustainability content, and ESD pedagogy is promoting the learning of skills perspectives and values necessary to foster sustainable societies. The research also identified the need to integrate ESD across all subjects, to provide

		professional development for teachers to ensure the ESD policy implementation and to adopt ESD management practices to support ESD in the curriculum in order to broaden ESD across countries."
****	Tillmann, S., Tobin, D., Avison, W. & Gilland, J. (2018). Mental health benefits of interactions with nature in children and teenagers: a systematic review. *Journal of epidemiology and community health.* 72, 958-66.	(OL-focused). Literature review of 35 papers. Nature influences mental-health positively but more empirical research is needed. ADHD etc. is mentioned. Over half the findings (53 of 100) confirm statistically significant positive relationships i.e. positive benefits of nature, whereas the remaining findings were non-significant. Only one paper reported as single findings suggesting nature have negative effects on children's mental health. The final summary is valuable. Structure of review is useful. See figure showing filtering process to selection of articles excluded and texts read.
****	Sandri, O. J. (2013). Threshold concepts, systems and Learning for Sustainability. *Environmental Education Research.* 19(6), 810-822.	Systems are core to sustainability. Refers to "Land and Mayer's notion of a threshold concept, to argue that seeing systems as the

		threshold concept for sustainability is useful for understanding the processes of Learning for Sustainability". Teaching sustainability through systems helps address real world issues. *This may be an important mechanism for LFS impact on attainme*t (and real-world issues in the future). Some useful additional material here – including reference to constructivism etc.
****	Broom, C. (2017). Exploring the relations between childhood experiences in nature and young adults' environmental attitudes and behaviours. *Australian Journal of environmental education*. 33(1), 34-47.	OL for environmental education. This also identifies relationships between early experiences in nature and values and actions as adults. Interesting observations on the significance of outdoor learning being structured for sustainability environmental awareness. Such learning is nurtured through environmental care discussions and critical thinking. Reflection and critical thinking are important. The article also mentions place-based learning and biophobia. Nice reference to E O Wilson (1984) where he discusses how "environmental ecological consciousness is

		theorized to connect to ecological identity and relates to an individual's deep reflection on, connection to, and engagement with the natural environment".
****	Kuo, M., Browning, M. & Penner, M. (2018). Do lessons in nature boost subsequent classroom engagement? Refueling students in flight. *Frontiers in Psychology.* (8)2253.	Rigorous study of the impact of outdoor classroom learning across a range of subjects, student groups and weeks of the academic term. Results indicate that students are better able to concentrate whilst in nature and after. The results were statistically significant and independent of teacher effects. As pairs of lessons were matched (indoors and outdoors) the advantage of the nature-based lessons could not be attributed to the teacher, the topic and approach to teaching, the week of semester, the time of day, or the nature of the lesson
****	Kuo M., Barnes M. & Jordan C. (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology* (10) 305 URL=https://www.frontiersin.org/article/10.3389/fpsyg.2019.00305	This is a substantial review. The authors conclude that there is a 'coherent narrative: experiences with nature do promote children's academic learning and seem to promote children's development as persons and as environmental stewards – and at least eight distinct pathways

| | | plausibly contribute to these outcomes' (p. 2). Five of these are centred on the learner and three on the ways natural settings may stimulate this. There are justifiable critiques relating to the interface between development and learning, and indeed the nature of learning, but nonetheless this review adds further to arguments that are becoming well-established for both child (and indeed adult) development and learning. |

Invitation to Quote

The Impact of 'Learning for Sustainability' on Educational Outcomes – Literature Review

SOCIAL RESEARCH
SCOTTISH GOVERNMENT

September 2018

To: All suppliers

12/09/2018

Dear Supplier

INVITATION TO QUOTE FOR A LITERATURE REVIEW OF THE IMPACT OF 'LEARNING FOR SUSTAINABILITY' ON EDUCATIONAL OUTCOMES

You are invited by the Scottish Ministers to quote for the provision of the research services detailed in the attached brief documentation. Your quotation should be submitted via Public Contracts Scotland **by 12 pm on 28 September 2018.** It is the responsibility of all suppliers to ensure that their quotation response is received no later than the appointed time. The Scottish Government may undertake not to consider quotations received after that time.

The Scottish Government is not bound to accept the lowest priced or any quote and shall not be bound to accept the supplier as sole supplier. Further information on the evaluation methodology can be found in the Instructions for Tenderers at Schedule 1. Prices quoted shall be deemed to be exclusive of VAT and shall remain firm for the duration of the contract.

The quotation will be evaluated using the following criteria and weightings:

Evaluation Criteria	Weighting
Quality	60%
Price	40%

By providing us with a quotation you agree to be bound by the Scottish Government Terms and Conditions (SGTC2) which will apply to any contract awarded to you after you have provided us with our quotation.

Enquiries and returns regarding this Invitation to Quote should be sent to: Learning Analysis, Area 2A North, Victoria Quay, Edinburgh EH6 6QQ.

Yours faithfully

Social Research
Scottish Government

CONTENTS

INSTRUCTIONS FOR TENDERERS

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1. It is the responsibility of the tenderer to obtain for themselves at their own expense any additional information necessary for the preparation of their tender.

2. All information supplied by the Scottish Ministers in connection with the Invitation to Tender shall be treated as confidential by tenderers except such information that may be disclosed for the purpose of obtaining sureties and quotations necessary for the preparation and submission of the tender.

3. All information requested should be provided on the Tender Schedules enclosed (additional sheets may be used if required, **but all information should be provided in the order and format of the Schedules**).

4. Tenderers may submit a tender using their own text creation facilities. However the content and layout must be identical to the Scottish Government version of the relevant sections of the tender, and must be in the same order.

5. Tenderers **must** submit their completed tenders via the PCS Quick Quote Portal for this opportunity. Please note that large electronic files take time to download and tenderers should ensure that sufficient time is allowed for this to be done. The speed with which submissions are made are dependent on the size of the document and inclusion of graphics, logos, photographs etc. should be omitted wherever possible.

6. All information submitted to the Scottish Ministers may need to be disclosed and/or published by the Scottish Ministers. Without prejudice to the foregoing generality, the Scottish Ministers may disclose information in compliance with the Freedom of Information (Scotland) Act 2002, (the decisions of the Scottish Ministers in the interpretation thereof shall be final and conclusive in any dispute, difference or question arising in respect of disclosure under its terms), any other law, or, as a consequence of judicial order, or order by any court or tribunal with the authority to order disclosure.

7. Further, the Scottish Ministers may also disclose all information submitted to them to the Scottish or United Kingdom Parliament or any other department, office or agency of Her Majesty's Government in Scotland or the United Kingdom, and their servants or agents. When disclosing such information to either the Scottish Parliament or the United Kingdom Parliament it is recognised and agreed by both parties that the Scottish Ministers shall, if they see fit, disclose such information but are unable to impose any restrictions upon the information that they provide to Members of the Scottish Parliament, or Members of the United Kingdom Parliament; such disclosure shall not be treated as a breach of this agreement.

8. Accordingly, if you consider that any of the information included in your Tender is commercially confidential please identify it and explain (in broad terms) what harm might result from disclosure and/or publication if a request is received, and the time period applicable to that sensitivity. It should be remembered though

that, even where you have indicated that information is commercially sensitive, Scottish Ministers may be required to disclose it under the Act if a request is received. Receipt by the Scottish Ministers of any material marked "confidential" or equivalent should not be taken to mean that the Scottish Ministers accept any duty of confidence by virtue of that marking. You will be notified if we receive a request for disclosure of any of the information you have identified as commercially sensitive. If you consider none of the information in your tender to be commercially confidential, please make a statement to that effect.

9. Scottish Ministers may publish, on the Scottish Government website, the names and contact details of companies who have been issued with an Invitation to Tender.

10. The Scottish Ministers reserve the right to reject any tender which, in their opinion, does not comply with the Specification of Requirements.

11. Please note that the responses to any questions raised during the tendering period will be circulated to all tenderers via PCS). The closing date for raising questions is **noon** on **19 September 2018.** The Scottish Government will circulate answers to all tenderers not later than **20 September 2018.**

12. All enquiries should be submitted via the PCS Quick Quote Portal.

13. The successful tenderer will be selected on the basis of the most economically advantageous bid, throughout the tender process as a whole, having regard to the price and quality of the proposals against defined evaluation criteria. A Price Quality Ratio (PQR) will be used in the tender evaluation. The ratio will be **60:40** in favour of quality.

14. Schedule 3 will form the basis of the quality evaluation. Schedule 4 will form the basis of the price evaluation. Further information on how tenders will be evaluated is set out in Box 1, below.

Box 1 – Evaluation

The aim of the evaluation is to select the tender which represents the best overall value for money. A Combined Score will be determined based on the following Quality/Price Ratio:

      Quality (Technical Proposals): 60%
      Price: 40%

A tender evaluation panel representing Scottish Government stakeholders will be set up to evaluate tenders. Each evaluator will evaluate every submission in isolation of the other evaluators. Each evaluator will award a score between 0 and 4, based on the evidence submitted in the tender proposal and any relevant attachments in response to each question and in accordance with the following methodology.

0 - Unacceptable	Nil or inadequate response. Fails to demonstrate an ability to meet the requirement.
1 - Poor	Response is partially relevant but generally poor. The response addresses some elements of the requirement but contains

	insufficient/limited detail or explanation to demonstrate how the requirement will be fulfilled.
2 - Acceptable	Response is relevant and acceptable. The response addresses a broad understanding of the requirement but may lack details on how the requirement will be fulfilled in certain areas.
3 - Good	Response is relevant and good. The response is sufficiently detailed to demonstrate a good understanding and provides details on how the requirements will be fulfilled.
4 - Excellent	Response is completely relevant and excellent overall. The response is comprehensive, unambiguous and demonstrates a thorough understanding of the requirement and provides details of how the requirement will be met in full.

The arithmetical (mean) average of all of the tender evaluation panel's marks for each question, taken as a proportion of the marks available, will be multiplied by the relevant question weighting and the resulting values totalled to obtain an overall Quality Score for each tender.

Quality scores will be measured out of 100 (for ease of marking) but will be reflected in the final scoring as a mark out of 60.

The tenderer who submits the lowest commercial offer (as measured by the "Evaluation Price" defined in Schedule 4) will be awarded the maximum price score (40). Other tenderers will be awarded a price score based on the percentage difference between their offer and that of the lowest offer.

Combined Score

A Combined Score for each tender will be calculated by adding the Quality Score (out of 60 points) and the Price Score (out of 40 points) together. The tenderer who achieves the highest Combined Score will be awarded the Contract provided their tender has been deemed to be fully compliant.

The Scottish Ministers reserve the right to reject or disqualify a tenderer where:

1. the tenderer fails to comply fully with the requirements of this Invitation to Tender and/or;
2. the tenderer is guilty of serious misrepresentation in relation to its Tender and/or the Tender process; and/or;
3. there is a change in identity, control, financial standing or other factor impacting on the selection and/or evaluation process affecting the tenderer.

15. Any tenderer who directly or indirectly canvasses any officer, member, employee, or agent of the Scottish Ministers concerning the award of the Contract and/or the process leading to that award or who directly or indirectly obtains or attempts to obtain information from any such officer, employee or agent or concerning any other Tenderer, Tender, or proposed Tender may be disqualified.

16. The Authority may, as appropriate, enter into Tender clarifications and commercial discussions with any tenderer(s). This could include a presentation and discussion by the tenderer at a central government organisational site and/or a meeting at the tenderer's premises to discuss the proposal further and to meet

selected personnel proposed for the project. At preferred bidder stage, the supplier may inspect the Authority's Premises to ensure that the Operating Environment is suitable for the provision of the Services.

17. Before the Tender return date, the Scottish Government may modify the Invitation to Tender by way of the Scottish Government point of contact issuing addenda. The procedure for receiving submissions will be detailed in any such addenda.

18. This Invitation to Tender and any associated correspondence are subject to the laws of copyright and must not be reproduced, whether in whole or in part, without the prior written consent of the Authority.

19. You may not in any way advertise or publicly announce that you are entering into discussions with and/or undertaking work for the Scottish Government without the Scottish Government's prior written consent.

20. The Invitation to Tender is issued on the basis that nothing contained in it will constitute an inducement or incentive nor will have in any other way persuaded a tenderer to submit a Tender or enter into any contractual agreement.

21. Any Tender that does not accord with all the requirements herein and in the covering letter may not be considered.

1. Introduction

The Scottish Government's Learning Analysis Unit, on behalf of the Scottish Ministers, wishes to commission a literature review to explore the impact of Learning for Sustainability (LfS) on educational outcomes.

The research will be used to support the Scottish Government's commitment to Learning for Sustainability and, more specifically, the implementation of the recommendations of the concluding report of the Learning for Sustainability National Implementation Group – Vision 2030+.

This specification sets out what is required, provides background information on the project and suggestions on method, but if applicable, bidders are encouraged to propose alternative methods for carrying out this work within the available budget and timescales.

2. Background and context

Learning for Sustainability (LfS) is both a theme across all areas of the curriculum and an approach to learning within it. LfS brings together:

- outdoor learning
- sustainable development education, and
- global citizenship

The Vision 2030+ Report, the concluding report of the Learning for Sustainability National Implementation Group, was published in 2016. It noted the positive progress of LfS in Scottish education whilst also making 14 recommendations to enable Scotland to meet the Group's on-going vision for LfS to 2030 and beyond. Recommendation 4 of the Vision 2030+ Report stated: "We should explore opportunities to conduct research to investigate the links between LfS, high-quality learning and teaching, and school improvement. This will develop our evidence base for further action nationally and will extend international understanding of this relationship."

The report's recommendations were accepted in full by Scottish Ministers and the Scottish Government is now undertaking work to give effect to those recommendations.

3. Aims

The aim of this research is to provide an up-to-date evidence review on the known impact of Learning for Sustainability on educational outcomes.

It will be used to support the delivery of the fourth recommendation of the Vision 2030+ Report; provide evidence on how best to implement the other recommendations of the Vision 2030+ report; and provide evidence of how to promote LfS within Scottish education more generally.

4. Research Questions

The literature review will provide a brief overview of the evidence review on the known impact of Learning for Sustainability on education outcomes. This research should cover education between the ages of 3-18 and can be drawn from education systems around the world, although focus on research focusing on Scotland would be most favourable.

For the purposes of this literature review, Learning for Sustainability includes:

- global citizenship;
- sustainable development education; and
- outdoor learning.

There may be other areas of sustainability not covered in the definition above. Tenders are invited to explain how relevant areas of sustainability would be identified and covered in the evidence review.

The specific educational outcomes relevant to this literature review are:

- impact on attainment
- impact on closing the poverty-related attainment gap or reducing inequity within education
- impact on understanding of citizenship
- impact on confidence of learners
- impact on skills for life and work beyond formal education
- impact on the personal and social development of learners
- impact on overall school improvement

The review will seek to address the following questions in regard to each of the educational outcomes listed above:

- What kind of impact does Learning for Sustainability have (positive or negative) and what is the level of that impact?
- How and why are these impacts achieved? This could include but not be limited to:
    - o the engagement and/or experience of learners studying Learning for Sustainability
    - o the relevance of Learning for Sustainability to 'real world' challenges commonly encountered outside education
    - o the extent to which Learning for Sustainability can support delivery of other areas of the curriculum
    - o the extent to which Learning for Sustainability aids the development of skills and knowledge commonly used beyond education and in later life and work
    - o the influence of curriculum structure on the prevalence of Learning for Sustainability
    - o the knowledge of teachers or education practitioners in the field of Learning for Sustainability
    - o the physical environment of an educational setting
    - o any other barriers or facilitators to the delivery of Learning for Sustainability

5. Methods

Tenderers should outline in detail the methodological approach that will be taken to address the research needs outlined above. This should include information on, for example, the types of databases that will be searched, search criteria and how results will be reviewed and evaluated.

Tenders should specify and identify any methodological constraints and difficulties that may be anticipated in meeting the requirements of the specification and, where possible, how these may be overcome.

6. Outputs and key deliverables

All outputs should be quality assured by the designated person in the contracted research team and be fully proof-read prior to submission. This should include checking that the document is well laid-out, technically correct, grammatically correct and that appropriate language is used. In those cases that the client detects proof read errors, they will be returned to the contractor who will be asked to resubmit the returned document, as well as a revised timetable detailing how the delay will be dealt with.

The written outputs of this research, including draft outputs, will be expected to be of publishable standard (concise, in plain English and featuring high quality analysis and writing). They will communicate in a style that is easily understood by an intelligent lay person. Any output not achieving this standard will be returned for revision. Details of the required style are available here:
http://www.gov.scot/Topics/Research/About/Social-Research/Guidance-for-Contractors

Tenderers are asked to note that the Client may withhold payment until it is completely satisfied that the submitted outputs meet the aims and objectives of the project and are of publishable standard. Hence, the outputs may need to go through two or more iterations, following detailed discussions over content and presentation, and contractors should take this into account in their timetables and costs.

The outputs will be analytical and policy focused rather than simply a reporting of information. They will include:

- an inception report providing a detailed timetable for the key points in the project, with a minute of the inception meeting as an appendix.
- regular updates detailing the progress of the study i.e. how the work is proceeding, the emerging findings, any issues identified and next steps. These updates will be submitted fortnightly, via email and/or telephone, to the contract manager.
- a final report no longer than 50 pages, which will include an Executive Summary

7. Ownership of outputs

The ownership of the research material, including the final report and any data produced as a result of the research, lies with the Scottish Ministers. All Intellectual Property Rights in any material (including but not limited to reports, guidance, specification, instructions, toolkits, plans, data, drawings, databases, patents,

patterns, models, designs which are created or developed by the Supplier on behalf of the Purchases for use, or intended use, in relation to the performance by the Supplier of its obligations under the Contract) are hereby assigned to and shall vest in the Crown absolutely.

8. Data Protection

The successful contractor will, in conjunction with the Scottish Government and in its own right, and in respect of the research contract, make all necessary preparations to ensure it will be compliant with Data Protection Laws. Please refer to the SG terms and conditions for further detail.

9. Ethical Sensitivities

The ethical considerations pertinent to this literature review surround the appropriate application, dissemination and utilisation of the research findings. The methodological approach should be clear and transparent. The Scottish Government will use the outcomes of the review to inform the development of future research on this topic. You should describe how you will ensure that findings are safeguarded against misinterpretation.

10. Key Risks and Responsibilities

Tenderers should submit as part of their proposal, what they believe will be the key risks to delivering the project and what contingencies they will put in place to deal with them.

A risk is any factor that may delay, disrupt or prevent the full achievement of a project objective. All risks should be identified. For each risk you should assess its likelihood (high, medium or low) and specify the possible consequences for the project (high, medium or low). The assessment should also identify appropriate actions that would reduce or eliminate each risk or its consequence.

11. Timetable and Milestones

The following milestones are expected to be met by the winning contractor:

Tender advertised	12 September 2018
Tender submitted	28 September 2018 (noon)
Contractor appointed	By 5 October 2018
Inception meeting	By 12 October 2018
Draft report submitted	w/c 26 November 2018
Final report submitted	14 December 2018

12. Budget

A maximum budget of £10,000 (excluding VAT) is available for this work. Rates and prices shall be deemed inclusive of all additional expenses howsoever incurred.

13. Contract Management

The contract will be managed by **[redacted]** who will be responsible for the day-to-day liaison with the contractor and for agreeing final versions of all research tools and outputs.

14. Sustainability/Environmental/Corporate & Social Responsibility (CSR)

The Contractor should comply with the Scottish Ministers' sustainable development strategy with respect to the delivery of this contract. The Contractor's policies and processes will support the Scottish Ministers' Greener Scotland strategic objective including: a pro-active approach to sustainable consumption and the efficient use of resources; consideration given to social and environmental consequences; policies which ensure that business activities have a direct positive impact on climate change and energy; and policies which encourage natural resource protection and environmental enhancement. Further details of the Scottish Ministers' policies in this area can be found at the following links:

- http://www.scotland.gov.uk/Topics/sustainabledevelopment
- http://www.gov.scot/Topics/Government/Procurement/policy/corporate-responsibility

The Scottish Government is committed to sustainable procurement and to this end the Contractor is required to use ethically sourced products in the provision of the required products and services during the period of the contract.

Schedule 3
TECHNICAL PROPOSAL

Preparing your Technical Proposal

In addition to the background information requested at Schedule 1, your response to Schedule 3 (technical proposal) and to Schedule 4 (pricing schedule) form your tender for the work. **Please submit your responses to these two schedules as separate documents**, and note that technical proposals will be assessed without sight of your pricing schedule. Only after your technical proposal has been scored against the criteria below will your pricing schedule be opened, so please do not include information pertinent to these criteria in your pricing schedule unless it is also in your technical proposal, otherwise it will not contribute to your marking.

In preparing your technical proposal, please note that these should be written in plain English, and be brief and concise – no longer than **6 pages**. Please follow the structure set out below so that your technical proposal responds to each of the criteria in turn. You may delete all guidance and instructions for tenderers (apart from the section/criteria headings) so that these do not contribute to your page allocation.

When preparing your tender documents please refer to the Scottish Government Social Research Contractor Handbook for more details of the process and expectations.

Award Criteria

Tenders will be evaluated against the following award criteria and each section carries a weighting to reflect the percentage of the marks allocated. A scoring system of 0-4 will be used to grade your submission. A guide to the response description, relevant marking and evaluation method is provided in Schedule 1.

QUALITY (TECHNICAL PROPOSAL) – 60%		
SECTION	**SUBJECT MATTER**	**WEIGHTING**
A	Understanding of the requirement, incl. policy context	25%
B	Proposed approach and methods	25%
C	Staffing, skills & task allocation, and expertise in the topic area. Also includes quality assurance	20%
D	Project Management, ethics and risk assessment	15%
E	Communication skills as evidenced by the tender	15%
Total		**100%**
PRICE – 40%		
Price		**100%**

Section A: Understanding the Requirement (Weighting - 25%)

Guidance to tenderers: please set out your understanding of the brief, demonstrating a clear understanding of the policy context based on your reading of the relevant

section of the specification as well as your past experience and existing evidence. Set out your understanding of the rationale for undertaking the research, with reference to the background/context, and (if applicable) your understanding of any data sources you think are relevant to this research/evaluation.

Answer

Section B: Proposed approach and methods, incl. ethics (Weighting - 25%)

Guidance to tenderers: please provide your proposed methodology, which clearly outlines a detailed research design and demonstrates how the aims of this study will be met. Suitability of the methodology – quality and appropriateness of the approach. Demonstration of sound understanding of the challenges and priorities of the contract.

The tender should set out a detailed account of the methodology to be used in the project, making clear if you are suggesting different or additional methodology to that set out in the specification as well as how any specific methodological requirements will be met. Outline your understanding of the specific objectives/research questions for this work. Set out how your proposed methodology fits each of these/provides the required evidence against each and how this will, in turn, meet the overall aim. Include information, where possible and applicable, on sampling frames, sampling methods, mode of administration, expected sample sizes and response rates (as well as methods used to improve these). Set out how any qualitative data will be analysed and any specific quantitative analysis proposed. Set out your rationale for adopting the methodological approach you propose and how the resource set aside (e.g. number of days/budget) will allow you to undertake the proposed work. Highlight any dependencies (e.g. co-operation from different groups, access to data) and other feasibility issues.

Please include an explicit consideration of **ethics**, setting out any ethical issues including Data Protection, sampling, recruitment, informed consent, avoidance of harm and reduction of barriers to participation etc.

Answer

Section C: Staffing, skills & task allocation, incl. quality assurance (Weighting - 20%)

Guidance to tenderers: tenderers should provide a list of the staff who will be involved in the project at all levels, as well as their specific role in this project, what tasks they will be allocated and their suitability for these tasks. The list should briefly highlight their relevant experience and expertise (both subject matter and research expertise e.g. with reference to similar projects they have been involved in), their estimated time to be spent on the project and the length of time they have been working with your organisation. Please state the name of the project manager and a designated deputy.

Please also designate a quality assurer and detail how they will ensure that all the deliverables are delivered to standard. The tenderer should demonstrate here: evidence of their ability to deliver concise reports, written in an accessible style, directly addressing the terms of reference given, to deadlines agreed; their systems in place on quality assurance, including of output at each stage, and supervision of staff. It should also address the ethical issue of ensuring that analysis is protected from bias; and quality of communication skills; written and spoken, of the team and lead contractor

Answer

Section D: Project Management and risk assessment (Weighting - 15%)

Guidance to tenderers: Please provide a detailed realistic timetable for carrying out the work based on the proposed approach and method and the milestones set out in Schedule 2. Highlight in particular any deadlines you identify as critical from the specification. Include timing on turnaround of reports and information on how you will ensure smooth turnaround (e.g. once you have received comments on the first draft from the Scottish Government). This section should also provide information on suggested meetings, contract monitoring etc. Please note that the timetable set out in your tender will form a part of the contract and changes will not be possible unless there are some unforeseen issues.

A risk assessment should be provided covering all main risks to the project, the likelihood of them happening, the consequences if they do happen, mitigation and recovery activities. This should also note any dependencies e.g. feedback from SG officials on research materials and reports that would be needed in order to undertake and complete this project and the implications if this support is not obtained/timely.

Provide information on the data security processes, including storage and transmission of personal data and data protection that will be followed (where appropriate).

Answer

Section E: Communications skills as evidenced by the tender (15%)

Guidance to tenderers: The tender should be clearly laid out using plain English. Care should be taken in the structure of the response. The tender shall demonstrate an ability to express complex ideas in simple terms.

Answer

Please ensure when preparing your Technical Proposal that you clearly state which section/criteria is being answered. Any additional detail that you wish to provide as part of your Technical Proposal should also be cross-referred to the relevant section.

Cost will be firm for the duration of this contract. Charges which appear elsewhere in the proposal but which are not summarised in this Schedule, will be presumed to have been waived.

Payment shall be made monthly in arrears on submission of detailed invoices.

The total cost should be quoted in Pounds Sterling (£) and should be exclusive of any VAT which may be chargeable. The total price must cover all aspects of the requirement, including staff costs, attendance at meetings, equipment, access to data, any reimbursement of research participants, travel and subsistence, overheads, and participation in any dissemination of the research that is envisaged in the specification.

Value Added Tax (VAT) should be shown separately and the VAT registration number given.

Separate aspects of the research/evaluation are to be individually priced and attributed to specific members of the project team along with the estimated number of days clearly stated and day rates for project team included (exc. VAT).

Tenderers should include a statement to confirm whether or not they pay the real Living Wage to all employees, as well as to any sub-contracted field force (interviewers). This information is not part of the assessment of the tendered price, but will be recorded for the successful tenderer to enable the Scottish Government to maintain accurate records of how many of its contractors pay the real Living Wage to employees.

All costs must be included and all sections in the price schedule completed, including, but not limited to, the following areas: quality assurance, fieldwork costs (including cost per interview), project management costs etc. Fees should be inclusive of the time and travel costs for meetings, face-to-face interviews, etc.

<u>Commercial Evaluation</u>

Tenderers should note that the <u>commercial evaluation</u> shall be based on the whole life cost, i.e. the total firm price proposed for the delivery of the contract.

The tenderer who submits the lowest price will be awarded the full weighting available for that section (**40%**). Other tenderers will be awarded a price score based on the percentage difference between their offer and that of the lowest offer.

Table 1 - Price for research contract

Description	Price	Cost Breakdown

FORM OF TENDER TO THE SCOTTISH GOVERNMENT

*I/We the undersigned do hereby contract and agree on the acceptance of the Tender by the Scottish Ministers, to provide the goods and/or services in the Specification in accordance with the Schedules, at the prices entered in the Pricing Schedule and in accordance with the Scottish Government's Terms and Conditions which appear in this set of documents.

*I/We the undersigned undertake to submit a tender in accordance with the following documents:

- Instructions to Tenderers
- Specification
- Evaluation Guide and Award Criteria
- Pricing Submission
- Form of Tender
- Terms and Conditions set (1-5)

*I/We agree to abide by this tender from **12:00 hours on 5 October 2018** the date fixed for receiving tenders, until the Award of Contract.

*I/We understand that the Scottish Ministers are not bound to accept the lowest or any tender and shall not be bound to use the Service Provider as a sole supplier.

*I/We understand that the service provision is expected to commence on **12 October 2018** and end on **14 December 2018** unless the Contract is terminated or extended in accordance with the provision of Schedule 2.

Signature:

Name: **(BLOCK CAPITALS)**

Designation:

Duly authorised to sign Tenders for and on behalf of:

Name of Tenderer

Nature of Firm**

Address

Telephone No   (Include Area Code)

E-mail

Date

* Delete as appropriate
** It must be clearly shown whether the Tenderer is a limited liability company,
statutory corporation, partnership, or single individual trading under his own name.

SCHEDULE (DATA PROTECTION)

Data Processing provision as required by Article 28(3) GDPR.

This Schedule includes certain details of the Processing of Personal Data in connection with the supply of Goods under this Contract:

Subject matter and duration of the Processing of Personal Data
The subject matter and duration of the Processing of Personal Data are [insert description here].

The nature and purpose of the Processing of Personal Data
[Include description here]

The type of Personal Data to be Processed
[Include list of data types here]

The categories of Data Subject to whom Personal Data relates
[Include categories of data subjects here]

The obligations and rights of the Purchaser

The obligations and rights of the Purchaser as the Data Controller are set out in Condition 26 of the Contract.

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