2023

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Hill, H.L.

Hill, H.L. (2023) 'How can informal education settings be best used to influence engagement with environmental issues?', The Plymouth Student Scientist, 16(2), pp. 253-284.
https://pearl.plymouth.ac.uk/handle/10026.1/21837

The Plymouth Student Scientist
University of Plymouth

*The Plymouth Student Scientist, 2023, **16**, (2), 253-284*

How can informal education settings be best used to influence engagement with environmental issues?

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Abstract

Increasing global impacts of environmental issues will affect children's futures. Formal primary school curriculums are insufficient in providing the information children need to understand these issues which increases the need for informal education settings, such as extracurricular eco clubs. By studying how classroom-based clubs engage primary school children with environmental issues through motivations to join, activities undertaken within clubs, and level of engagement they inspire outside the sessions, recommendations can be made to maximise knowledge and engagement opportunities for children both in and out of sessions.

Primary school children attending an after school eco club over five weeks were given information about environmental issues with different activities to complete each week. Qualitative data through informal interviews and work produced were collected to determine motivations for joining, reasons for enjoyment of activity and interest in topic, determine potential correlations between activity type and topic engagement, and discover whether independent learning outside sessions was undertaken. Quantitative and qualitative data were also collected via a short anonymous survey to establish overall favourite activity and topic to further investigate potential correlations.

Results indicated extracurricular eco clubs have excellent potential for engaging children with environmental issues. All activities engaged children with environmental topics with art-based activities and topics relating to animals proved most popular. Activity enjoyment and topic interest is dependent on personal preference and motivations for joining eco club, emphasising the importance of using a variety of activities and topics to promote engagement. Motivations to undertake self-directed learning outside eco club were also related to children's individual interests. Teachers could use these findings to develop eco club resources to maximise engagement and inspire long-lasting individual interest. Further investigation into incorporation of activities outside the classroom could determine if these inspire engagement more than classroom-based activities.

Keywords: Climate education, environmental challenges, childhood, eco club, environmental engagement, learning activity, informal education

Introduction

Children today are growing up in a world where environmental issues such as climate change and biodiversity loss are already affecting their lives by posing serous challenges to the stability of their future on an individual and global level (Ojala, 2017). They have not created these issues (Heggen *et al.,* 2019) but they will be the ones who must deal with the consequences as our future leaders, policy makers and global citizens (Walker, 2017). Education, both formal and informal, is recognised as essential for shaping the opinions and values of children and is thought to be the most effective way to confront the environmental challenges our society faces, now and in the future (UNESCO, 1997a; Department for Education, 2022).

The values and beliefs that affect our actions are established in childhood, influencing development of behaviours (Salazar *et al*., 2022). Exposure to environmental issues and pro-environmental behaviours, defined as actions taken by individuals to protect the environment (Lee and Khan, 2020) to children may result in higher motivation to deal with environmental issues in later life. Children whose parents communicate pro-environmental behaviours are more likely to develop pro-environmental values and beliefs themselves (Matthies *et al*., 2012), but not all children have pro-environmental influences at home. This makes formal education settings essential in developing pro-environmental values and behaviours (United Nations, 1992). Agenda 21, agreed at the United Nations Conference on Environment and Development in 1992, recognises and stresses the need for people of all ages to have access to environmental and sustainable development education to promote that development (United Nations, 1992).

However, the current UK national curriculum for primary education includes very little in terms of compulsory education on environmental issues or sustainability (Department for Education, 2013). The Department for Education (DfE) Sustainability and Education Strategy (2022) discusses building on knowledge of natural environments and understanding of the natural world through science and geography curriculums at primary school level but does not detail whether changes to primary curriculums will incorporate environmental issues affecting our natural world.

This makes informal education, such as extracurricular eco clubs (EEC), important in terms of teaching children about environmental issues because they do not follow the national curriculum and can help influence the development of children as environmentally responsible citizens of the future (Lee, 2017). The DfE Sustainability and Education Strategy recognises the importance of informal learning opportunities as an engagement resource where children can draw on what they have learnt in formal lessons and ‘bring their learning to life’ (Department for Education, 2022). As EEC are optional, it is important to create learning experiences that children will be excited to attend and motivated to engage in to enhance their knowledge and encourage a lifelong belief that they can make a difference (Trott, 2019).

Literature review

Brief summary of environmental education to date

Environmental education (EE) has long been viewed as the best way to shape the knowledge, attitudes, and beliefs of school children and young people to enable them to respond to local and global environmental challenges (United Nations, 1992; UNESCO, 1997b, UNESCO, 2015).

The United Nations, often through the United Nations Educational, Scientific and Cultural Organisation (UNESCO), has advocated education as a tool for promoting awareness of environmental issues for over 40 years (Leicht *et al.,* 2018) (Figure 1).

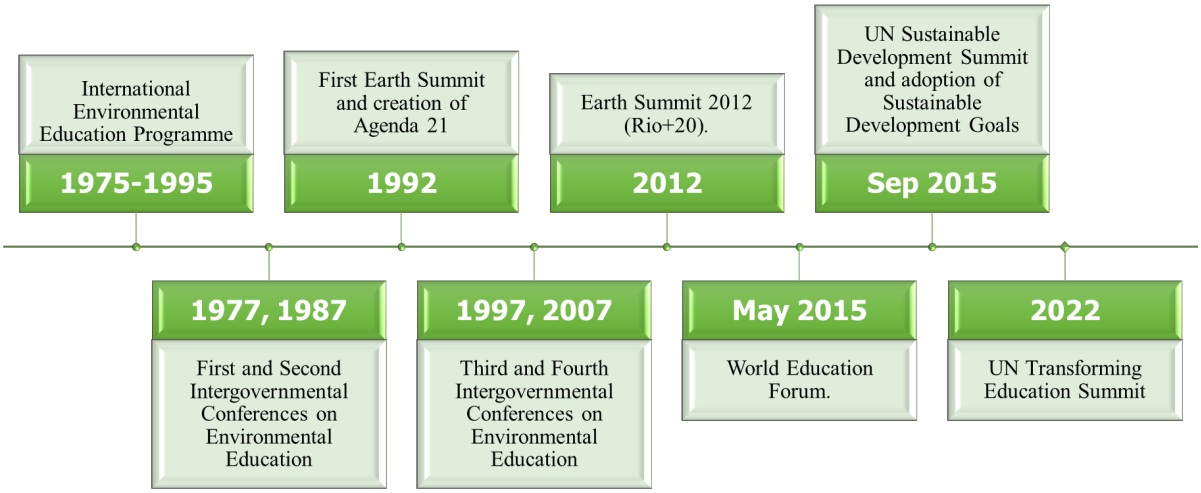

Figure 1: Timeline of international conferences and summits regarding the importance of environmental education (UNESCO, 1997b; UNESCO, 2007; UNESCO, 2015; Leicht *et al.,* 2018; United Nations, no date (a); United Nations, no date (b)). Brief information on the content of each meeting can be found in Appendix 1.

Chapter 36 of Agenda 21, created in 1992 (Figure 1), stated increasing understanding of humanity's physical, biological, and socio-economic environments through education for all ages would facilitate a change in attitudes and the ability of individuals to address environmental issues (United Nations, 1992). This was updated in 2015 by UNESCO's Sustainable Development Goals (SDGs) as part of the 2030 Agenda for Sustainable Development (UNESCO, 2015). Education has a specific SDG (SDG 4), to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (UNESCO, 2015) and is included as a measure of importance in many of the others (Leicht *et al.,* 2018). Target 4.7 specifically focuses on embedding sustainable development into education to enable acquisition of knowledge and skills by all learners (Leicht *et al.,* 2018). Whilst it is important to recognise the necessity of sustainable development education, it is a move away from raising awareness of environmental threats and their impacts which might be more accessible as a starting point for younger children.

Barriers to environmental education in primary schools

Most children spend over 30 hours per week in formal education, defined as a government-set curriculum taught to groups of children of the same age by a qualified teacher (Lee, 2017). This makes schools the ideal place for children to

learn about environmental issues and develop pro-environmental values and beliefs (Walker, 2017). Bearing this in mind, and the longstanding international emphasis on the importance of EE (Figure 1), it is interesting to note that the current primary school curriculum in the UK, published in 2013, does not include any mention of environmental issues (Department for Education, 2013). The DfE published their 'Sustainability and Climate Change Education Strategy' in 2022 promising to give children and young people the opportunity to become "agents of change" and face the climate crisis with hope through "knowledge-rich education" which would give them the "truth about climate change" (Department for Education, 2022). However, there is no apparent mention of changing the National Curriculum to meet these promises.

The strategy proposes a model primary curriculum developed by 2023 to enable children's understanding of natural environmental processes, such as how habitats provide for the animals that live in them, climate zones and weather patterns (Department for Education, 2022). However, this is well-covered in the existing primary science and geography curriculums (Department for Education, 2013) so seems like a target which requires minimal change to achieve. The responsibility is placed on school staff through the introduction of 'climate ambassadors', members of existing staff trained to support EE efforts, and a reliance on teachers to execute the National Climate Emergency Action Plan through continued professional development (Department for Education, 2022). This could be seen as shifting responsibility from government policy to schools and teachers to deliver education about climate change and other environmental issues (Dunlop *et al.,* 2022). Unfortunately, primary school teachers already face difficulties in introducing EE within an already packed curriculum. A national Teach the Future poll of teachers found that 91% of the primary school teachers polled agree or strongly agree that climate change should be included as a compulsory subject in their schools but faced multiple barriers to implement this (Teach the Future, no date).

The main barriers amongst those polled were lack of time and lack of confidence and/or knowledge regarding climate change education, which correlates with the findings of Howard-Jones *et al.* (2021). They found support for introducing climate change education at primary level was high amongst their sample of primary school teachers (n. 205), second only to the core subjects of literacy and numeracy but constrained by insufficient resources (Howard-Jones *et al.,* 2021). These include time for planning, physical resources like worksheets, and to a lesser extent, support from schools for professional development, research, and guidance (Howard-Jones *et al.,* 2021). This corroborates the findings of Matthies *et al.* (2012), who proposed inclusion of practical training for teachers in EE to influence pro-environmental behaviours. This evidence indicates that support for climate change education is not lacking, but its current omission from the National Curriculum might prevent it from being properly implemented. Much of this evidence focuses on climate change education, but it is likely that without the required support highlighted in existing research, EE as a topic will face the same barriers.

Importance of extracurricular eco clubs for environmental education in primary schools

EEC are recognised by the UK government as an important resource for learning about environmental issues (Department for Education, 2022). Most research into

EE has been undertaken in a classroom environment (Trott, 2019) but EE can also take place outside formal settings unconstrained by a curriculum (Treagust *et al.,* 2016). This is defined as informal learning where children from different age groups can come together out of school hours in a more relaxed setting to learn without the constraints of a curriculum, under the leadership of a trusted adult who is personally motivated and inspired to teach children about issues that aren't covered as part of their official job role (Lee, 2017).

EEC challenge the view that learning must be teacher-led to inspire student growth (Lee, 2017) by allowing students to question the norms and values associated with traditional classroom learning, which are often heavily influenced by the norms and values held by the government setting the curriculum (Stevenson, 2007; Treagust *et al.,* 2016). They offer the opportunity for children to develop their own pro-environmental norms through the process of increasing awareness of environmental problems, creating recognition of the need for action (Matthies *et al.,* 2012) and influencing the formation of vital pro-environmental behaviours (Delalić, 2022), such as nature protection and preservation, recycling, and energy conservation (Matthies *et al.,* 2012). Young children, especially between 8 and 10 years, are at the stage where moral development is thought to occur provided the information required to develop them is delivered by a trusted source of information like a teacher or parent (Matthies *et al.,* 2012). Research has indicated pro-environmental behaviour in children is directly influenced by adult beliefs at home (Matthies *et al.,* 2012; Walker, 2017) meaning EEC could be a place where pro-environmental values and behaviours can be introduced to and potentially instilled in children from homes where adults may not hold these beliefs.

The informal nature of EEC gives teachers flexibility over the content and structure of sessions that they do not have in formal settings (Trott, 2019). They can also encourage opportunities for discussion about real life issues faced by the environment, allowing children to demonstrate their opinions and emotions as well as giving them the chance to think about what they can do to help (Lee, 2017). In contrast, formal classroom environments are often heavily structured to enable teachers to disseminate the information dictated by the curriculum in a passive manner, giving students the knowledge required to solve theoretical problems which can be easily assessed (Stevenson, 2007). This passive manner of imparting information has the potential to improve educational knowledge, attitudes, and behaviours (Van de Wetering *et al.,* 2022) so should not be completely disregarded. However, research into informal, participatory learning environments indicates they provide spontaneous, natural learning experiences through participation in enjoyable activities (Trott, 2019; Delalić, 2022). Being outside curriculum constraints, they allow for action-based learning which encourages a sense of agency and increased belief in participants that they can make a change as well as increasing environmental knowledge (Trott, 2019). This can empower children to consolidate and act on information they have already learnt, either in formal schooling or from external influences like family and mass media (Trott, 2019). This is especially important in primary school children who may not have the opportunity to learn about environmental issues from other sources.

Academic literature on EEC to date indicates there are numerous benefits associated with them (Figure 2). This demonstrates why EEC are crucial in engaging

children and young people with environmental issues. However, half of the research used to compile Figure 2 focused on the benefits of EEC to teenagers (Middlestadt *et al.*, 2001; Feldman and Matjasko, 2005; Roberts, 2009; Smith, 2019; Cincera *et al.*, 2022). Sánchez-Llorens *et al.,* (2019) compared the environmental consciousness of primary and secondary school students and found that primary school children had a higher level of environmental consciousness than their teenage counterparts, as well as a higher predisposition for adopting positive environmental actions into their lives.

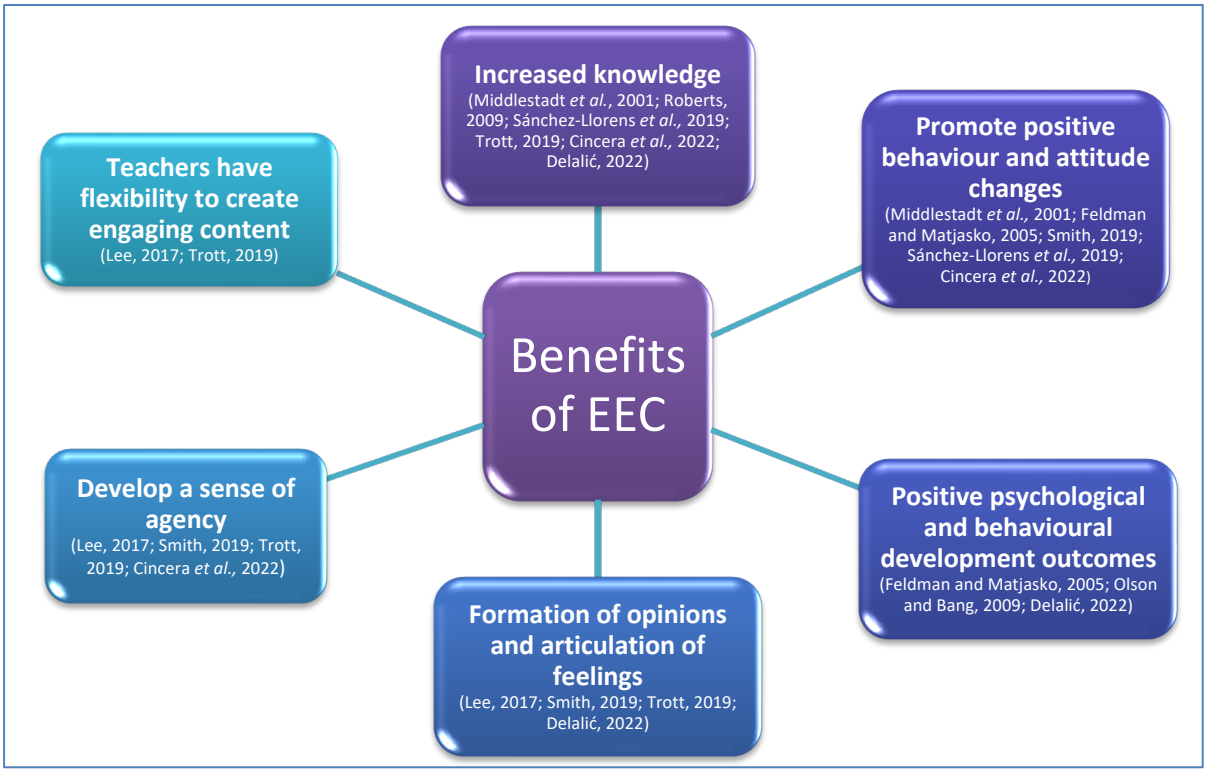

Figure 2: The benefits of extracurricular eco clubs (EEC) to participants as identified by scientific research, supporting their effectiveness at engaging children and young people of all ages (Middlestadt *et al.,* 2001; Feldman and Matjasko, 2005; Roberts, 2009; Olson and Bang, 2009; Lee, 2017; Smith, 2019; Sánchez-Llorens *et al.,* 2019; Trott, 2019; Cincera *et al.,* 2022; Delalić, 2022).

Research also indicates the level of interest in the environment decreases with age from childhood to adolescence (Treagust *et al.*, 2016; Sánchez-Llorens *et al.,* 2019). These findings support the importance of EEC at primary school level as a tool for embedding a life-long inclination towards pro-environmental behaviours. Only one study, Trott (2019) considered the importance of how primary school children are engaged with environmental issues within EEC to promote sustained interest, concluding that they must use creative methods to impart knowledge and encourage engagement within an empowering setting, which demonstrates a considerable gap in existing literature.

How can extracurricular eco clubs encourage engagement?

EEC should offer a space of organised free time that encourages learning through activities which promote engagement and consistent attendance (Delalić, 2022). Numerous studies have determined the importance of children spending time in

nature to create a connection to the environment and develop pro-environmental behaviours (Kuo *et al.,* 2019; Whitburn *et al.,* 2019; Van de Wetering *et al.,* 2022). However, not all schools have the physical or temporal resources to offer nature-based experiences to supplement learning, so it is important to find ways to promote an interest in environmental protection in a non-structured classroom environment. EEC should also focus on developing children's learning within the affective domain, related to their emotions, values and attitudes, because focusing on improving knowledge alone (the cognitive domain) may be insufficient to inspire pro-environmental behaviours and beliefs (Bergman, 2016). EEC encourage more social interaction than formal education settings and enable this between different age groups. This allows children to discuss their ideas and opinions freely which can help them to realise other points of view and address any misconceptions they may already have, potentially inspiring a new way of viewing environmental issues as well as aiding their affective learning (Monroe *et al.*, 2019).

Environmental issues can be perceived as abstract and intimidating to children as they may not have any personal experience of them (Olson and Bang, 2009; Collado *et al.,* 2015) so it is important to frame the issues discussed in a positive way by promoting what individuals can do rather than the consequences of not dealing with these issues in a broader sense (Olson and Bang, 2009). This promotes normal psychological development and enables children to feel empowered to act (Olson and Bang, 2009). Using creative activities can help to mitigate the negative feelings environmental issues can produce, as well as nurturing a connection to the natural world which may encourage further curiosity and feelings of environmental stewardship (Warwick *et al.,* 2017).

By recognising the importance of play and creative activities in mitigating negative feelings, EEC can present information and tasks about environmental issues in a fun, hands-on way that formal educational experiences may not offer (Trott, 2019) within a structured environment to influence positive cognitive (Feldman and Matjasko, 2005) and affective outcomes (Bergman, 2016). By offering enjoyable activities, children may be more motivated to attend EEC consistently. Activities like art (Flowers *et al.,* 2015; McDonald and Holttum, 2020), creative writing (Sorin and Porter, 2018) and games (Collins *et al.,* 2011; Juhász, 2021) have been found to engage children in ways that enhance both academic and personal development and can be easily implemented in classroom-based EEC. Hands-on activities in an informal environment are a viable method of engaging children with environmental issues, with the potential to encourage sustained interest and engagement with the issues after the club ends (Trott, 2019) but to date there is little literature on the benefits of activity type in encouraging engagement with environmental issues.

It is also vitally important to convey positivity through extracurricular activities. Hope for the future is a powerful tool that must be instilled in children to encourage engagement with difficult environmental issues (Ojala, 2012). Life-long habits can be formed based on information received in childhood from trusted adult sources so it is important to ensure that any negative feelings children may encounter are counterbalanced by positive experiences and knowledge to encourage pro-environmental sensitivity and habits (Delalić, 2022). How knowledge is imparted to children is as important as the result (Delalić, 2022), so by using activities perceived as enjoyable in EEC, teachers can convey the challenges faced and offer ways in

which children can help to mitigate them, however small the action, to encourage more positive feelings such as recognition they can be part of the solution and inspire hope for the future (Trott, 2021).

Research aims and objectives

The overall aim of this research is to investigate how EEC can be used to engage primary school children with environmental issues.

Research questions

1. What motivates children to engage with EEC?
2. To what extent does type of activity promote engagement with topics?
3. Does attendance inspire children to investigate environmental issues in their own time?

Research objectives

- Design and deliver three active sessions about different environmental problems, using different learning activities to engage the children.
- Collect and analyse qualitative and quantitative data while children are participating in EEC.
- Analyse data to answer the research questions.
- Make recommendations for engaging children with future EEC sessions.

Methodology

Research setting and participation

Research was undertaken at a small village primary school in a semi-rural location in Southeast Cornwall. The school was chosen due to its well established and popular eco club, led by the Year 6 teacher. She has been running the club for approximately 10 years, during which time it has been regularly oversubscribed (Appendix 2). Participation was voluntary and each child was provided with information regarding the aims and objectives of the study and consent forms for themselves and their parents to sign beforehand (Appendix 3). Ethical approval was obtained from the University of Plymouth Science and Engineering Faculty Ethics Committee prior to the commencement of the study (Appendix 4). In reporting of results, children were given pseudonyms, including year group, to protect their anonymity.

Session content

Primary data were collected over five non-consecutive sessions of eco club between 27th September and 8th November 2022 due to teacher absence and half term. Each session focused on a different topic and used different participatory methods to collect the data required to answer the research questions (Table 1).

Table 1. List of session dates and topics, activity undertaken, and which research question the data collected answers.

Session date and title	Participatory methods	Research question this meets
Session 1: 27.09.22 What environmental issues do you know about?	Participant choice	1. What motivates children to engage with EEC?
Session 2: 04.10.22 Looking after nature and animals	Board game designed by researcher	2. To what extent does type of activity promote engagement with topics?
Session 3:11.10.22 The problem with plastic	Creative writing-based activity of participants choice	2. To what extent does type of activity promote engagement with topics?
Session 4: 01.11.22 Climate change	Art based activity of participants choice	2. To what extent does type of activity promote engagement with topics?
Session 5: 08.11.22 Thank you eco club!	Survey completion and activity of participant choice (board game/written/art) on any topic covered in previous sessions	2. To what extent does type of activity promote engagement with topics? 3. Does attending EEC inspire children to investigate environmental issues in their own time?

Sessions 1-4 (S1-S4) followed the same structure to obtain data to answer the research questions (Figure 3). The structure of session five (S5) (Table 1) differed as there was no PowerPoint presentation, no group discussion, and children were able to choose their activity and topic. Informal interviews were conducted as children completed their chosen task. They were also asked to complete a short survey to indicate which activity and topic they enjoyed most overall.

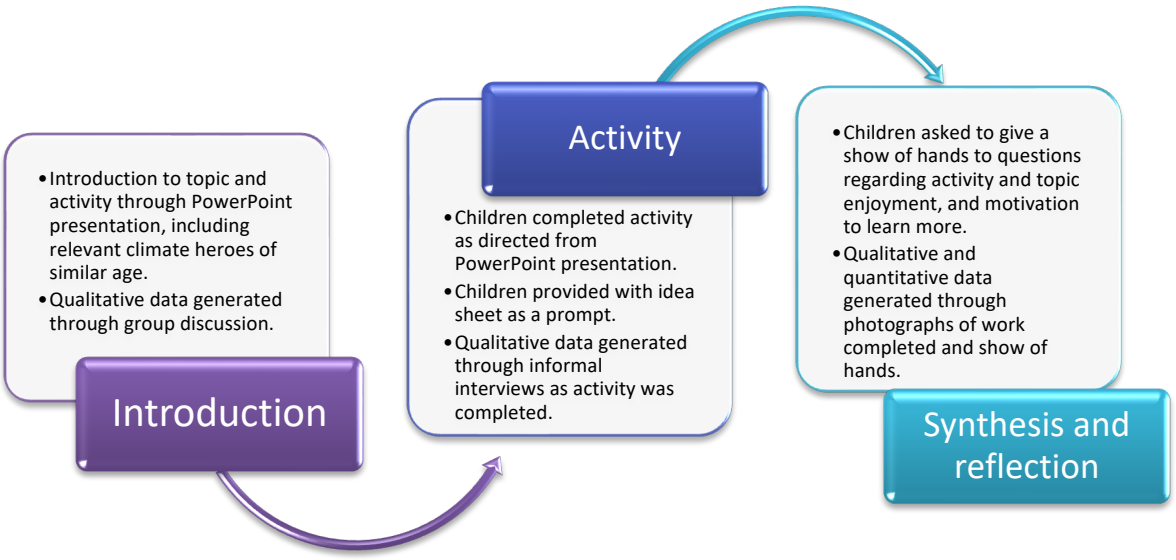

Figure 3: Session structure for sessions 1-4, generating mostly qualitative data. Session resources are in Appendix 5.

Research approach

To address the research gaps identified in the literature review, and answer the overall research aim, this research takes an exploratory approach to ascertain motivations for joining eco club, discover the extent to which different activities promoted engagement with environmental topics, and investigate whether involvement led to self-directed learning. Data collection during the sessions draws on the methodology of the transactional perspective. This methodology allows for the participants actions within an environment to be studied 'in the moment', in this case as children undertook the activities, to be combined with the output, to allow better understanding of the impact the environment has on the data collected (Östman and Öhman, 2022).

To fully understand children's experiences and motivations, a mixed methods research approach was most suitable to allow for conclusions to be drawn from the data collected. Group discussion (pre-activity), informal interviews during activity completion, and 'show of hands' questions at the end of the session allowed for collection of real-time, observational qualitative and quantitative data to enable construction of a narrative that best reflects their thoughts and experiences (Stokes *et al.,* 2019). To determine whether there was a correlation between activity type and engagement with topics overall, a short survey was used to generate quantitative data. The survey also generated qualitative data to find out why the activity and topic chosen were the most enjoyed, as well as whether children had undertaken self-directed learning.

Data collection and analysis

Qualitative data

Qualitative data were collected through group discussions in S1-S4 during topic introduction, via informal interviews with participants as they completed the activity and short, end-of-session question and answer activities (Figure 3). Data were also collected through informal interviews with participants during S5 as they completed their activity of choice and in some answers to the survey. The interviews employed the 'Think Aloud' process, which captured the children's thoughts as they completed the activity to enable greater understanding of existing knowledge, activity enjoyment and personal interest through direct conversation (Barnum, 2021, p.21). Output from S1, S3 and S4 was photographed, potentially enabling greater understanding of children's responses to questions.

All group sessions, interviews and end of session activities were audio recorded and transcribed by the researcher. Analysis followed the principles of grounded theory to derive information from the views expressed by the participants in the qualitative data to create new theories based on the content of the interview transcripts (all sessions) and output (S1, S3 and S4) (Cresswell, 2003, p14). Following the principles of grounded theory qualitative data analysis, data were analysed and themed using open coding (Appendix 7) (Delve, no date).

Quantitative data

Quantitative data were obtained in S5 using a short survey to ascertain most enjoyed activity and topic to identify potential correlations (Appendix 6). The survey also asked for reasons for enjoyment and whether self-directed learning had been

undertaken outside the sessions. Quantifiable responses from all sessions were analysed using Microsoft Excel due to a small sample size.

Results and discussion

Results have been divided into three sections to correspond with the research questions. There were 12 participants in total – three from Year 3 (aged 7-8), seven from Year 4 (aged 8-9) and two from Year 6 (aged 10-11). Each participant attended at least three sessions of eco club.

What motivated children to join eco club?

The children's main motivations for joining eco club were identified via informal interviews in S1 (Figure 4).

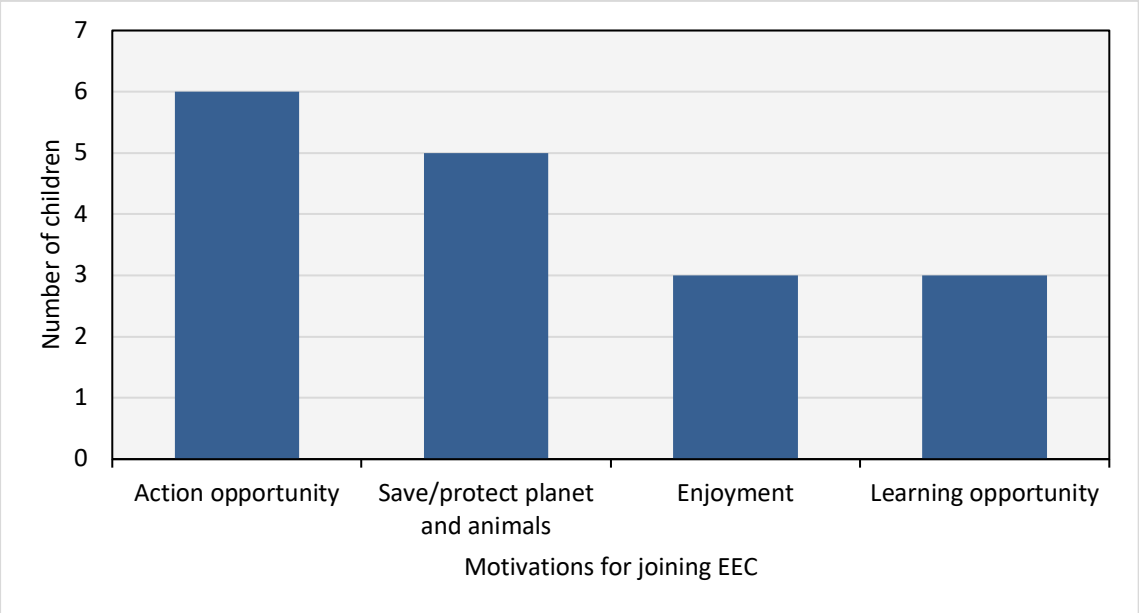

Figure 4: Children's motivations for joining eco club as described during informal interviews in session 1. Some children specified more than one reason for joining. Nine of the ten children present answered this question due to lack of consent form. Coding information in Appendix 7.1.

Figure 4 demonstrates the most common reason for joining was action opportunity, with three children identifying picking up litter as a motivating factor for joining (Appendix 7.1). This could be because it is an activity that has been undertaken in the past by EEC on school grounds and in the local community (Appendix 2). This supports the idea that pro-environmental behaviours are developed by spending time in nature (Kuo *et al.,* 2019; Whitburn *et al.,* 2019; Van de Wetering *et al.,* 2022). There is also evidence to suggest picking up litter in a familiar environment has been found to encourage a sense of environmental stewardship in primary school children who are at an important stage of moral behaviour development, especially when that behaviour has been modelled by a teacher acting as a positive role model (Liang *et al.,* 2022).

It is encouraging that a desire to protect or save the planet and its animal inhabitants is high on the list of motivations, suggesting that children of primary school age who

engage with EEC are sufficiently aware of environmental problems and want to do something to help. This supports the findings of Sánchez-Llorens *et al.,* (2019), who found primary school children had higher levels of belief that environmental issues can be solved and were more environmentally consciousness than older children. They also found primary school children tended to relate the concept of environment to nature, forests, and jungles, and were concerned that nature was not respected enough (Sánchez-Llorens *et al.,* 2019).

Club enjoyment as a motivating factor (Figure 4) emphasises the importance of creating enjoyable experiences to promote engagement (Trott, 2019; Delalić, 2022). Children's attendance was also motivated by opportunities to learn (Figure 4), thereby helping to reduce the learning gap in the National Curriculum (Department for Education, 2013).

In terms of existing knowledge, six children cited wildlife-focused TV programmes, the news, or the internet as sources of information. Previous studies have identified mass media representation of environmental issues as an important source of environmental awareness in children (Treagust *et al,* 2016; Trott, 2019), with TV and internet recognised as two of the most important sources of informal information for children (Sánchez-Llorens *et al.,* 2019). Only one child associated a personal experience with how she learnt about the environmental issue she was depicting (Figure 5).

Figure 5: Picture drawn by Ellie Year 4 depicting people, including babies, in rain who look sad. One person smiling under the rain.

When asked how she learnt about the topic she had chosen to draw, she explained:

> "Because it can actually destroy flowers and stuff and it might be gloomy."
> *How did you find out about this problem?*
> "In my house my garden got destroyed."

> *From lots of rain?*
> "Yeah, a storm. And all of my fences have fallen down so someone is fixing it up." (Ellie, Year 4) (Further questions by researcher in italics).

This is consistent with the results of Trott (2021), who found that most children in their study described distant effects of climate change rather than personal experience. The global issues represented by mass media can increase awareness of issues but are unlikely to represent the effects participants may experience in their personal lives, which could be done by EEC.

All children chose to draw a picture or poster with very little or no writing, apart from 'Save the (topic)'. Five pieces of work compared ideal good worlds with perceived bad worlds, an idea given by the teacher at the beginning of S1, again demonstrating knowledge of global rather than local impacts. People and objects in pictures mostly looked unhappy in the 'bad' side and smiling in the 'good' side which may indicate the children associate happiness with a healthy world (Figure 6). Environmental issues are often a source of anxiety and pessimism for children (Tsevreni, 2011; Trott, 2019) inspiring negative feelings (Trott, 2021), which may explain why the 'bad' side showed unhappy faces. The presence of happy faces in the 'good' side is encouraging as it may indicate children can perceive solutions to the problems (Delalić, 2022) and can relate this in their work.

Figure 6: Picture drawn by Daisy Year 4, representing her perceptions of a 'good' world on the left and a 'bad' world on the right.

Conversations with children during S1 seemed to focus on more negative aspects, with only older children specifically relating human action to environmental issues:

> "Because this could be the only planet that we have, it's been alive for so many years and if we stop it now it's all our fault and well, yeah." (Maria, Year 6)

> "Because if we don't stop people from polluting and stuff we may hurt the planet." (Laura Year 6)

This identifies recognition of the stewardship role humans play in the environment which is a positive outcome found by other EEC programmes where children of similar age have been found to recognise the importance of human involvement in addressing environmental problems (Trott, 2021). For younger participants, the complex nature of human involvement in the causes of environmental problems may be more difficult to understand (Olson and Bang, 2009) which may explain why they did not explicitly relate human actions as causes of environmental issues in their interviews.

Despite the predominantly negative content of the interviews, the session output gave out a more positive message (Figure 6). The negative outlook implied by the interviews emphasises the importance of using activities at EEC to create a positive outlook for the future and the need to give children a sense of hope that they can be part of the solution (Ojala, 2012).

Overall, children were motivated to attend EEC due to an awareness of global environmental issues, mostly through exposure to mass media, and the desire to do something about them to protect their world. The club is also perceived as enjoyable and an opportunity to learn more about what they can do to help. It could also represent an opportunity to engage children with local impacts of environmental issues to complement their knowledge of global impacts from exposure to mass media.

To what extent did activity type promote engagement with topics?

Activity type and engagement with topics – individual sessions
Interview responses from S2-S4 indicated majority enjoyment of activities and interest in topics (Figure 7).

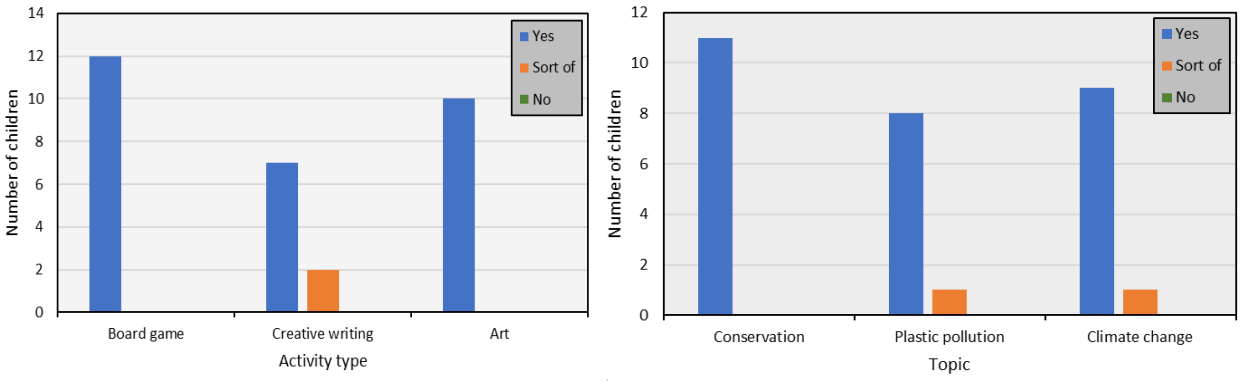

Figure 7: Enjoyment of activities and interest in topics from interviews with children during sessions 2, 3 and 4 during the week they were undertaken. Raw data in Appendix 7.2.

These results indicate children will enjoy many activities and topics within an EEC setting, supporting previous research which found activity type had little effect on the effectiveness of EE programmes provided it was designed to engage learners (Monroe *et al.,* 2019; Van de Wetering *et al.,* 2022). This may be because they have control over what they are doing and can choose how they interpret the instructions given. By enabling children to think about what they want to represent, it can raise their awareness of environmental issues and their impact on them through being creative and motivate them to develop the belief they can take action to help (Olson and Bang, 2009).

Reasons for enjoyment of activity were obtained via interviews in S2-S4 (Figure 8). The only common themes for enjoyment of activities were protection of animals or planet, which links with children's motivations for joining (Figure 4). There are other consistent themes across two sessions, such as activity or topic preference. This supports the research of Bergman (2016) who found student perspectives on EEC enjoyment depends on their personal interests. This could also explain why learning opportunity and enjoyment of an activity, also motivations for joining (Figure 4), were only mentioned as reasons for enjoyment for the board game activity.

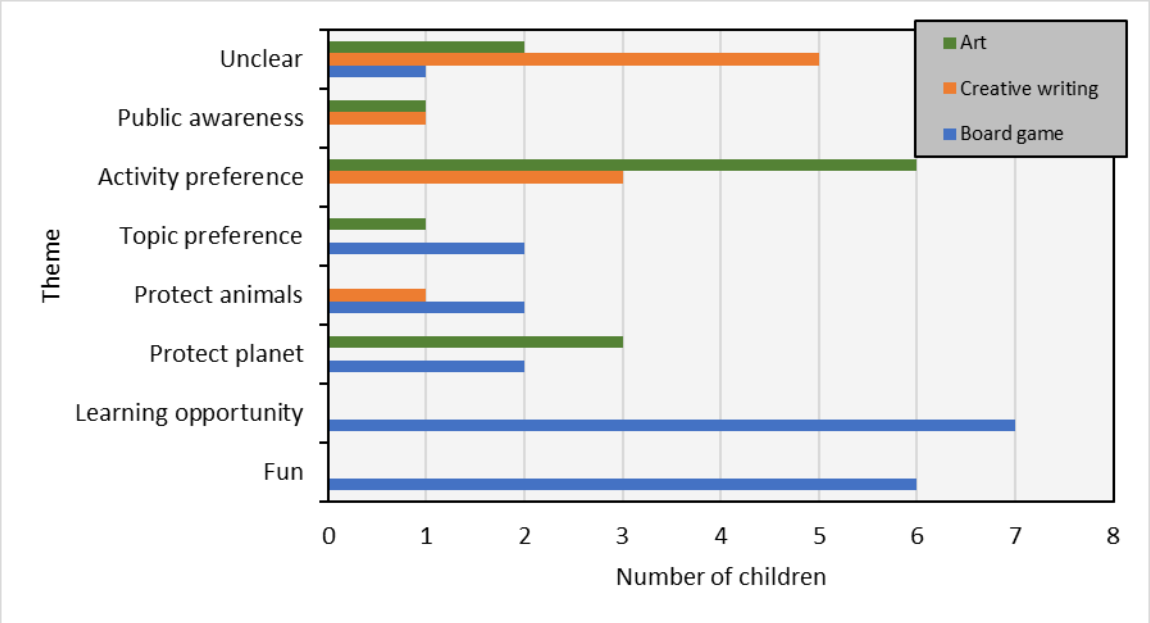

Figure 8: Common themes indicating reasons for enjoyment of activity from conversations held with children during sessions 2, 3 and 4. Some children had more than one reason. Coding information in Appendix 7.2.

One child talked about promoting awareness of the problem to others (Figure 8) by creating posters in S3 and S4 (Figure 9), which she intended to display in her window at home.

> "I liked when we were doing about plastic and climate change and nature because they all got me writing big posters and I have put them up in my window." (Daisy, Year 4).

Lee (2017) found that students in EEC programmes generally wanted to publicise their work and influence their local community, which is not supported by these results. The ideas sheets provided to children in S3 and S4 contained ideas aimed at disseminating information to the wider public (Appendix 5). This reinforces the importance of activities that link to personal interests and motivations for joining (Bergman, 2016).

Figure 10 also demonstrates a preference for using animals to communicate environmental messages. This was a common theme across all work produced in S1, S3 and S4 (Table 2).

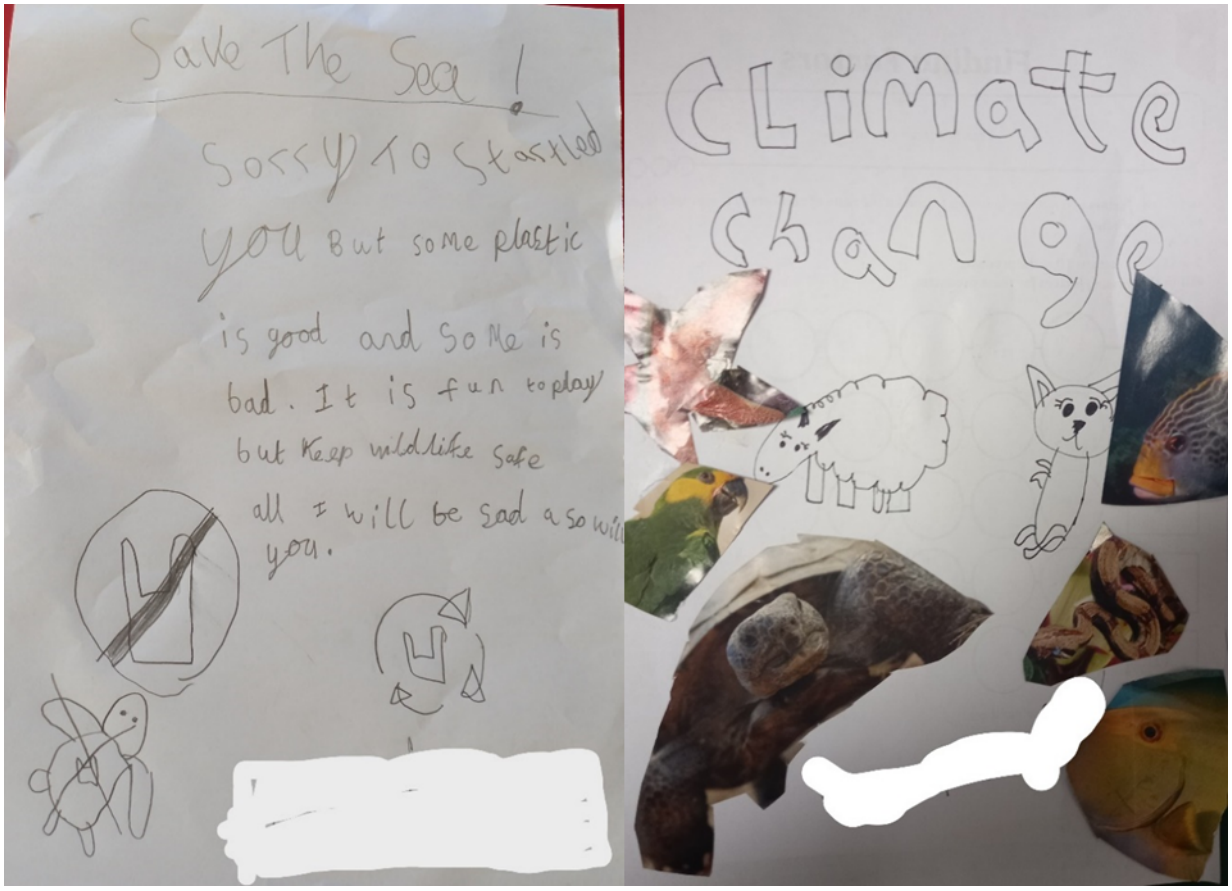

Figure 9: Posters created by Daisy, Year 4, to promote public awareness of plastic pollution and climate change.

Table 2: Number of children who used animals in their work per session. There was no work created during session 2 as the activity was a board game. Work produced during session 5 was not photographed.

Topic	Activity	Number of children who used animals in their work	Total attendance
What environmental issues do you know about? (S1)	Free choice	5	10
Plastic pollution (S3)	Creative writing	8	9
Climate change (S4)	Art	9	10

Children's recognition of threats to animals from environmental issues and concern for how they will be affected has been identified as a chief concern by previous studies (Treagust *et al.,* 2016; Trott, 2021). This is a positive outcome, as having enough knowledge about environmental issues to understand their consequences for animals and the planet is a precursor to pro-environmental behaviour (Chawla and Cushing, 2007). Environmental issues can be complex and hard to understand, so focusing on what children are interested in, in an age-appropriate manner, can help them to make sense of information they have been given regarding environmental issues (Olson and Bang, 2009).

Protecting animals was also a common theme for interest across multiple topics, along with desire to help and protection of the planet (Figure 10). This could be because primary school children tend to relate environmental issues with nature or animals (Treagust *et al*., 2016; Sánchez-Llorens *et al*., 2019; Trott, 2021) and have stronger eco-learning and behavioural intentions than children aged 12 or above (Bergman, 2016, Sánchez-Llorens *et al*., 2019). These results are also consistent with the two most common motivations for joining eco club, action opportunity and protection of planet and animals (Figure 4), which makes incorporating activities that address these motivations within eco club crucial for encouraging engagement with topics. Figure 10 shows reasons for interest in topic and indicates activity enjoyment does not promote engagement.

Topic was mentioned as a reason for enjoyment during the board game and art activities, however it was not the most common theme in either (Figure 8). Themes indicating enjoyment of activity, through fun (S2) or activity preference (S3, S4) were higher (Figure 8). There was a correlation between the two most popular motivations for joining eco club (Figure 4) and reasons for topic interest (Figure 10), demonstrating the importance of creating activities that appeal to children's personal motivations for joining to promote topic engagement.

Activity type and engagement with topics – survey responses
Anonymous survey responses from S5 indicated overall favourite activity and topic (Figure 11).

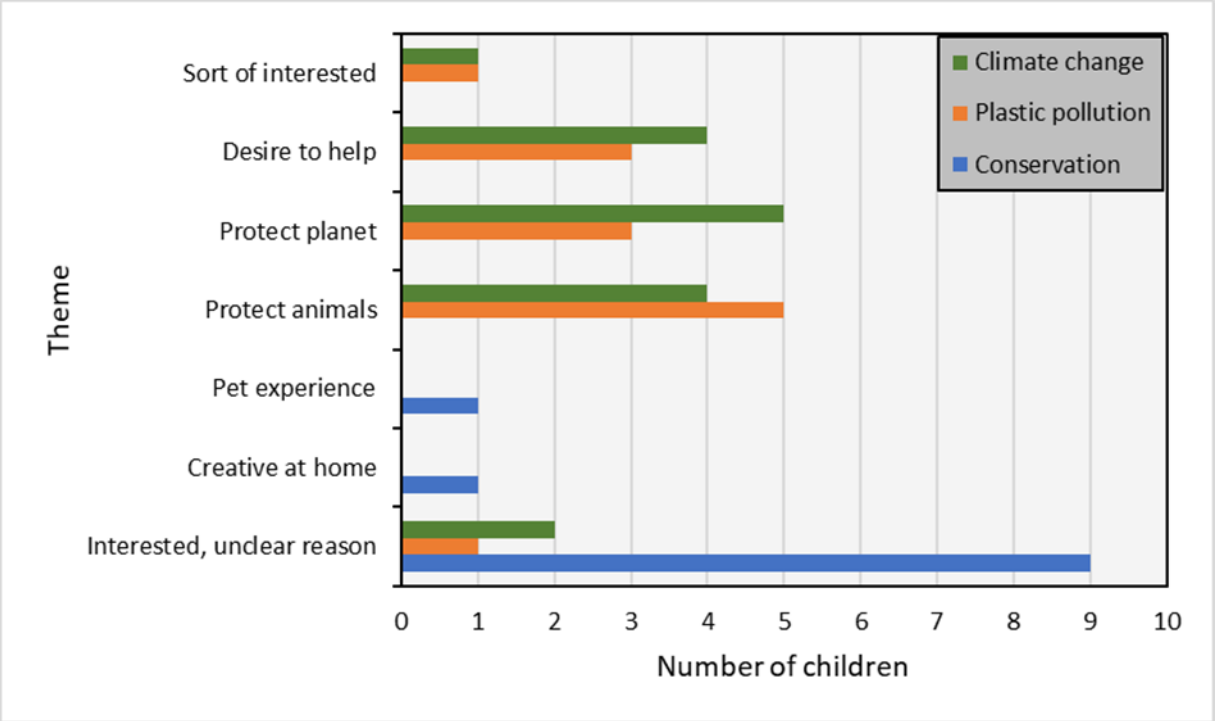

Figure 10. Common themes indicating reasons for interest in topic from conversations held with children during sessions 2, 3 and 4. Some children stated more than one reason. Children were not specifically asked why they were interested in conservation due to researcher error, two volunteered information. Coding information in Appendix 7.2.

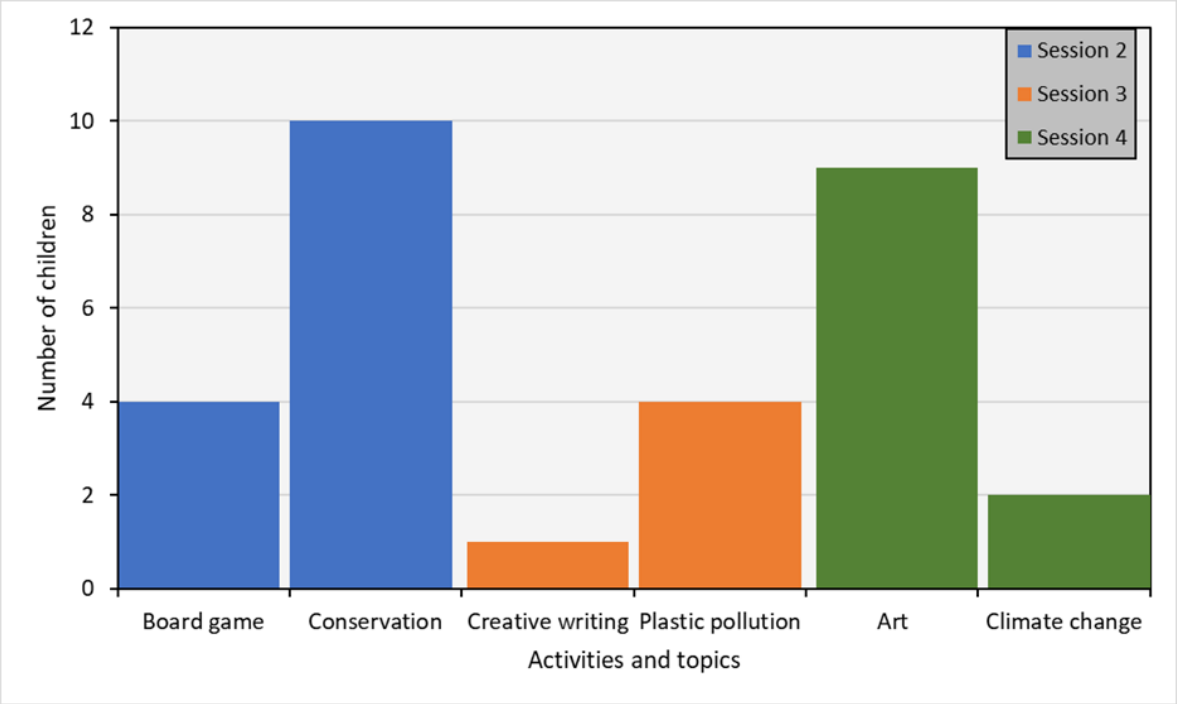

Figure 11. Most enjoyed activities and topic children would present in an assembly as indicated by anonymous survey results from session 5, organised by session. All twelve participants completed the survey. Some children chose more than one activity and topic. Raw data is in Appendix 7.3.

Figure 11 clearly shows art was the most enjoyed activity, and conservation was the most enjoyed topic. The art activity took place in S4 (climate change), whereas conservation (S2) had a board game activity. These results suggest there is not a clear relationship between activity type and topic engagement.

Children were asked to give reasons for enjoyment of their chosen favourite activity in the survey and during interviews (Figure 12). Four out of the five themes were common in both survey and interview, indicating consistency in the children's responses. Preference for activity was the most common response in survey and interview (Figure 12). The preference for art may be because, unlike writing, it is a small part of the National Curriculum (Department for Education, 2013) so is not part of everyday lessons. Art also allows children to demonstrate their understanding of an issue creatively in way they may not be able to articulate using language and fosters connections between the cognitive and affective domains (Flowers *et al.,* 2015) which can lead to increased pro-environmental behaviour (Bergman, 2016).

Figure 11 indicates less enjoyment of creative writing compared to other activities. More children were unable to articulate why they enjoyed the writing activity in comparison to the range of themes identified for the other activities (Figure 8), which indicates that although writing was enjoyed in the moment as part of EEC (Figure 7) it would not be the favoured activity given a choice.

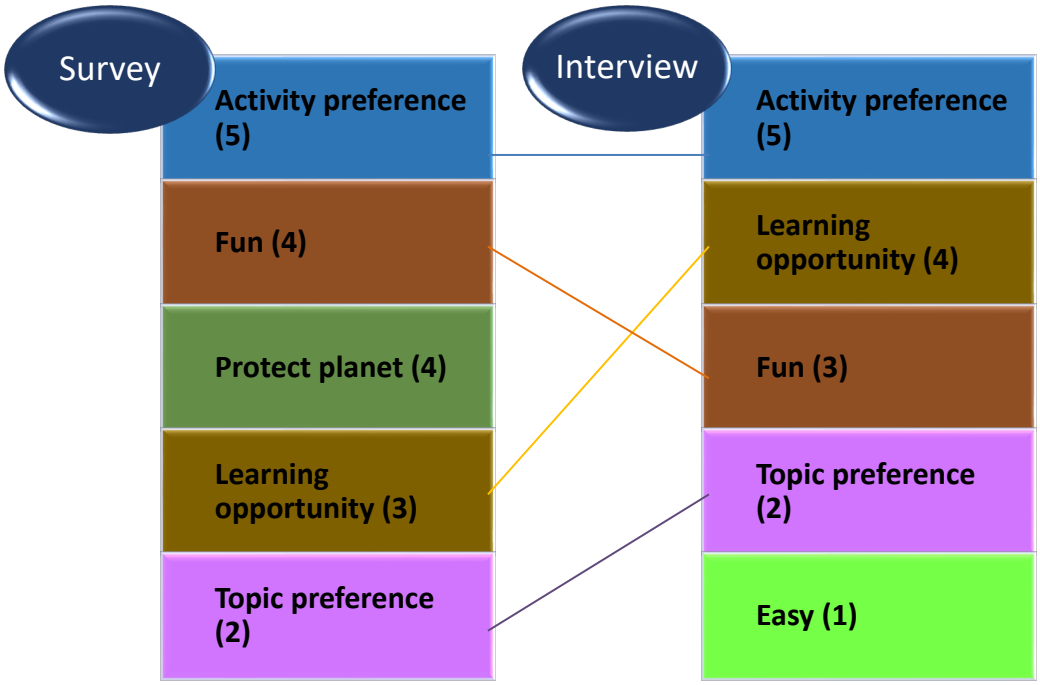

Figure 12. Cross-reference of common themes indicating overall reasons for enjoyment of activity from anonymous survey responses and interviews. Some children stated more than one reason. Number in parentheses indicate number of children whose answer fit the theme. Coding information in Appendix 7.3.

The topic during art week (S4) was climate change and was the least enjoyed (Figure 11) which indicates activity did not promote engagement with this topic. This may be because climate change can be perceived as unsettling and trigger negative feelings, leading to avoidance of or distraction from the issue (Trott, 2019). It may also be because climate change has not been extensively talked about in eco club compared to nature and plastic pollution, topics that have been covered in the past by eco club (Appendix 2). This, combined with session time restraints for topic discussion, may have led to decreased understanding. Lack of topic engagement is further demonstrated by the work produced in S4, where all participants created nature collages or drawings which had little or no mention of climate change causes or mitigation (Figure 13).

The importance of fun and learning opportunities at EEC is also a theme from both survey and interview (Figure 12), linking back to motivations for joining (Figure 4) and supporting research that EEC offer an enjoyable way to engage with environmental issues (Trott, 2019; Delalić, 2022), regardless of activity or topic, in an environment that encourages curiosity (Warwick *et al.,* 2017). This is essential for nurturing a sense of connection to the world which, alongside children having the choice of how to represent themselves, can lead to a desire to learn more (Warwick *et al.,* 2017).

This variety of reasons for topic choice, apart from personal inclination towards topics based on animals and nature (Figure 4; Figure 11; Figure 14), may indicate how children's personal values dictate their choices. It is interesting family influence was only mentioned by one child, as parental views and actions are considered a contributing factor in development of childhood pro-environmental values (Matties *et al.,* 2012; Byrne *et al.,* 2014). This could also apply to children who chose their topic because they perceived it as important. Themes regarding opportunities for learning and action reinforce the importance of EEC in development of pro-environmental behaviour and link back to motivations for joining (Figure 4). This indicates children have been sufficiently engaged by EEC content to understand they have agency to be part of the change (Trott, 2021). They also suggest the development of environmental consciousness, which is directly linked to EE (Sánchez-Llorens *et al.,* 2019).

Informal interviews during S5 also asked children to identify whether any of the activities made them think about the topic being covered that week (Figure 15) to further understand potential linkages between activity and topic engagement. Children were also asked to give reasons for why they chose the assembly topic in the survey (Figure 14).

Figure 13: Examples of artwork from S4, climate change. The top two represent nature collages and drawings with no mention of climate change, as produced by six children, with the bottom two representing work showing understanding of causes of climate change in an indirect way as produced by four children. Image credits: Top left – Maria Year 6. Top right – Carly Year 3. Bottom left – Fiona Year 4. Bottom right – Laura, Year 6.

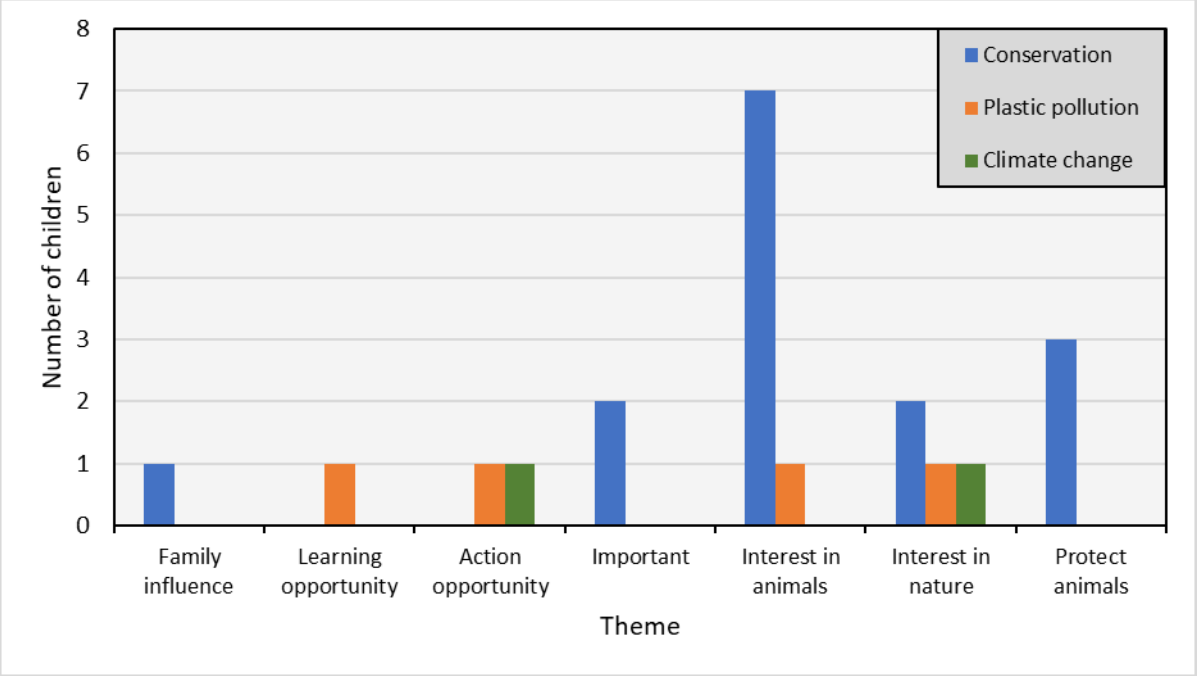

Figure 14: Reasons for assembly topic choice from the survey in session 5. Some participants indicated more than one reason. Coding information in Appendix 7.3.

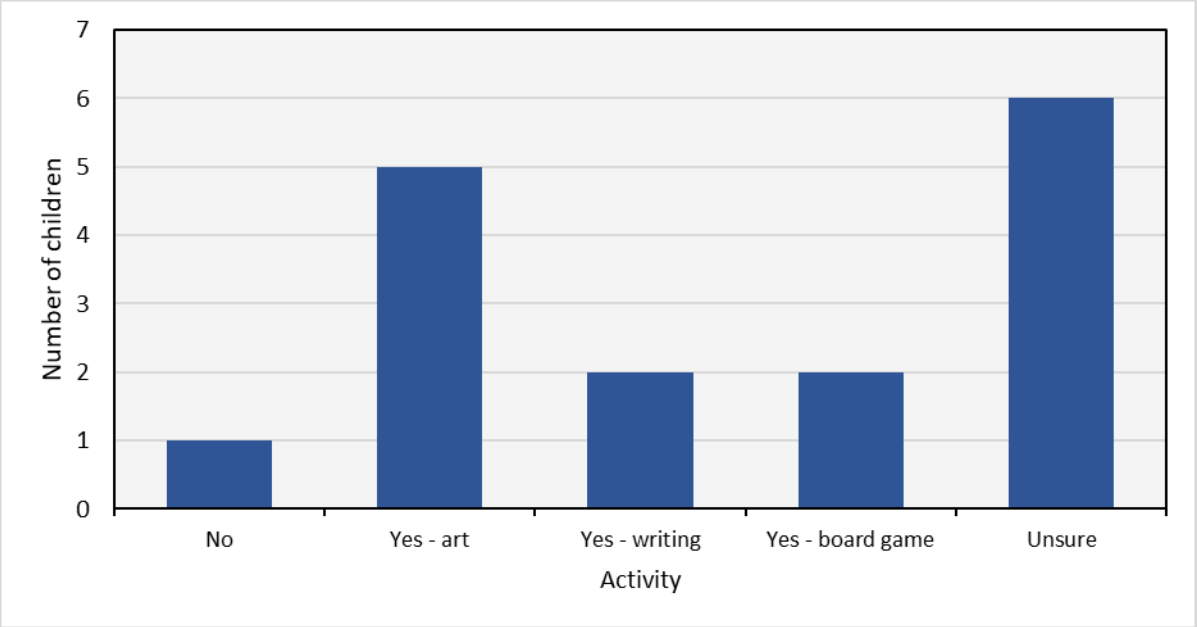

Figure 15: Responses to interview question 'Did any activity help you think about the topic we were learning?' Some participants specified multiple activities. Coding information in Appendix 7.3.

Figure 15 shows every activity undertaken encouraged engagement with topic. It is possible that art was mentioned most due to it being the favoured activity (Figure

11). This reinforces the need for EEC to introduce complex subjects like climate change by using a variety of activities to appeal to children's personal activity preferences (Bergman, 2016) to promote engagement.

Half of the children were unsure whether activity inspired engagement (Figure 15). This is best demonstrated by the comment of Maria, Year 6:

> "This one *(collage)* doesn't really explain anything but it's like a creative activity which I quite like… but I don't know how a collage really shows anything that it needs to climate change or wildlife or anything like that."

This quote, combined with Figure 13 examples and Figure 15 results, indicates that children may need more guidance on the set task to encourage engagement with a specific topic. Using concrete examples of the type of work children could create can enhance learning by association in a concise format that is easy to understand (Weinstein *et al.,* 2018). Using examples may encourage children to think more about what they want to represent whilst still giving them autonomy over their choice of how to depict it, to ensure they feel involved in making decisions over how they are learning and motivate long-term interest (Warwick *et al.,* 2017).

These results indicate that all activities have the potential to engage children with environmental topics provided they are perceived as enjoyable and link with motivations for joining EEC. Personal preference for activities and topics should also be considered, as indicated by the preference for art and interest in conservation. Using art activities and conservation topics within EEC as a base to increase knowledge of a wide range of environmental issues might encourage further engagement, as might using examples to guide children's thought on topics.

Did attendance inspire further investigation into environmental issues?
Children were asked during S5 whether attending eco club had inspired them to investigate environmental issues in their own time (Figure 16).

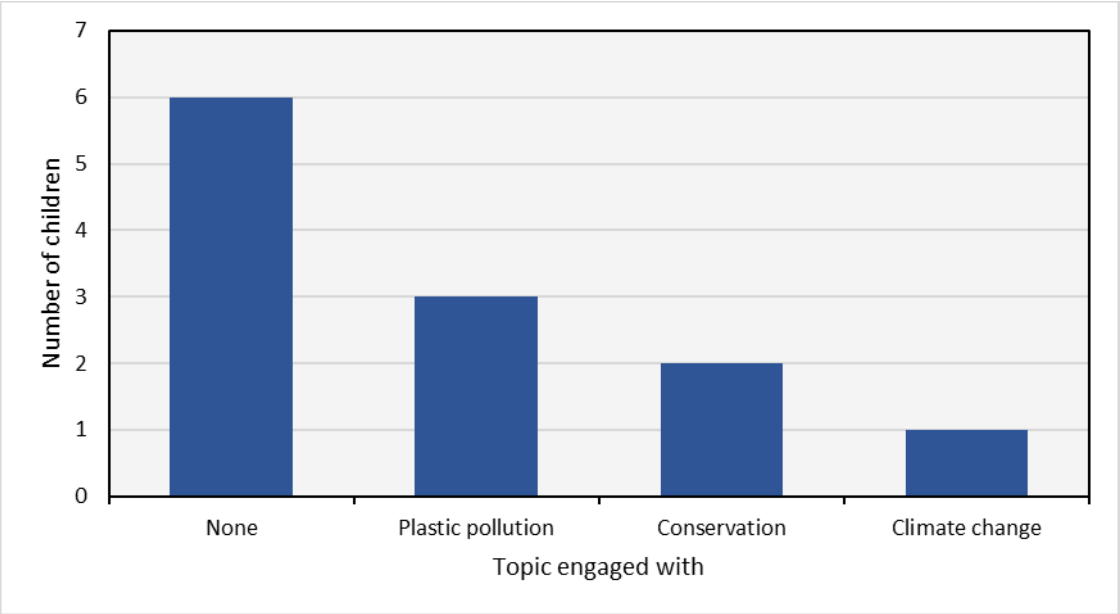

Figure 16: Topics investigated by children in their own time after eco club sessions, compiled using interview transcripts from session 5. Raw data in Appendix 7.4.

Half the participants investigated topics in their own time (Figure 16), suggesting attendance at EEC has moderate influence on inspiring children to undertake self-directed investigation. This is consistent with research by Trott (2019; 2021) who found that few participants had increased knowledge of environmental issues post-program due to self-directed learning. They concluded EEC have the potential to engage children outside lessons provided they have been supported to develop a sense of agency to create sustained interest (Trott, 2019).

The children who investigated topics had different reasons for doing so (Figure 17). Given the predominant interest in animals overall (Figure 9, Table 2, Figure 10, Figure 14), the reasons for investigating conservation and climate change were unsurprising. Litter picking and noticing has been previously carried out by eco club (Appendix 2), which may explain why children continued to do this in their own time as observing a trusted role model like a teacher modelling pro-environmental behaviour can contribute to children's development of the same (Matties *et al.,* 2012). Recycling and reusing items were not specifically covered during S3 (Appendix 5), so this may be due to individual interest or pro-environmental behaviour modelled at home (Matties *et al.,* 2012; Byrne *et al.,* 2014).

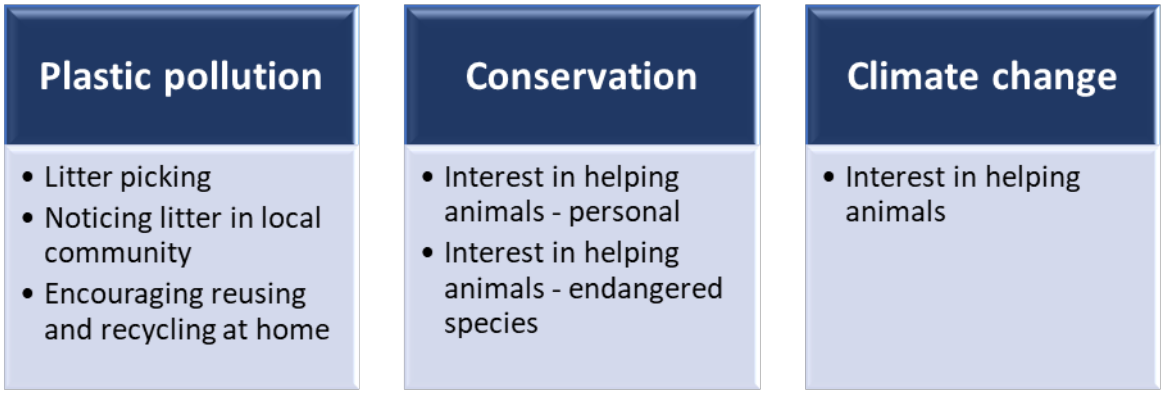

Figure 17: Reasons why children investigated topics following EEC sessions. Raw data and coding information in Appendix 7.4.

Five of the children who indicated post-session activity had pre-existing interest in the topic they investigated outside eco club (Appendix 7.4). This supports existing research that personal interest can create motivation to further explore topics (Dahl and Nierenberg, 2021). Small-scale actions such as litter-picking are thought to be the most appropriate way to frame mitigation measures for primary school children (Chawla and Cushing, 2007) and children's experience of litter picking as part of eco club (Appendix 2) may have influenced their decision to do this in their own time. Any action undertaken outside EEC is encouraging as it can create lifelong motivations to carry out pro-environmental behaviour (Bergman, 2016).

The results in Figure 16 contradict data collected at the end of S2-4, where most children indicated interest in finding out more about topics (Table 3).

Table 3: Number of children who indicated interest in learning more after the session, counted via show of hands during end of session group discussion. *This figure does not indicate total attendance at session as some children left early.

Session number and topic	Number of children interested in finding out more	Number of children present*
2 - Conservation	8	9
3 – Plastic pollution	3	5
4 – Climate change	6	8

The difference between number of children interested per session and number of children who carried out self-directed activities or learning could be due to situational interest, which relates to reactions inspired by a particular situation which may not last after the experience (Hidi and Renninger, 2006). Situational interest still motivates learners (Hidi and Renninger, 2006; Dahl and Nierenberg, 2021), which could explain why all children reported enjoyment of session topics and activities (Figure 7) but did not all engage in further learning. Situational interest can lead to individual interest, a predisposition to engage in self-directed learning in topics of personal interest (Hidi and Renninger, 2006) provided the learning environment can successfully trigger maintained interest (Dahl and Nierenberg, 2021). This could be done by EEC through use of different activities and topics to appeal to children's personal preferences.

Post-session anecdotal evidence from participant's parents and the school headteacher suggested children were sufficiently engaged with session content to talk about what they learned with others. The headteacher witnessed a participant telling external governors 'It doesn't matter how old you are, you can still make a difference', a recurring theme during sessions to promote positivity and hope around environmental issues (Appendix 5). Other parents reported their children had spoken about the sessions at home, especially climate heroes (Appendix 5), voluntarily participated in litter picking at home and during free time at school, took steps to protect garden wildlife, and created posters to stick in their windows. This supports the need for EEC to be personally relevant and meaningful by design (Monroe *et al.,* 2019) by taking children's individual interests into account to inspire and motivate them to act in a pro-environmental manner away from the EEC sessions (Bergman, 2016). It also demonstrates how EEC can inspire children to act as environmental communicators to adults in their own spaces (Trott, 2019) which is vitally important, as they represent the generation whose lives will be most affected by increasing impacts of environmental issues.

These results indicate attendance at EEC has the potential to inspire children to undertake activities or research in their own time and this may be related to pre-existing interest or enjoyment of a particular activity. Many children indicated desire to learn more during sessions, but this situational interest must develop into individual interest to maintain learning and inspire pro-environmental behaviour outside EEC. This strengthens the need for EEC to engage children using a variety of activities and topics to appeal to children's personal preferences and inspire further engagement in their own time.

Conclusions

These results indicate informal education settings like EEC have huge potential to engage primary school children with environmental issues, both global and local, and this is not dependent on the type of activity undertaken. EEC can best be used to engage primary school children with environmental issues by offering activities which are perceived as enjoyable and relate to participants motivations for joining, as all activity types were found to have potential to promote engagement due to activity and topic enjoyment being mostly determined by individual preference. This makes using a variety of activities and topics during EEC sessions vital to influence engagement for all children attending. Art-based activities and animal-focused topics were found to be most popular overall, mostly due to personal preference for the activity and motivation to help look after the planet and animals, which was a motivation for joining EEC. Conversations with children during the first session highlighted the importance of approaching environmental issues from a place of hope and positivity to inspire further engagement and avoid negative feelings which may lead to disinterest and inaction.

This research also indicated setting broad tasks may not result in full engagement with a topic, so EEC may benefit from using examples of desired output or setting simple tasks that allow a variety of interpretations. This will enable children to use their own ideas and understanding whilst promoting topic engagement by being slightly more structured. Using children's pre-existing interests and motivations for joining could be used to aid teachers in developing EEC resources that will promote engagement with topics and may lead to children further developing their individual interests outside lessons and turn this interest into life-long pro-environmental values and behaviours.

Limitations

Attendance at eco club was voluntary which may have had two implications on results - inconsistent attendance, as found in research by Lee (2017), and higher likelihood of participants having pre-existing interest in environmental issues, consistent with research by Trott (2019). To ensure consistency, participants were selected on the provision that they had attended at least three sessions. The sample size was also relatively small with only twelve eligible participants included in data analysis, which especially limited quantitative data collection.

Magazine materials provided for S4 were mostly wildlife based due to a lack of acceptable materials showing effects of climate change, which may have led to the overall focus on animals and landscapes presented in the artwork (Figure 13). This could also link with time constraints of sessions, limiting the ability to explain complex topics like climate change thoroughly. Sessions were a maximum of 50 minutes long, making it difficult to ensure individual understanding of topics.

Future work

This research has highlighted the importance of EEC for engaging children with environmental issues, inside and outside of sessions, and how using a variety of learning activities can help with this. The following recommendations could add to these findings:

- Adding further sessions to identify whether knowledge gained because of participation in EEC resulted in in long-term engagement with environmental

issues. Previous studies have identified the importance of regular EE to maintain concern for the environment and continued desire to take positive action (Chawla and Cushing, 2007; Treagust *et al.*, 2016).

- Inclusion of non-classroom-based activities, such as wildflower planting or litter picking, to identify whether actively participating in environmental action is more engaging, as suggested in existing research (Kuo *et al.,* 2019; Whitburn *et al.,* 2019; Van de Wetering *et al.,* 2022).

- Repeating the research with classes of children in a formal learning setting to identify whether activity type influences levels of environmental engagement with children who may not have a predisposition towards environmental issues and action. This would also address the sample size limitation of only studying EEC, and if different year groups were included, enable comparison of engagement due to age.

Acknowledgements
Firstly, I would like to thank my supervisor Dr Alison Stokes for her enthusiasm for my research from our very first discussion. Her incredible knowledge, support and guidance have been invaluable, and I am so grateful for all the time and advice she has given me over the past year. This experience has convinced me that I would like to pursue a career in environmental education.

Secondly, I would like to thank Mrs Cunningham and Mr O'Hara from Sir Robert Geffery's Primary School for allowing me to undertake my research in the school eco club and being so accommodating. I would also like to thank all the children at eco club who blew me away with their environmental awareness and dedication to making a difference, it was an absolute pleasure spending time with them all. I can only hope I inspired them as much as they inspired me.

Finally, I could not have done this without the unwavering support of my husband Paul, my daughter Seren, and the rest of my amazing family over the course of this research. Thank you.

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