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Experiential Learning for Children Aged 4-14: A Rapid Evidence Assessment

Emily Ranken, Yana Manyukhina, Dominic Wyse and Alice Bradbury

Contents

Abstract....2
Introduction....3
Rationale....3
Experiential learning....3
Objectives....5
Methods....7
Eligibility criteria....7
Information sources....8
Search strategy....8
Selection process....10
Data collection process....11
Data items....11
Study risk of bias assessment....11
Results....12
Study selection....12
Figure 2: Flowchart showing the process of the identification of studies....12
Methodological quality of studies....13
Characterisation of experiential learning....13
Motivation and engagement....13
Agency....15
Wellbeing....16
Academic achievement....18
Children’s experiences and views of experiential learning....21
Other....22
Conclusion....24
Limitations of the research....25
Implications....25
References....27
Appendices....34
....45

Abstract

A rapid evidence assessment (REA) about experiential learning in education was undertaken to synthesise research concerning children aged 4-14. The REA investigated the effects that approaches to experiential learning had on children's motivation, engagement, agency, wellbeing, and academic achievement. Database searches were carried out of the Education Resources Information Center (ERIC), the British Education Index, the Teacher Reference Center, the Education Database and APA PsycInfo to review peer-reviewed research studies published between 2013 and 2023. Studies were screened for their relevance, and the Mixed Methods Appraisal Tool (MMAT) was used to assess the methodological quality of relevant studies. 88 studies were included in the final analysis.

Synthesis of the findings of the 88 research studies showed positive effects for experiential learning approaches related to children's motivation, engagement, agency, wellbeing, and academic achievement. Key effects included strong evidence for the beneficial effect of experiential learning on children's science and maths achievement, and the positive effect that experiential learning had on the engagement and motivation of children who are at-risk, have special educational needs, have behavioural or emotional difficulties, or who are otherwise struggling in formal education. The implications of the REA include the importance of embedding experiential learning within the curriculum, and of connecting it to the wider community.

Introduction

Rationale

This rapid evidence assessment (REA) was part of the Rethinking Curriculum project, a collaboration between the Chartered College of Teaching (CCT) and the Helen Hamlyn Centre for Pedagogy (0-11 Years) at IOE, UCL's Faculty of Education and Society. Rethinking Curriculum is a long-term curriculum development project which aims to ensure that teachers and school leaders are equipped with the knowledge, resources and confidence to make decisions that mean that all pupils will have access to an expansive, inspiring curriculum that connects them with local communities and enables them to lead healthy, fulfilled lives.

Rethinking Curriculum builds on the legacy of Open Futures (2003 to 2018), a pedagogical framework which supported teachers in the delivery of high-quality teaching and learning, embracing enquiry-based learning, and the development of life skills in young people. Rethinking Curriculum is built around two phases, with an initial phase of collaborative intelligence-gathering, solution design and sector engagement, informing the development of detailed plans for the activity to be undertaken during phase two. This REA formed part of the intelligence-gathering in phase one.

The CCT undertook an analysis of the archive of resources from Open Futures, and identified key underlying themes, namely: 21st century competencies; outdoor learning; experiential learning; practical learning; arts-based learning; enquiry-based learning; teacher agency; pupil agency; interdisciplinarity; transferability; pupil wellbeing; and community engagement. In order to determine the main focus for the REA, scoping searches were performed for each theme that had been identified by the CCT archive analysis to identify existing meta-analyses and systematic reviews. Overall, experiential learning was determined to be a fruitful area in which to perform a rapid evidence assessment, due to both a lack of existing meta-analyses and systematic reviews and a relatively large number of individual studies. It represents a key component of the Open Futures programme and aligns well with the aims of the Rethinking Curriculum project. The following themes from the archive analysis were seen as linked with experiential learning: some aspects of 21st Century Competencies; outdoor learning; practical learning; and enquiry-based learning. Experiential learning is also a recognised and well-established concept within education research (Morris, 2020) and it was therefore expected that a rapid evidence assessment would yield relevant and robust evidence in relation to curriculum in primary education.

Experiential learning

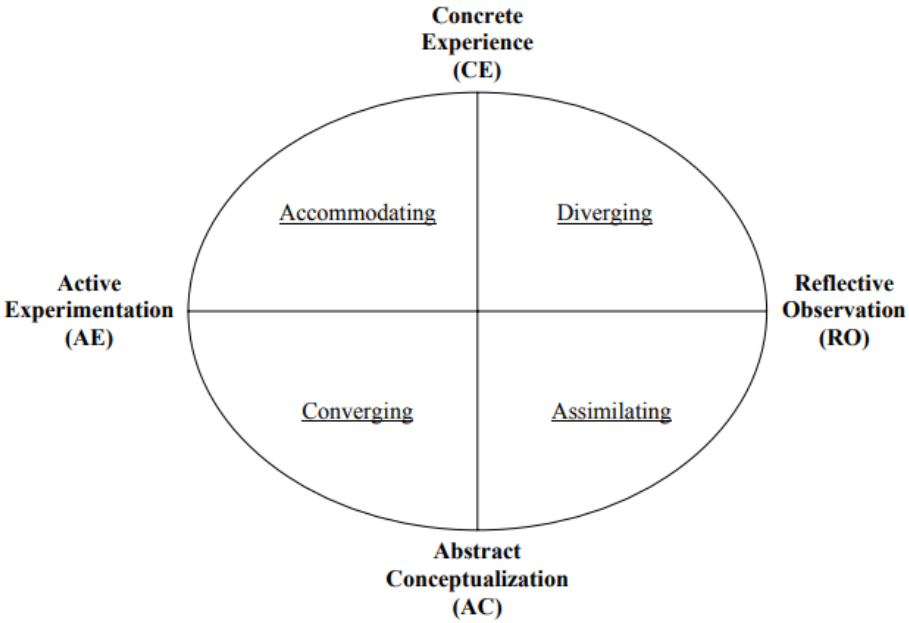
The importance of contextualised, concrete, educational experiences that draw on children's existing knowledge was recognised by Dewey in his book *Experience and Education* (1938), as an attempt to resolve what he saw as a perpetual conflict between the paradigms of traditional and progressive education. He described traditional education as "imposition from above and

from outside," (Dewey, 1938, p.18) suggesting that children's existing experience and knowledge was usually discounted as shallow, inappropriate or otherwise irrelevant. The act of learning during traditional education was described by Dewey as mainly about pupils absorbing the knowledge of those who came before and was therefore static, failing to take into account both the original ways that this knowledge was created and the way that changes may occur in the future (Dewey, 1938). Progressive education of the time was also seen as problematic because Dewey argued that it was formulated in opposition to the traditional paradigm, and was thus a philosophy of education based on what was not done rather than on new ways of doing (Dewey, 1938). This philosophy based on rejection of and opposition to traditionalism also neglected questions of how progressivism was to be implemented within the lived experience of students.

Neither paradigm included what Dewey considered to be key: a recognition of experience as a fundamentally important part of a child's education. Dewey's book *Experience and Education* (Dewey, 1938) attempted to solve the debate by establishing the organic connection between education and personal experience. It is the nature of this experience, grounded in the principle that children are able to make sense of their own worlds and develop their existing schemas, that Dewey considered central to the question of what makes for a good education.

Dewey's recognition of the importance of experience was developed many years later by Kolb, whose model remains influential in experiential learning theory (Seaman, Brown, and Quay, 2017). Kolb extended Dewey's theory into a learning model with four recursive phases: experiencing, reflecting, thinking and doing (Figure 1).

Figure 1: The experiential learning cycle and basic learning styles (Kolb, 1984)



Kolb's model proposes four interconnected learning modes which form a cyclical process: concrete experience, abstract conceptualization, reflective observation and active experimentation. Concrete experiences serve as the foundation for observation and reflection, which are then transformed into abstract concepts. These concepts inform future actions and guide the creation of new experiences. The model emphasizes the importance of balancing these modes to facilitate learning.

Kolb viewed concrete experiences as any experience that a person may have in any area or situation in their life (Kolb, 1984), which Bergsteiner et al., (2010) considered too broad a characterisation to be the basis of an educational theory. Kolb's model has been criticised for lacking theoretical and empirical foundation (Bergsteiner et al., 2010; Morris, 2020; Miettinen, 2000). In particular, Kolb's definition of what constitutes a concrete learning experience was not precisely specified (Bergsteiner et al., 2010). Whilst experience is seen as central to a good education in experiential learning theory, not all experiences are of equal value (Dewey, 1938). Experience can be negative, or simply disconnected and meaningless in such a way that leads to a limiting of future valuable experiences. The quality and the nature of the educational experience is therefore central.

In order to understand more clearly what constitutes a concrete experience in experiential learning, Morris (2020) performed a systematic review of 60 studies, looking at how educators interpret the meaning of a concrete experience. Contrary to Kolb's own theory, Morris found that in the studies examined, concrete experience constituted defined events in specific, uncontrived contexts, as opposed to simply any experience a learner may encounter. These experiences involved the learner's senses and their immersion in reality, as opposed to abstract conceptualisation (McCarthy, 2016). Critical reflection mediated learning during the experiential learning process. Kolb did not specify the need for critical reflection, but Morris found that many educators considered that solving problems in context required some level of critical reflection. Another aspect of concrete experiences was that the learners must be involved and active in the experience.

Drawing on Dewey's theory, and to some degree on Kolb's model, experiential learning was therefore defined for the purposes of this study as a semi-structured, child-centred process in which the child actively engages with a tangible, felt experience. A concrete experience is one which is contextually rich, situated in a specific place and time, that involves engagement with specific real-world problems, and in which the learners are involved, active participants. This may include an element of critical reflection. The teacher's role is to facilitate rather than direct children's learning.

Objectives

The REA synthesised research concerning children aged 4-14 years who had participated in experiential learning approaches as part of their education. It investigated the effect of this participation on children's motivation, agency, engagement, wellbeing, and academic achievement. These outcomes were

decided after scoping searches demonstrated that they were relevant aspects of children's learning that may be affected by experiential learning approaches. The REA aimed to answer the following questions:

1. What are the effects of experiential learning approaches on the motivation, engagement, agency, and wellbeing of children aged 4-14?
2. What are the effects of experiential learning approaches on the academic achievement of children aged 4-14?
3. What are the experiences and views of children aged 4-14 regarding experiential learning approaches?

Methods

The methods of the REA were based on guidance from the Cochrane Collaboration (Higgins et al., 2022) and PRISMA guidelines for systematic reviews (Page et al., 2021). These standard procedures were simplified at various points of the study, as is recommended best practice for the time and resource constraints associated with REAs (Haby et al, 2016).

Eligibility criteria

Studies were initially selected according to the criteria outlined in Table 1.

Table 1: Initial eligibility criteria before scoping searches.

Inclusion criteria	Peer-reviewed Published in English Published 2010-2023 Involves children aged 4-11
Exclusion criteria	Published in a language other than English Published before 2010 Involves experiential learning outside of a school context Involves children outside the 4-11 age range

Following the results of scoping searches, these criteria were adjusted. Dates of coverage were narrowed to 2013-2023 due to a large number of initial results and the limited time available for the REA. The decision was made to expand the age range from 4-11 to 4-14, as there were several important studies that included children both within this age range and outside it in the same study. As we developed a clearer definition of experiential learning, we revised the earlier idea that experiential learning needed to take place in a classroom context: many influential studies took children out of the classroom. The scoping searches also revealed several studies that made use of virtual reality (VR) technology as a replacement for the concrete experience. The decision was made to exclude these studies for the purposes of narrowing down the final sample, as there is debate as to whether the experience that they provide is tangible and felt in a way that can be compared with activities without VR.

Different studies define experiential learning in different ways, and several studies included interventions that could be described as experiential learning but that described it as something else. Therefore, studies describing “project-based learning”, “inquiry-based learning” or “hands-on learning,” were included in the initial title and abstract screening in order to investigate the intervention in more detail to determine whether or not it constituted experiential learning according to the definitions of this study. At the screening stage, several of these studies were deemed to meet the inclusion and exclusion criteria, and were therefore included in the final study.

The final inclusion and exclusion criteria used for this study are shown in Table 2.

Table 2: Final eligibility criteria

Inclusion criteria	Peer-reviewed Published in English Published 2013-2023 Involves children aged 4-14 The experiential learning that takes place in the study constitutes a semi-structured, child-centred process in which the child actively engages with a tangible, felt experience. A concrete experience is one which is contextually rich, situated in a specific place and time, that engages with specific, real-world problems and in which the learners are involved, active participants. This may include an element of critical reflection. The teacher's role is to facilitate rather than direct children's learning.
Exclusion criteria	Published in a language other than English Published before 2013 Involves children outside the 4-14 age range VR or video technology is used as a replacement for a concrete experience The article is not a report of an evaluation of an intervention with data or outcomes e.g., conference proceedings, informal articles, lists of lesson tips, etc.

Information sources

Literature search strategies were developed using subject headings and text words related to the key concepts of the study. The thesaurus of each database was checked to ensure that the relevant terms were used. Five databases were searched, with dates of coverage 2013-2023 (see Table 3).

Search strategy

Both qualitative and quantitative studies were sought. No study design limits were imposed on the search, although only studies in English and published after 2013 were included, due to resource limits.

Table 3: Database and search information

Database	Interface	Date of most recent search	Search string(s)	Filters used
ERIC	EBSCO	28/03/23	((Children OR pupils) OR ("primary education" OR "early childhood education" OR "elementary education")) AND ("experiential learning" OR "practical learning" OR "learning by doing" OR "hands on learning") AND ((motivation) OR ("learner engagement" OR "student attitudes") OR ("wellbeing" OR "mental health") OR ("academic achievement" OR "educational attainment"))	Peer-reviewed English language 2013-2023
British Education Index	EBSCO	29/03/23	((Children OR pupils) OR ("primary schools" OR "elementary schools") OR ("primary education" OR "elementary education")) AND ("experiential learning" OR "practical learning" OR "learning by doing" OR "hands-on learning") AND (("children's agency") OR ("student engagement") OR ("well-being" OR "wellbeing" OR "mental health") OR ("motivation in education" OR "academic motivation") OR ("educational attainment" OR "academic performance" OR "academic achievement"))	Peer-reviewed English language 2013-2023
Teacher Reference Center	EBSCO	09/03/23	((children OR pupils OR students) OR ("primary education" OR "elementary education" OR "early childhood education")) AND (("Experiential learning" OR "practical learning" OR "learning by doing" OR "hands-on learning")) AND (("Children's agency" OR ("academic motivation" OR "Student attitudes") OR "student engagement" OR ("well-being" OR Wellbeing OR "Mental health") OR ("Academic	Peer-reviewed English language 2013-2023

			achievement” OR “educational attainment”))	
Education Database	ProQuest	09/03/23	summary((("children & youth" OR pupils) OR ("elementary education" OR "primary education")) AND ("Experiential learning" OR "Practical learning" OR "Learning by doing" OR "Hands-on learning") AND ((Motivation) OR ("children’s agency") OR ("well being" OR "wellbeing") OR ("academic achievement" OR "educational attainment")))	Peer-reviewed English language 2013-2023
APA PsycInfo	Ovid	09/03/23	((primary school students OR elementary school students OR Pupils) OR (elementary education OR primary education)) AND (experiential learning OR practical learning OR learning by doing OR hands-on learning) AND (agency OR motivation OR student engagement OR well being OR wellbeing OR mental health OR academic achievement)	English language 2013-2023

Selection process

Searches were run through the relevant databases and the results uploaded to the software tool EPPI Reviewer, where duplicates were removed. One reviewer first screened the titles and abstracts of all studies according to the inclusion and exclusion criteria, before reading the full text of the included studies to further screen for relevant studies.

A second reviewer repeated the process with 10% (n = 42) of the studies from the initial search to determine inter-rater reliability. On initial analysis of the sample for the inter-rater reliability checks, both reviewers agreed completely on 35 out of 42 studies. Out of the seven studies that were contested:

- Three of the studies were agreed by both reviewers to be excluded, but the reason for doing so differed. It was decided to discount this disagreement, as there was agreement in the sense that the studies were not relevant for inclusion in the REA.
- Two papers were disagreed on due to being narrative descriptions of studies without clear methodology, rather than research studies. It was agreed to include these but to mark them as low quality in the methodological quality assessment stage.

- Agreement on the remaining two papers was reached through discussion.

Data collection process

One reviewer read through all included studies and entered relevant information into EPPI Reviewer. Due to the time constraints of a rapid evidence assessment, authors were not contacted for any missing data. The automation tool within EPPI Reviewer was used to collect metadata (e.g. author name, date, title, and country), which were then collated in an Excel spreadsheet along with the other data items, listed below.

Data items

The data collected from each study are as follows:

- Year
- Title
- Author/s
- Country
- Study context
- Study design
- Number of participants
- Characteristics of participants
- Aim of study/research questions
- Description of the experiential learning that took place in the study
- Brief summary of outcomes, including how the experiential learning approach affected the motivation, engagement, agency, wellbeing and/or academic achievement of pupils. Fragments of relevant data were collected for this item.

Study risk of bias assessment

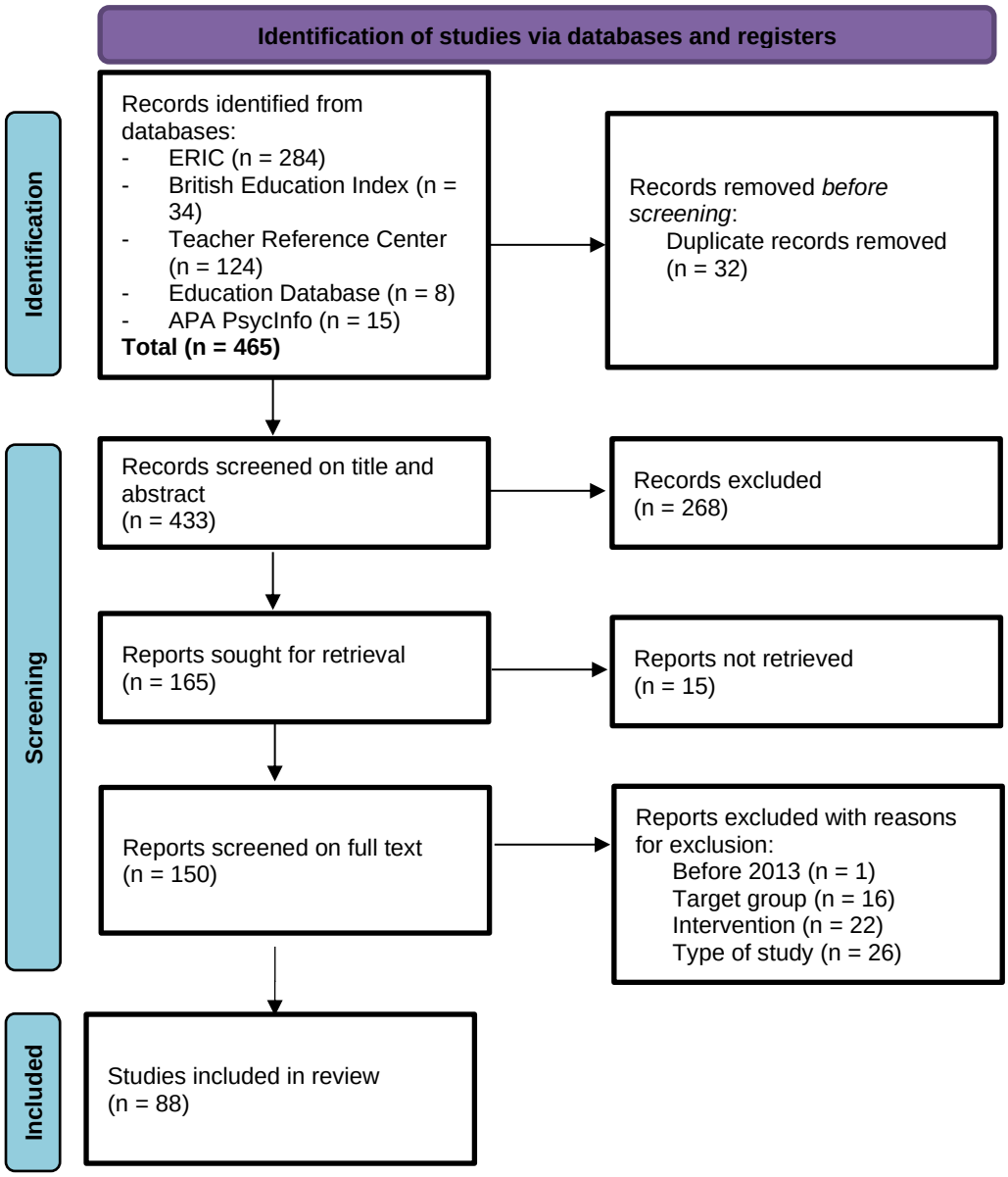
The Mixed Methods Appraisal Tool (MMAT) (Appendix 1) was used to assess the quality of the included studies. One reviewer assessed the studies and assigned each a score out of 5. A score of 4 or 5 meant that a study was deemed to be high quality, 3 or 2 that it was of medium quality, and 1 that it was low quality. 20% of included studies were then independently coded using the same tool by two other researchers for reliability.

Results

Study selection

Figure 2 presents a flowchart of the process of assessing studies for inclusion in the REA, detailing the number of studies in the initial database search through to the number of studies included in the REA.

Figure 2: Flowchart showing the process of the identification of studies



Appendix 2 shows the characteristics of the included studies and the data collected.

Methodological quality of studies

All studies were assessed by one reviewer, then 20% (n = 18) of the included studies were assessed by two more reviewers taking 10% (n = 9) of the studies each. Full agreement was reached for 12 out of the 18 studies. Out of the remaining six studies, all were within one point of disagreement, which was deemed to be an acceptable level of agreement.

Characterisation of experiential learning

As experiential learning is a complex and contested concept, not all of the included studies explicitly used the term experiential learning, despite all meeting the threshold for the description of experiential learning as described in the inclusion and exclusion criteria. Different ways of describing the experiential learning interventions of the studies included:

- Experiential learning (n = 34)
- Hands-on learning (n = 22)
- Outdoor learning (n = 18)
- Play-based learning (n = 4)
- Inquiry-based learning (n = 3)
- The maker or makerspace approach (n = 3)
- Learning by doing (n = 2)
- Project-based learning (n = 2)
- Activity-based learning (n = 1)

Motivation and engagement

Experiential learning was highly engaging for most pupils most of the time. All of the studies that explicitly mentioned engagement found that experiential learning had positive effects on children's engagement (Acharya et al., 2020; Badami and Rubab, 2020; English et al., 2021; Alvi and Gillies, 2021; Djonko-Moore et al., 2018; Fifold, 2019; Franquesa-Soler et al. (2019); Follari et al., 2021; Gan and Gal, 2023; Gillanders and Casal de la Fuente, 2020; Holmes, 2022; James and Williams, 2017; Looijenga et al., 2020; O'Hayer, 2023; Scott, 2014; Vuopala et al., 2020; Wainwright et al., 2020). Evidence suggests that most children remained focused and engaged during experiential learning activities. For example, a quantitative, non-randomised study of 196 second-grade maths students in the USA found a significant improvement in children's levels of engagement when they participated in lessons where teachers used project-based teaching methods as opposed to traditional methods (Holmes, 2022).

Real-life contexts proved highly motivating for students. Activities that were situated in real-life contexts heightened intrinsic motivation among students (Alvi and Gillies, 2021; Ecker and Mostow, 2015; Gresham and Shannon, 2017; James and Williams, 2017; Korfiatis and Petrou, 2021; Maynard et al., 2013; Scott, 2014). Research indicates that when children felt like they were participating in an activity that had real purpose, was

meaningful to them, and was explicitly relevant to their everyday lives, they were likely to show high levels of motivation (Korfiatis and Petrou, 2021; James and Williams, 2017), and may even have been motivated to continue this learning outside of the time allocated for the study (Korfiatis and Petrou, 2021). A randomised controlled trial of 90 3rd and 4th grade students in Israel reported that children who participated in an experiential science learning activity outdoors were more likely to report a positive effect on their motivation when compared to children undertaking the same science learning on a computer (Aflalo et al., 2020). Similarly, a qualitative study of 75 students in the USA who interacted with reptiles using authentic scientific equipment during a programme designed to increase children's knowledge of and familiarity with reptiles reported that children described feeling "like scientists", which led to increased levels of curiosity and motivation (Scott, 2014).

Evidence from longitudinal studies suggests that an increase in motivation persisted over time. A longitudinal, non-randomised quantitative study of 48 6th and 7th grade students in Spain found that a STEM course based on hands-on learning activities produced sustained high levels of motivation in students across the course of one year (Julia and Antoli, 2018).

Embodied experiences as a form of experiential learning promoted engagement. Several studies constituted engagement as "embodied experiences" that children participated in through experiential learning activities (Adams and Beauchamp, 2021; Evans et al., 2015; Fairbrother et al., 2020; Stapleton and Lynch, 2021). These took the form of multisensory, kinaesthetic learning approaches that encouraged children to use their senses or their bodies, enabling children to be fully absorbed in the experience (Fairbrother et al., 2020; O'Hayer, 2023), especially when they considered this to be a form of play (Adams and Beauchamp, 2021). When children were encouraged to use their body as part of the concrete experience, this offered "powerful, meaningful frameworks" for children's learning (Fairbrother et al., 2020, p.692) and led to complete immersion and feelings of authenticity (Adams and Beauchamp, 2021; Evans et al., 2015; Fifold, 2019). For example, a qualitative study in the UK which analysed children's embodied experiences whist playing a hunting game in a nature reserve found that children reported heightened senses which led to feelings of joy and excitement as they became immersed in the experience. The authors suggest that this led to an increased sense of connection with animals and plants, and that children were able both to empathise with and remember more of their learning about the natural world after this experience (Adams and Beauchamp, 2021). Even children in a qualitative study from the USA who did not consider a field-based geography experiential learning programme to be valuable stated that this was due to too many activities which involved sitting and listening to an instructor, as opposed to moving around and experiencing the environment through their senses (James and Williams, 2017).

Children who have behavioural or emotional difficulties, have special educational needs, or are struggling in formal education may have been particularly engaged in experiential learning. Sustained, high levels of engagement among children with behavioural or emotional difficulties or

special educational needs were noted by teachers and researchers in several studies of experiential learning (Amadio, 2015; English et al., 2021; Zyngier, 2017; Fifold, 2019; Maynard et al., 2013; Stapleton and Lynch, 2021). Among children who had been disengaged from their learning, in a regular classroom environment in Australia, experiential learning in the form of a music education programme enabled these children to pay sustained attention to a task (English et al., 2021). A further example of this is the description of a blind student who was especially engaged in the sensory possibilities afforded to him by a field trip to a national park in the USA, describing it as “a beautiful time” (Stapleton and Lynch, 2021, p.281).

However, a number of studies suggested that the increased level of engagement may have been due to the positive reinforcement and trust that was built with the facilitator of the activity rather than to the nature of the experiential learning that children were participating in. This personal relationship may have meant that children were more focused on trying to please the instructor, rather than being motivated by the experiential learning activity itself (English et al., 2021; Fifold, 2019).

Children were motivated by novelty and a break from routine. Despite the positive effects of experiential learning on children’s motivation and engagement as described above, some evidence suggests that this could partially be explained by a sense of novelty that an experiential learning activity brought, along with the consequent break from children’s usual routine. As part of a music education programme for kindergarteners, Gillanders and Casal de la Fuente (2020) found that young children (age 3-6) were primarily motivated by the use of unfamiliar objects in the classroom as opposed to the intervention itself (Gillanders and Casal de la Fuente, 2020).

Agency

Children’s agency in experiential learning was defined as an active process. Studies which explicitly mention agency define it in terms of something children do, rather than an abstract concept (Caiman and Lundegard, 2014; Korfiatis and Petrou, 2021). Children were described as making their own decisions and choices about their learning; negotiating with each other to solve problems independently; and making a difference to a particular situation by actively participating (Caiman and Lundegard, 2014; Christie et al., 2016; Korfiatis and Petrou, 2021).

Experiential learning promoted children’s agency. Experiential learning interventions enabled children to make choices and direct their own learning (Wainwright et al., 2020; Maynard et al., 2013; Looijenga et al., 2020). They were able to independently make decisions and cooperate to solve problems through discussion (Caiman and Lundegard, 2014). Positive outcomes from the agency afforded to children in the experiential learning interventions included taking on leadership roles in their class (Berg et al., 2021), and taking pride in sharing their discoveries (Berg et al., 2021). In a qualitative study of children aged four and five in Sweden, Caiman and Lundegard

(2014) found that the children established agency in several ways during their examination of mini plants in the school garden. The researchers described as “striking” (Caiman and Lundegard, 2014, p.455) the ways in which the children quickly established agency independently from the teacher in the experiential learning context. They noted the importance of giving children opportunities to experience situations where they are in control of the whole process.

Experiential learning provided children with a sense of ownership over their learning. A sense of ownership over their learning (Berg et al., 2021; English et al., 2021; Korfiatis and Petrou, 2021) that was felt by children was noted in several studies. It is suggested that this is likely to create stronger emotional attachment to their learning and promote more positive outcomes (Berg et al., 2021; Christie et al., 2016; McDowell et al., 2021).

Some children found the agency afforded to them in the experiential learning interventions overwhelming. Several studies focused on younger children (aged 4 to 7) described them experiencing the process as “daunting, rather than liberating,” and shared feelings of being “stuck,” “worried,” and “confused,” (Christie et al., 2016, pp.426-427). The authors attributed this to the fact that the children in the study had not worked in this way before and were unsure what was expected of them. Similarly, de Bilde et al. (2015) found that children with lower initial language achievement struggled more in an environment with a lot of unlimited choice than their higher achieving peers, suggesting that this was due to too many options and not enough support.

Adults played a key role in scaffolding children’s agency in experiential learning. Whilst experiential learning interventions provided opportunities for children to make choices and direct their own learning, activities that were structured and guided by adults were crucial for children’s outcomes in several studies (Ersoy and Pehlivan, 2018; Alvi and Gillies, 2021; Christie et al., 2016; Collins et al., 2020; Strawhacker and Bers, 2018; Vuopala et al., 2020; Wainwright et al., 2020). This may be due to the extra support that some children needed due to feeling overwhelmed by the nature of an experiential learning activity, as suggested by de Bilde et al. (2015). One case study in Australia focused on a teacher’s promotion of experiential learning within her classroom, where children were encouraged to learn independently wherever possible (Alvi and Gillies, 2021). The teacher achieved this by creating the environment for children’s independent learning, providing materials and support where necessary, and then allowing children choice within this framework. This was instrumental in promoting positive outcomes in children’s oral language and literacy.

Wellbeing

Experiential learning positively affected a variety of wellbeing outcomes. Children’s levels of confidence frequently increased due to participation in experiential learning programmes (Ersoy and Pehlivan, 2018; Blucher,

Aspden and Jackson, 2018; Zyngier, 2017). A randomised controlled trial of 50 children who participated in an experiential learning intervention in Taiwan demonstrated greater problem-solving competence than those learning in a conventional environment (Cheng et al., 2019). A qualitative study of 47 children participating in a community engagement programme in Australia noted that children's success in collaborating during an experiential learning activity dramatically improved children's confidence, which carried over into their school life (Zyngier, 2017). One study from Nepal with a sample size of 193 children also observed a decrease in absenteeism after participation in the programme (Acharya et al., 2020).

Experiential learning promoted children's socio-emotional skills. Children's relationships with each other improved after taking place in the experiential learning interventions in many studies (Acharya et al., 2020; Alvi and Gillies, 2021; English et al., 2021; Ersoy and Pehlivan, 2018; Koh et al., 2016; Strawhacker and Bers, 2018). Evidence shows an increase in collaboration skills after participating in experiential learning programmes (English et al., 2021; Alvi and Gillies, 2021; Blucher, Aspden and Jackson, 2018; Korfiatis and Petrou, 2021; Looijenga et al., 2020; Strawhacker and Bers, 2018), including those children who would usually struggle with this (English et al., 2021). Several studies observed that this may lead to a greater sense of community (Gartland, 2021; Strawhacker and Bers, 2018). However, this is not necessarily due to the effects of the experiential learning intervention itself: for some children, the main benefit of experiential learning may be the chance to spend time with their friends in a less constrained environment than they are used to in school, as suggested by Hammarsten et al. (2019).

Experiential learning may have developed children's feelings of empathy and thus their inclusivity of those different from themselves (Evans et al., 2015; Koh et al., 2016; van Haren and Kiddy, 2018). Children's empathy may be developed through experiential learning in two different ways. First are the benefits of increased collaboration skills, which the research suggests lead to an increase in children's empathy to those around them (English et al., 2021). Secondly, embodied experiences designed explicitly to increase children's connections to those around them, whether human or animal, were effective in increasing children's levels of empathy (Adams and Beauchamp, 2021; Evans et al., 2015; Koh et al., 2016). A qualitative study of 49 children aged 10-12 in the UK investigated the embodied experiences of non-disabled children participating in wheelchair basketball sessions over a 12-week period. Before the intervention, children had limited knowledge of disability sport and approached it from a medicalised perspective, focusing on disabled people's perceived limitations. Children's perceptions shifted rapidly after they participated in the programme; they began to question their initial perceptions of the ability of disabled sportspeople and started to focus more on similarities between themselves and physically disabled individuals. However, participants made no reference to impairments other than physical disability, suggesting that they were unable to fully generalise their learning (Adams and Beauchamp, 2015).

Experiential learning may have helped children learn how to regulate their emotions. Gan and Gal (2023) analysed the role that emotion plays in experiential learning. Children were likely to experience strong emotions as part of the experiential learning process due to its connection to real-life experiences, which can be unpredictable and challenging. However, the process of experiential learning itself may be a medium for children to learn how to regulate their emotions. Evidence suggests that children's ability to regulate their own emotions during and after an experiential learning experience was increased (Berg et al., 2021; Ersoy and Pehlivan, 2018).

Children showed improved in-class behaviour as a result of experiential learning. Gartland (2021) suggests that because of the increase in empathy and connectedness that children experience, experiential learning can improve children's behaviour. Evidence suggests that as many experiential learning interventions allowed children more agency over both their learning and their bodies (children are often permitted to move around more than they would be during traditional learning), children felt less constrained by the traditional expectations of the classroom (O'Hayer, 2023).

Some studies indicated that experiential learning is an effective way to encourage healthy eating habits (Berezowitz et al., 2015; Fifolt and Morgan, 2019; Hashim and Said, 2021). Children who grew and harvested vegetables themselves were more likely to be willing to try new food and take it home to share with their parents (Fifolt and Morgan, 2019; Hashim and Said, 2021), and having a school garden in which children actively participated in the upkeep was positively associated with higher consumption of fruits and vegetables (Berezowitz et al., 2015).

Repeated and sustained opportunities to engage in experiential learning promote wellbeing. Longitudinal studies, where children had opportunities to repeatedly engage in experiential learning, frequently reported on the wellbeing effects that had arisen over time as children participated in more experiential learning activities (de Bilde et al, 2015; Gratani et al., 2023; Morag et al., 2013). A longitudinal study of 50 9 to 10-year-olds in Italy across the course of a year found that participation in experiential learning that was authentic, challenging, and open to children's own ideas improved students' self-efficacy, organisational and interpersonal skills (Gratani et al., 2023).

Academic achievement

Experiential learning was frequently deployed in the teaching of science and had positive effects on children's science knowledge. Many studies focused the experiential learning intervention around the science curriculum (Acharya et al., 2020; Aflalo et al., 2020; Berg et al., 2021; Carrier et al., 2013; Cheng et al., 2019; Dhanapal, 2013; Djonko-Moore et al., 2018; Fifolt and Morgan, 2019; Hammarsten et al., 2019; Hashim and Said, 2021; James and Williams, 2017; Paulsen and Andrews, 2019; Shao, 2021). This often took the form of inquiry-based learning. A quantitative study of 319 children in China showed an increase in science self-efficacy, science competence and science

confidence scores after participation in an apprenticeship programme in a botanical garden (Zhao et al., 2021). A randomised controlled trial of 50 children aged 9-10 in Taiwan compared those studying living creatures in an aquaponics environment using an experiential learning approach with a control group of those participating in a conventional learning environment. Children participating in the experiential learning condition had higher learning outcomes and displayed more problem-solving competence than the control group (Cheng et al., 2019).

Research suggests that experiential learning led to an improvement in children's scientific vocabulary. Evidence showed an increase in the amount and accuracy of scientific vocabulary that children use both during experiential learning interventions and in their learning afterwards (Djonko-Moore et al., 2018; Hammarsten et al., 2019; Hashim and Said, 2021). A qualitative study of 34 children in the USA showed that children used a larger amount of scientific vocabulary without prompting during a visit to a science museum (Djonko-Moore et al., 2018), and as a result were enabled to engage in scientific inquiry to develop deeper knowledge of science concepts (Djonko-Moore et al., 2018). Children had a greater ability to describe the natural world and were able to describe plants and animals that they encountered more accurately (Hammarsten et al., 2019). Children showed knowledge of the connections between the scientific vocabulary they had learned, and were better able to describe their own sensory experiences according to texture, size, pattern and hardness (Hashim and Said, 2021).

Experiential learning had positive effects on children's maths vocabulary and critical thinking skills. When children were forced to actively engage with their learning, evidence suggests that they used more mathematical vocabulary to question, actively research and gather information (Christie et al., 2016; de Bilde et al., 2015; Ekwueme et al., 2015; Gresham and Shannon, 2017). As part of this process, children improved their critical thinking skills in their search for solutions (Christie et al., 2016; Ekwueme et al., 2015). Children's explanations of how they arrived at a mathematical solution were clearer and more logical after engaging with the experiential learning task (Ekwueme et al., 2015). A key example of this is a longitudinal, quantitative study of 2360 kindergartners in Belgium which investigated whether experiential practices over the course of a year predicted children's achievement in arithmetic. The researchers found that experiential learning approaches were especially beneficial for kindergarten children with initial low arithmetic achievement (de Bilde et al., 2015), but that there was no association between experiential learning and arithmetic achievement for children who already had middle or higher levels of attainment.

Positive effects of experiential learning on other areas of the curriculum. The research suggests that experiential learning can have positive effects on children's learning across the curriculum. A systematic review of research into the effect that school gardens have on children's academic achievement found that academic performance improved (or showed no difference) in studies comparing gardening and nongardening students, regardless of the academic area assessed (Berezowitz et al., 2015). Two studies found positive

effects of experiential learning on children's music learning (Avci, 2020; English et al., 2021). In younger children, experiential learning had positive effects on social skills, oral language development and transition to school (Blucher, Aspden and Jackson, 2018). A qualitative study from Australia showed that participation in an experiential learning programme led to accelerated progress in writing for preschool and kindergarten students (van Haren and Kiddy, 2018).

There is some evidence that the positive effects on children's learning after an experiential learning intervention continue long-term. Evidence suggests that the longer an intervention continues for, the greater the effects on students' knowledge and behaviour (Bergman, 2016). A quantitative study of 225 children in Germany found that positive effects on children's science knowledge of small animals persisted up to four years after having visited a 'Green Classroom,' for half a day, alongside fewer misconceptions, and a lasting effect on children's positive emotions towards these animals (Drissner et al., 2014). In another study, children were able to use accurate vocabulary connected to conservation that they had learned at an Ocean Science Festival 3 months after the event (Idema and Patrick, 2019). A longitudinal, ethnographic study of 90 4th grade students in the USA over four years found that when an outdoor experiential learning programme continued long-term, a culture of knowledge-sharing developed among children, enabling them to gain knowledge from each other such as the names of plants and animals in an ecosystem (Stapleton and Lynch, 2021).

Negative effects of experiential learning on academic achievement. Few studies showed a negative effect resulting from the experiential learning intervention. Christensen and Wistoft (2022) found that in a quantitative study of 1609 students in Denmark that those who followed cooking recipes precisely had similar or improved learning outcomes to those who took a more experiential approach to cooking. They suggest that this is due to the nature of cooking education; children may be more successful in this instance if they follow specific instructions, so this may not necessarily be the case for subjects where greater creativity or interpretation is likely to lead to a more positive result. Fairbrother et al. (2020) found that some children tended to remember the concrete experience, but not the message that it was designed to teach. Similarly, they found that despite being designed to be realistic for children, some children struggled to connect the programme with their lived experiences, and expressed doubt about how it would actually play out in the real world. The author suggests that more discussion and time for reflection be taken to answer children's questions.

Conflict between experiential learning and the formal curriculum. Whilst the evidence suggests that the majority of teachers recognised the benefits of experiential learning for their pupils, teachers in several studies perceived a tension between experiential learning and the formal curriculum. A longitudinal study of field trips in Israel found that most teachers did not integrate learning from the field trip into existing curriculum content (Moseley, 2020). Experiential learning was frequently seen as a one-off event, often run by outside providers (Carrier et al., 2013; Moseley, 2020). When teachers did

implement experiential learning activities themselves, several made the point that it was very time-consuming, which could have an effect on the amount of time available to implement the curriculum (Badami and Rubab, 2020; Carrier et al., 2013; Efird, 2015; Ersoy and Pehlivan, 2018; Fifold, 2019; James and Williams, 2017). Furthermore, teachers mentioned a tension between the experiential learning programme and the demands of a curriculum that involves high-stakes testing (Carrier et al., 2013).

Children's ability to connect their learning to the curriculum may depend on adult scaffolding. Similar to the findings on agency, it is possible that children relied on adults to make the connections between what they were learning in experiential activities and the curriculum explicit. When teachers were active and explicit in making links and supporting children to engage in critical reflection of an experience, children themselves were better able to describe the learning they have engaged in and make links to their work in the classroom (Acharya et al., 2020; Berg et al., 2021; Coates and Pimlott-Wilson, 2019; Hammarsten et al., 2019).

Children's experiences and views of experiential learning

Children's experiences and views of experiential learning tended to be positive. All studies that explicitly analysed children's own views found that these were positive for most children most of the time. Children described feeling happy and excited, especially when the experiential learning activity took place outside (Adams and Beauchamp, 2021; Berg et al., 2021; Korfiatis and Petrou, 2021). Some studies noted feelings of calmness and a lack of stress that were expressed by children (Coates and Pimlott-Wilson, 2019; Hammarsten et al., 2019). Many children expressed a desire to engage in more, similar programmes of learning in the future (Korfiatis and Petrou, 2019; Zyngier, 2017). In a randomised controlled trial of 90 students, Aflalo et al. (2020) found that 73% of children engaging in learning in an outdoor setting enjoyed their learning, in comparison to a control group which completed a science lesson on a computer, where only 38% of children reported enjoying their learning.

In many of the studies, children differentiated sharply between traditional learning and the experiential intervention. Experiential learning was not considered 'real' learning by many children, and several studies note children's difficulty making connections between the experiential learning intervention and their everyday classroom learning (Carrier et al., 2013; Djonko-Moore et al., 2018; Coates and Pimlott-Wilson, 2018; Fifold, 2019; Moseley et al., 2020; Zyngier, 2017). Older children in particular had difficulties with the idea of how learning and play might converge in an experiential learning situation (Coates and Pimlott-Wilson, 2019). A quantitative study of 432 children in the USA found that over a third of all students most enjoyed the experiential learning intervention (forest management in their local community) for the chance to be outside of the classroom, and only 5% most enjoyed gaining knowledge, suggesting that

these children did not consider being outside the classroom a learning experience in its own right (Bergman, 2016).

Some children had negative opinions about the experiential learning they experienced. For some, it was a little too real; students participating in a mock trial were concerned about ruining relationships with their friends (Ersoy and Pehlivan, 2018); and some kindergarten students struggled with an open environment where they had a large amount of autonomy over their learning (de Bilde et al., 2015). Some students found the experience overwhelming and stressful as it was very different to what they were used to (Christie et al., 2016; Djonko-Moore et al., 2018; Gan and Gal, 2023). Some children from urban areas on field trips to rural locations found them “boring,” “hot,” or “dirty,” or did not enjoy inclement weather (Djonko-Moore et al., 2018; Gan and Gal, 2023; Talebpour et al., 2020), and in one study a pupil became upset after witnessing a kestrel kill a pigeon (Gan and Gal, 2023). Other children did not like encountering insects (Hammarsten et al., 2019); however, this study found that children became more comfortable with them the more time they spent in the environment. Djonko-Moore et al. (2018) notes how important it is that "urban children should be prepared in advance for the wildlife, smells, and sounds they may experience at national parks" (Djonko-Moore et al., 2018, p.149).

Other

Several of the included studies did not have outcomes that focused solely on motivation, engagement, agency, wellbeing, academic achievement, or children’s experiences and views as a result of their participation in experiential learning. Other relevant outcomes of these studies are below.

There were strong connections between experiential learning and the natural world. Many of the included studies were based in a natural setting, including several studies on Forest Schools. Many studies consequently investigated children’s environmental knowledge or connection to nature as part of their outcome data (Aktepe, 2015; Amadio, 2015; Bergman, 2016; Chou et al., 2015; Djonko-Moore et al., 2018; Faruhana et al., 2022; Gan and Gal, 2023; Idema and Patrick, 2019; Morag et al., 2013; Moseley et al., 2020; Stapleton and Lynch, 2021; Talebpour et al., 2020). Several of these studies reported positive outcomes connected to children’s relationships with nature and the environment (Carrier et al., 2013; Faruhana et al., 2022; Turtle et al., 2015; Stapleton and Lynch, 2021; Talebpour et al., 2020). Children had an increased connection with nature (Aktepe, 2015; Berg et al., 2021; Gan and Gal, 2023; Stapleton and Lynch, 2021; Talebpour et al., 2020,) which included attitudes such as empathy for living creatures, a sense of oneness with the natural world, and a sense of responsibility for the environment (Talebpour et al., 2020). Children developed increasing eco-appreciation and ecological knowledge across several years of an experiential learning programme (Bergman, 2016). They also had increased knowledge of natural disasters that may occur in their area, and an increased level of emergency preparedness (Djonko-Moore et al., 2018). Having personal responsibility for plants and animals drew children closer to them (Aflalo et al., 2020). Evidence

also suggests that children who had had live experiences with wildlife had increased conservation willingness.

Development of practical skills. Due to the hands-on nature of experiential learning, several studies reported on the practical skills that children gained, such as “planting, picking herbs for their lunch salad, cooking food, digging and building a stone wall,” (Hammarsten et al., 2019, p.235), building homes for mason bees or transplanting native plants (Stapleton and Lynch, 2021), and gardening and farming skills (Korfiatis and Petrou, 2021).

Conclusion

This rapid evidence assessment addressed the effects of experiential learning approaches on children's motivation, engagement, agency, wellbeing, and academic achievement, as well as children's own experiences and views of experiential learning. The evidence points to experiential learning having a strong positive effect on all these outcomes, as well as on other outcomes not initially identified for analysis, including children's connections with nature, environmental and ecological awareness, and the development of practical skills.

Research has shown that experiential learning supported children's academic achievement. Many studies showed positive outcomes of experiential learning on children's science and maths achievement, as well as in writing, music and oral language development. There is evidence that the positive effects of experiential learning continue long-term: children were able to remember learning that they engaged in through experiential learning interventions for several months or years afterwards.

Research suggests that experiential learning was highly engaging and motivating for most pupils most of the time, especially when it was connected to contexts that are explicitly relevant to children's everyday lives. This is consistent with Kolb's model of experiential learning (Kolb, 1984). Furthermore, experiential learning that came in the form of embodied experiences may be particularly engaging for children.

An important finding is the beneficial effect that experiential learning seemed to have on children who were at-risk, had special educational needs, had behavioural or emotional difficulties, or who were otherwise struggling in formal education (Zyngier, 2017). The evidence suggests that experiential learning promoted motivation and engagement for these children.

Experiential learning effectively promoted children's agency, giving them the opportunity to make independent decisions and take on leadership roles, as well as providing them with a sense of ownership over their learning. The agency that was afforded to children through experiential learning was most effective when scaffolded by an adult through the creation of an environment conducive to experiential learning.

Similar positive outcomes of experiential learning can be seen through its effect on children's wellbeing. Evidence suggests that participation in experiential learning programmes increased children's confidence, problem-solving skills, socio-emotional skills, empathy, emotion regulation, in-class behaviour, and healthy eating habits.

Children themselves had overwhelmingly positive views of experiential education, often displaying enthusiasm and the desire to engage in more, similar programmes of learning in the future. However, children frequently did

not recognise experiential learning as ‘real’ learning, and in some cases struggled to connect it to learning that they had engaged in in class.

A few studies noted negative or neutral outcomes for some children as a result of experiential learning. Some students struggled with the unstructured nature of the experiential learning they were engaging in and found it overwhelming and stressful to participate in learning that was significantly different from what they were used to. One study noted that children remembered the experiential learning activity, but not the concept that it was designed to teach (Fairbrother et al., 2020).

Furthermore, some children may have had negative experiences of experiential learning, often in studies where the experiential learning activity took place outdoors, due to encountering wildlife and a natural environment that they were not used to interacting with.

Limitations of the research

The methods of the REA were based on guidance from the Cochrane Collaboration (Higgins et al., 2022) and PRISMA (Page et al., 2021) guidelines for systematic reviews. Due to a restricted time frame, it was not possible for this study to fully conform to the methodological requirements of a systematic review. The decision was made to follow the Cochrane guidance for systematic reviews but to simplify the process at various points of the study, as is recommended best practise for REAs (Haby et al, 2016). Literature that was searched for was limited to peer-reviewed journals, so grey and unpublished literature may have been missed. Only studies published in English were included, and date of publication was limited to 2013-2023. It is likely that further relevant studies were published prior to 2014. Only one reviewer was used to select and assess the quality of all 88 studies; inter-rater reliability processes were therefore implemented to mitigate the risk of investigator bias. Results were synthesised through narrative synthesis, rather than through meta-analysis of quantitative data from individual studies, although this would have required a sufficient number of comparable quantitative data sets in the studies.

The bulk of the conclusions drawn from this study were taken from studies assessed to be high (n = 48) or medium (n = 29) quality at the methodological quality assessment stage of the review. However, the large number of qualitative studies that were assessed as being high quality may point to the possibility that the Mixed Methods Appraisal Tool (MMAT) used to assess the included studies may not be sensitive enough to provide an accurate representation of their quality.

Implications

The results of this rapid evidence assessment indicate that experiential learning can be a highly valuable tool for children’s learning. It provides evidence that underscores the importance of experiential learning as one of the key topics of Open Futures, as identified by CCT. The different ways in which experiential learning is characterised in the included studies further link

the concept to other topics identified in CCT's analysis, including elements of 21st century competencies, outdoor learning, practical learning, and enquiry-based learning.

As a result, several key implications for the Rethinking Curriculum project can be drawn. One of the aims of the Rethinking Curriculum project is to provide children with a curriculum that is expansive and inspiring. The evidence from this REA suggests that embedding experiential learning in the curriculum can prove deeply engaging and motivating for children, as well as providing benefits beyond traditional academic subjects. However, children's learning through experiential programmes should be adequately scaffolded by adults to support children to draw connections between experiential learning activities and learning in other areas. Teachers often perceived a conflict between experiential learning and the formal curriculum, including when their students must participate in high-stakes testing (Carrier et al., 2013). Evidence suggests that experiential learning should not be seen as a supplement to the curriculum that takes time away from academic learning, but as a complement to it, with teachers being provided with the time and resources to embed experiential learning in a way that supports children's academic achievement. Experiential learning should therefore be embedded in the curriculum at all levels, from national to classroom, to ensure this.

Rethinking Curriculum also aims to connect children with their local communities. Experiential learning that is embedded in real-life, meaningful contexts for children lends itself to links being made with local organisations and community members: several studies referred to community organisations working in partnership with schools to provide experiential learning opportunities for children, in addition to studies which suggest that experiential learning is effective in building a sense of community between children. Any initiatives developed through Rethinking Curriculum should aim to link children's learning in school with what is happening in the communities in which they live.

Another aim of Rethinking Curriculum is to enable children to lead healthy, fulfilled lives. Evidence from this REA suggests that experiential learning can promote children's wellbeing in a number of areas, including increasing confidence and socio-emotional skills, decreasing absenteeism from school, and encouraging healthy eating habits. Experiential learning can therefore be seen as a key component of any programme designed to promote children's health and wellbeing.

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References marked with an asterisk indicate studies included in the meta-analysis.

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Appendices

Appendix 1: Mixed Methods Appraisal Tool (MMAT) version 2018

Category of study designs	Methodological quality criteria	Responses			
		Yes	No	Can't tell	Comments
Screening questions (for all types)	S1. Are there clear research questions?				
	S2. Do the collected data allow to address the research questions?				
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.				
1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?				
	1.2. Are the qualitative data collection methods adequate to address the research question?				
	1.3. Are the findings adequately derived from the data?				
	1.4. Is the interpretation of results sufficiently substantiated by data?				
	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?				
2. Quantitative randomized controlled trials	2.1. Is randomization appropriately performed?				
	2.2. Are the groups comparable at baseline?				
	2.3. Are there complete outcome data?				
	2.4. Are outcome assessors blinded to the intervention provided?				
	2.5 Did the participants adhere to the assigned intervention?				
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?				
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?				
	3.3. Are there complete outcome data?				
	3.4. Are the confounders accounted for in the design and analysis?				
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?				
4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?				
	4.2. Is the sample representative of the target population?				
	4.3. Are the measurements appropriate?				
	4.4. Is the risk of nonresponse bias low?				
	4.5. Is the statistical analysis appropriate to answer the research question?				
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?				
	5.2. Are the different components of the study effectively integrated to answer the research question?				
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?				
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?				
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?				

Appendix 2: Characteristics and data collected from included studies

Title	Author and year	Country	Study design	No. of participants	Characteristics of participants	Study quality
Small Change Is Beautiful: Exploring Possibilities of Eco-San on School Garden for Transformative Pedagogy	Acharya et al. (2020)	Nepal	Qualitative	193	180 students - grades 5, 6, 7 10 parents 3 teachers	High
Other Knowings and Experiencing Otherness: Children's Perspectives of Playing a Hunting Game in a Nature Reserve	Adams and Beaucha mp (2021)	Wales	Qualitative	104	Age 9-10	High
Learning Outdoors or with a Computer: The Contribution of the Learning Setting to Learning and to Environmental Perceptions	Aflalo et al. (2020)	Israel	Randomised controlled trial	90	2 3rd grade classes and 2 4th grade classes	Medium
Implementation of a Performance Task for Developing the Value of Love of Nature	Aktepe (2015)	Turkey	Mixed methods	21	4th grade	Low
Promoting Self-Regulated Learning through Experiential Learning in the Early Years of School: A Qualitative Case Study	Alvi and Gillies (2021)	Australia	Qualitative	13	Age 6	High
A Snapshot from a Rural Area of Australia: Why and How Early Childhood Educators and Carers Take on Board Sustainable Practices	Amadio (2015)	Australia	Qualitative	Unknown	Preschool, local Aboriginal community	Low
Music Education with Educational Drama	Avci (2020)	Turkey	Mixed methods	21	5th grade 8 girls and 13 boys	Low
Praxis for a Post-Information Future: Evaluating the Impact of a Pedagogical Framework Based on Experiential Learning	Badami and Fatima (2020)	Pakistan	Qualitative	12 teachers	diverse student background, 20% of students from orphanages	Medium
School Gardens Enhance Academic Performance and Dietary Outcomes in Children	Berezowit z et al. (2015)	USA	Systematic review	-	US elementary schools	Medium
Meaning-Making of Student Experiences during Outdoor Exploration Time	Berg et al. (2021)	Canada	Qualitative	63	aged 8–9 years of the 21 student participants, 9	High

					were girls and 12 were boys.	
Assessing Impacts of Locally Designed Environmental Education Projects on Students' Environmental Attitudes, Awareness, and Intention to Act	Bergman (2016)	USA	Non-randomised	432	approximately 80% of residents are Caucasian, 10% American Indian, and 6% African American.	High
Play-Based Learning in an Aotearoa New Zealand Classroom: Child, Parent, Teacher, and School-Leader Perspectives	Blucher, Aspden and Jackson (2018)	New Zealand	Qualitative	21	Participants were children in their first year of school, along with their teacher, parents or caregivers, and a school leader.	High
Pre-school children's agency in learning for sustainable development.	Caiman and Lundegard (2014)	Sweden	Qualitative	7	4-5 years old	High
Elementary Science Indoors and Out: Teachers, Time, and Testing	Carrier et al. (2013)	USA	Mixed methods	49	Fifth grade students	High
Developing a Cycle-Mode POED Model and Using Scientific Inquiry for a Practice Activity to Improve Students' Learning Motivation, Learning Performance, and Hands-On Ability	Chen (2022)	Taiwan	Randomised controlled trial	60	Sixth-grade students from an elementary public school located in an urban area	Medium
From Reflective Observation to Active Learning: A Mobile Experiential Learning Approach for Environmental Science Education	Cheng et al. (2019)	Taiwan	Randomised controlled trial	50	Fourth graders - 9–10-year-olds	High
The Effectiveness of Teaching Aids for Elementary Students' Renewable Energy Learning and an Analysis of Their Energy Attitude Formation	Chou et al. (2015)	Taiwan	Randomised controlled trial	90	two fourth-grade classes (age 10) Similar in gender proportions and science grades	Medium

Children's Cookbooks -- Learning by Using Recipes, Cooking Experiments and Taste Competence	Christensen and Wistoft (2022)	Denmark	Quantitative - descriptive	1609	Gender, age, ethnicity and parents' socioeconomic status was very similar to the national distribution.	High
Context, Culture and Critical Thinking: Scottish Secondary School Teachers' and Pupils' Experiences of Outdoor Learning	Christie et al. (2016)	Scotland	Qualitative	150	Age 11-14	High
Learning While Playing: Children's Forest School Experiences in the UK	Coates and Pimlott-Wilson (2019)	England	Qualitative	33	1 group of 4–5-year-olds, 1 group of 8–9-year-olds	High
An Educational Intervention Maximizes Children's Learning during a Zoo or Aquarium Visit	Collins et al. (2020)	Ireland	Non-randomised	500	9-12 years old Mixed gender	Medium
Experiential Education in Kindergarten: Associations with School Adjustment and the Moderating Role of Initial Achievement	de Bilde et al. (2015)	Belgium	Quantitative - descriptive	2360	Kindergartners	High
A Comparative Study of the Impacts and Students' Perceptions of Indoor and Outdoor Learning in the Science Classroom	Dhanapal (2013)	Malaysia	Mixed methods	24	Grade 3 Mixed gender	Low
Student Interest in STEM Disciplines: Results from a Summer Day Camp	Dillivan and Dillivan (2014)	USA	Non-randomised	14	3rd to 6th grade students Mixed gender	Medium
Using Culturally Relevant Experiential Education to Enhance Urban Children's Knowledge and Engagement in Science	Djonko-Moore et al. (2018)	USA	Qualitative	34	Third- through sixth-grade children from African American and Latinx urban communities Free or reduced lunch for 87% to 91% of the children	High
Short-Term Environmental Education: Long-Term Effectiveness?	Drissner et al. (2014)	Germany	Quantitative descriptive	225	Grades 3-5	High
The Opinions of Primary School Teachers Regarding to the Use of	Duban (2019)	Turkey	Qualitative	7	Teachers 2 from private school and 5	High

Museums in Science Courses					from public school	
How Might "You"…? Seeking Inquiry in the Museum Studio	Ecker and Mostow (2015)	USA	Qualitative	Un-known	3rd grade students	Low
Learning Places and "Little Volunteers": An Assessment of Place- and Community-Based Education in China	Efird (2015)	China	Qualitative	73	Fifth and sixth grade students	Medium
The Impact of Hands-On-Approach on Student Academic Performance in Basic Science and Mathematics	Ekwueme et al. (2015)	Nigeria	Mixed methods	120	The population of the students consists of all the junior secondary three students at the two schools used. Their mid-term test scores in mathematics and Basic Science were used to select the top 8, middle 8 and lower 8 scoring students to make up a mixed ability class in each class for the study.	Medium
What Are the Affordances of the Digital Music Space in Alternative Education? A Reflection on an Exploratory Music Outreach Project in Rural Australia	English et al. (2021)	Australia	Qualitative	7	10-13 years old Rural, low socio-economic background	High
An Alternative Method to Resolve the Classroom Problems: Mock Trial	Ersoy and Pehlivan (2018)	Turkey	Qualitative	20	4th grade	High
Non-Disabled Secondary School Children's Lived Experiences of a Wheelchair Basketball Programme Delivered in the East of England	Evans et al. (2015)	England	Qualitative	49	Aged 10-12	High
Children's Learning from a "Smokefree Sports" Programme: Implications for Health Education	Fairbrother et al. (2020)	England	Qualitative	25	Aged 10-11	High

Transforming Children's Live Experiences with Species into Conservation Willingness: The Mediating Roles of Biodiversity Knowledge and Affective Attitudes	Faruhana et al. (2022)	Maldives	Quantitative - descriptive	429	Aged 11-12	High
Engaging K-8 Students through Inquiry-Based Learning and School Farms	Fifolt and Morgan (2019)	USA	Qualitative	20	5 principals, 15 class teachers	High
Taking Learning to New Heights: Exploring Ecology, State History, and Geology through a Field Trip to 4,200 Meters (14,000 Feet)	Follari et al. (2021)	USA	Qualitative	Unknown	4th grade	Low
Children's Learning Preferences for the Development of Conservation Education Programs in Mexican Communities	Franques a-Soler et al. (2019)	Mexico	Quantitative - descriptive	354	8-12 years old evenly split between urban and rural mixed gender	High
The Influence of Situational Emotions on the Intention for Sustainable Consumer Behaviour in a Student-Centred Intervention	Fröhlich (2013)	Germany	Non-randomised	176	5th grade	Medium
Student emotional response to the lesser kestrel environmental and sustainability education program.	Gan and Gal (2023)	Israel	Qualitative	59	5th grade	High
Exploring Elementary Student Perceptions of Experiential Learning within Critical Service-Learning	Gartland (2021)	USA	Qualitative	3	1 teacher - Black female, 5 years of teaching experience 2 students - Black female	High
Enhancing Mathematical Thinking in Early Childhood through Music	Gillanders and Casal de la Fuente (2020)	Spain	Qualitative	6	Age 3-6	High
A Case Study: Activity-Based Learning Process Prepared by NTC's (Nikola Tesla Center) System of Learning Approach	Girgin and Akgun (2020)	Turkey	Qualitative	34	Fourth grade	High
Learning in the Post-Digital Era. Transforming Education through the Maker Approach	Gratani et al. (2023)	Italy	Mixed methods	50	Age 9-11 Mixed gender	Medium
Building Mathematics Discourse in Students	Gresham and	USA	Qualitative	Unknown	Unknown	Low

	Shannon (2017)					
Closing the attainment gap in Scottish education: The case for outdoors as a learning environment in early primary school.	Hamilton (2021)	Scotland	Randomised controlled trial	75	71 students, 4 teachers Student average age = 5.5 Mixed gender	Medium
Developing Ecological Literacy in a Forest Garden: Children's Perspectives	Hammarsten et al. (2019)	Sweden	Qualitative	28	Age 7-9	High
Youth Chef Academy: Pilot Results From a Plant-Based Culinary and Nutrition Literacy Program for Sixth and Seventh Graders.	Harley et al. (2018)	USA	Non-randomised	248	Age 11-13	Medium
Vocabulary Knowledge in Science Learning on Children's Development through Farming Activities in the Rural Area	Hashim and Said (2021)	Malaysia	Qualitative	10	Age 6-12	High
Active engagement: A study of project-based learning in the math classroom.	Holmes (2022)	USA	Non-randomised	196	2nd grade	Medium
Learning through Play: Portraits, Photoshop, and Visual Literacy Practices	Honeyford and Boyd (2015)	Canada	Qualitative	Unknown		High
Investigating the efficacy of a targeted youth intervention on negative problem orientation.	Humphrey (2016)	UK	Non-randomised	666	549 females, 117 males Mean age of 13.9	Medium
Experiential Learning Theory: Identifying the Impact of an Ocean Science Festival on Family Members and Defining Characteristics of Successful Activities	Idema and Patrick (2019)	USA	Mixed methods	175	Children and adults visiting the festival	High
The Influence of a Science Camp Experience on Pupils Motivating to Study Natural Sciences	Ivánková (2022)	Slovakia	Mixed methods	11	Age 10-12	Medium
School-Based Experiential Outdoor Education: A Neglected Necessity	James and Williams (2017)	USA	Qualitative	56	7th and 8th grade	High
Spatial Ability Learning through Educational Robotics	Julià and Antoli (2016)	Spain	Randomised controlled trial	21	Age 12	Low
Impact of Implementing a Long-Term STEM-Based Active Learning	Julià and Antoli (2019)	Spain	Non-randomised	48	6th and 7th grade	Medium

Course on Students' Motivation						
Experiences of Design-and-Make Interventions with Indian Middle School Students	Khunyakari (2015)	India	Qualitative	60	Age 11-14 Represented students from urban and rural settings, a variety of language settings and was mixed gender	Medium
Implementation of a Values Training Program in Physical Education and Sport: Perspectives from Teachers, Coaches, Students, and Athletes	Koh et al. (2016)	Singapore	Qualitative	38	Age 10-12	High
Participation and Why It Matters: Children's Perspectives and Expressions of Ownership, Motivation, Collective Efficacy and Self-Efficacy and Locus of Control	Korfiatis and Petrou (2021)	Cyprus	Qualitative	95	Age 9-11	High
The Effect of Hands-on '"Energy-Saving House" Learning Activities on Elementary School Students' Knowledge, Attitudes, and Behavior Regarding Energy Saving and Carbon-Emissions Reduction	Lee et al. (2013)	Taiwan	Mixed methods	119	Fifth grade	Medium
The Role of Experiential Learning and Engineering Design Process in K-12 STEM Education	Long et al. (2020)	Vietnam	Non-randomised	32	Grades 6-9	Medium
How Focus Creates Engagement in Primary Design and Technology Education: The Effect of Well-Defined Tasks and Joint Presentations on a Class of Nine to Twelve Years Old Pupils	Looijenga et al. (2020)	The Netherlands	Qualitative	49	Age 9-12	High
Teaching nanotechnology in primary education.	Mandrikas et al. (2020)	Greece	Qualitative	45	6th grade	Medium
Child-Initiated Learning, the Outdoor Environment and the "Underachieving" Child	Maynard et al. (2013)	Wales	Qualitative	48	4-7 years old	High
The whole world in their hands: An investigation of the influence of mobile technologies on	McDowell et al. (2021)	England	Qualitative	170	Year 2 - year 5	High

learner engagement of primary school children in outdoor settings.						
Positive College Perception: The Impact of a Curriculum-Based Summer Camp's Transition	Mocarski et al. (2022)	USA	Qualitative	167	72 1st - 6th grade students 95 parents	Medium
Long-Term Educational Programs in Nature Parks: Characteristics, Outcomes and Challenges	Morag et al. (2013)	Israel	Qualitative	9	7 5th grade students, teacher and facilitator	High
Road to Collaboration: Experiential Learning Theory as a Framework for Environmental Education Program Development	Moseley et al. (2020)	USA	Mixed methods	562	fifth grade students (ages 10–11) from 39% Caucasian, 53% African American, 0.3% American Indian/Alaska Native, 3% Asian, and 22% Hispanic	High
Elementary School Students' Emotions When Exploring an Authentic Socio-Scientific Issue through the Use of Models	Nicolaou et al. (2015)	Cyprus	Qualitative	19	Age 11-12	High
Wearable Textiles to Support Student STEM Learning and Attitudes	Nugent et al. (2019)	USA	Non-randomised	1426	Upper elementary students Mixed gender 66% white, 33% non-white	Medium
Perspectives of kindergarten through second grade teachers regarding methods to promote student engagement in learning.	O'Hayer (2023)	USA	Qualitative	15	K-2 teachers	High
School Fieldtrip to Engineering Workshop: Pre-, Post-, and Delayed-Post Effects on Student Perceptions by Age, Gender, and Ethnicity	Ozogul et al. (2019)	USA	Non-randomised	3344	Age 9-14	Medium
Using Screen Time to Promote Green Time: Outdoor STEM Education in OST Settings	Paulsen and Andrews (2019)	USA	Qualitative	59	10 educators, 27 parents and 22 children Student average age of 7.6	Low

Engaging Primary Children and Pre-Service Teachers in a Whole School "Design and Make Day": The Evaluation of a Creative Science and Technology Collaboration	Pressick-Kilborn and Prescott (2017)	Australia	Qualitative	Unknown	Primary	Medium
The Use of Photo Elicitation Interviews in Summer Science Programs to Determine Children's Perceptions of Being a Scientist	Scott (2014)	USA	Qualitative	18	Age 7-11	High
Fostering Relationships between Elementary Students and the More-Than-Human World Using Movement and Stillness	Stapleton and Lynch (2021)	USA	Qualitative	90	K-4th grade	High
Promoting Positive Technological Development in a Kindergarten Makerspace: A Qualitative Case Study	Strawhacker and Bers (2018)	USA	Qualitative	20	Kindergarten	High
Children's Connection to Nature as Fostered through Residential Environmental Education Programs: Key Variables Explored through Surveys and Field Journals	Talebpour et al. (2020)	USA	Qualitative	317	Fifth grade	High
Hands-On Math and Art Exhibition Promoting Science Attitudes and Educational Plans	Thuneberg et al. (2017)	Finland	Non-randomised	256	Age 12-13	Medium
Linking Service-Learning Opportunities and Domestic Immersion Experiences in US Latino Communities: A Case Study of the "En Nuestra Lengua" Project	Tijunelis et al. (2013)	USA	Qualitative	40	Learners of Spanish in a public elementary school, grades K-3	Low
Forest Schools and Environmental Attitudes: A Case Study of Children Aged 8-11 Years	Turtle et al. (2015)	UK	Quantitative - descriptive	195	Age 8-11	Low
Growing to Give: Transforming Learning via New Pedagogies for the 21st Century	van Haren and Kiddy (2018)	Australia	Qualitative	Unknown	Preschool and kindergarten	Medium
Implementing a Maker Culture in Elementary School -- Students' Perspectives	Vuopala et al. (2020)	Finland	Qualitative	18	one class of third graders and one of fifth graders	High

Playful Pedagogy for Deeper Learning: Exploring the Implementation of the Play-Based Foundation Phase in Wales	Wainwright et al. (2020)	Wales	Qualitative	49	Aged 5-6	High
Primary Grade Students Engage in Creative Word Play through Traditional and Hands-On Methods	Webb et al. (2014)	USA	Non-randomised	71	2nd and 3rd grade	Medium
Becoming a Biologist: The Impact of a Quasi-Apprenticeship Program on Chinese Secondary School Students' Career Intention	Zhao et al. (2021)	China	Mixed methods	319	7th and 8th grade	High
How Experiential Learning in an Informal Setting Promotes Class Equity and Social and Economic Justice for Children from "Communities at Promise": An Australian Perspective	Zyngier (2017)	Australia	Qualitative	47	Age 11-13 Children who are 'at risk'	High

Partners

https://www.ucl.ac.uk/ioe/departments-and-centres/centres/helen-hamlyn-centre-pedagogy-0-11-years