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Peep Exploring Together: Supporting the foundations of Science, Technology, Engineering and Maths (STEM)

Evaluation report

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14 November 2024

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Acknowledgements

The authors are indebted to the project team made up of Sally Smith, Katy Baker and Janet Sly at Peeple, Melissa Prendergast at Sheringham Nursery and Children's Centre and Dr Alexandra Hendry from the Department of Experimental Psychology at the University of Oxford and her Research Assistant for all their help and support over the last few years. Thanks to all the staff, parents and children for taking part in the research. We would also like to thank Anneka Dawson for her expertise, leadership, and guidance before she went off on maternity leave together with other IES colleagues for their support including Becci Newton, Sara Butcher, Ellie Cooper, Zoe Gallagher and Steve O'Rourke. Finally, thank you to Mercers' Company for funding this important research and continuing our learning and understanding of the early years sector.

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Executive Summary

Introduction

In the current UK labour market there is a significant lack of 'STEM capital' - the interest, knowledge, confidence and appreciation of available opportunities and, a shortage of STEM skills with 97% of STEM-related organisations reporting that they struggled to recruit in 2019[1]. The shortfall in capital and skills is magnified among girls and other groups in society in particular, those from disadvantaged families.

The first five years are crucial to providing a foundation for STEM capital and skills. However, some members of the Early Years (EY) workforce and some parents (particularly parents experiencing multiple forms of disadvantage) are under-skilled and under-resourced in supporting the development of STEM capital and skills among children in their early years.

Peeple is a charity that supports parents and their children to learn together. They develop interventions and train practitioners nationally. In response to a lack of STEM capital and skill and the lack of explicit initiatives to address these, Peeple wanted to design and test an intervention to support practitioners and parents to encourage the foundations of STEM in children aged 3–5 years old through everyday activities in their EY settings and at home. The intervention became known as the Peep Exploring Together Programme.

Project development

In Autumn 2020, Peeple successfully submitted a proposal to the Mercers' Company, as part of their philanthropic Special Initiative in Early Years, Literacy and Transitions.[2] The proposal combined expertise from Peeple, the University of Oxford, Sheringham Nursery School and Children's Centre and the Institute for Employment Studies (IES).

The project faced a number of early challenges which had an impact on its planned phases, including systemic issues within the early years sector relating to staffing, health, financial concerns, and the additional time and effort required to plan for and support children's development needs in the wake of the Covid pandemic.

The initial plan had been to develop and pilot a programme to be delivered face to face to parents by trained practitioners and independently evaluated with a small-scale randomised controlled trial (RCT). This plan was adapted over the course of the project to move the Programme content and training online and for the evaluation to a mixed

[1] Blair 2019

[2] https://www.mercers.co.uk/philanthropy/young-people-and-education

method study including a pre and post-test measure of the science and maths components of the home learning environment and interviews with participating practitioners and parents.

The Exploring Together Intervention

The intervention aims to improve practitioners' and parents' confidence, knowledge and skills to support early STEM learning. The intervention comprises the Exploring Together Training (for practitioners), and the Exploring Together Programme (for parents).

Integral to the intervention were two specific elements, the first being the STEM lens, a conceptual tool that uses simple STEM definitions to identify and make the most of everyday opportunities to support early STEM learning. Another key facet of the training is a focus on encouraging high-quality interactions, using the ShREC *(Sh-Share attention, R-Respond, E-Expand, C-Conversations)* approach.

Practitioner training

The Exploring Together Training (for practitioners) is provided online through Padlet, a digital tool for creating and sharing content with others, and comprises a combination of recorded and live modules with additional reading/resources available.

The training was delivered by two trainers from Peeple over a period of four weeks. At the end of Modules 1-4, practitioners completed a short reflective journal[3] to consider what they had learnt and how they might implement the concepts in their practice. Practitioners were also required to join a WhatsApp group to receive support from the trainers throughout the training and Programme delivery.

Flexible implementation support was provided by the trainers to practitioners during the Programme delivery e.g. drop-in sessions and email, telephone and support visits.

Parent Programme

The Exploring Together Programme (for parents) comprises:

- Eight weekly sessions accessed online using Padlet with an A4 folder containing hardcopies of all the online materials.
- Home-play packs with free resources to support the suggested activities and to encourage parents to explore together at home.

Parental engagement with the online materials and home-play activities was supported through a WhatsApp broadcast list function facilitated by Peeple, or a WhatsApp group/setting's communication platform moderated by the setting practitioner, and

[3] The Reflective Journals were designed to take 10-15 minutes to complete

exchanges and brief one-to-one conversations between practitioner and parent when dropping off/picking up children.

The Parent Programme is referred to as the “Programme” throughout this document.

Methodology

Research questions

The research questions were developed and then used to design the evaluation’s research tools.[4] All of the research questions were investigated using the research methods detailed below and are reported accordingly:

1. Is the intervention feasible for practitioners to take part in and adequate to enable them to support parents implementing STEM learning in the Home Learning Environment (HLE)?
   a. What are the barriers and enablers to supporting the Programme?
2. Is the Exploring Together Programme feasible for parents to take part in?
   b. What are the barriers and enablers to parents taking part in the Programme and transferring STEM learning to the home learning environment?
3. What are the perceived impacts of the intervention on children’s skills and confidence?
4. What are the perceived impacts of the intervention on practitioners’ and parents’ and skills and confidence in supporting STEM learning?
5. What factors may need to be considered to scale-up the intervention?

Research methods

IES worked closely with Peeple in a ‘critical friend’ model throughout the project and included supporting the team to carry out some of their own evaluation work and reviewing the practitioner training. All partners worked closely to adapt and develop the design of the independent evaluation. Due to the difficulties with recruitment and the move away from an RCT, the independent evaluation became more exploratory. It did not try to explore robust impact or causality but focussed on the quality of the home learning environment in relation to science and maths, and the perceived impact of the Exploring Together Intervention on practitioners, parents and children.

The independent evaluation consisted of:

- Three theory of change Intervention, Delivery and Evaluation (IDEA) workshops (two pre-programme and a third at post-programme);
- Three telephone/online interviews with a setting manager and trained practitioners (although the original aim was two in each of the six settings);

[4] Copies of which are included in the appendix.

- 12 telephone interviews with parents (two from each of the six settings);
- Review of Programme materials and brief descriptive analysis of the reflective journals.

The report also includes a brief summary of the analysis of parent-reported changes (through a questionnaire) with regard to maths and science in the HLE carried out by the research team at the University of Oxford.

Findings: Feasibility of the intervention

Overall feedback from practitioners and parents was very positive. The Programme modules and activities worked well and both practitioners and parents, and reportedly children, found the course enjoyable and beneficial.

Exploring Together Training (for practitioners)

All practitioners interviewed reported completing and engaging positively with the modules. They felt that module topics were accessible and helped show them how they could be used in everyday life.

The limited suggestions for improvement included adjusting the timing of Implementation support sessions to accommodate practitioners' schedules and incorporating more science terminology into activities for parents without overwhelming them. Additionally, the idea of in-person sessions with parents was proposed to further enhance engagement and understanding.

Exploring Together Programme (for parents)

Parents generally found the Programme content and resources to be beneficial. They gave positive feedback on the Programme's quality and support from trainers. Some suggested improvements such as clearer guidance on when to engage in activities and managing the amount of information provided to them. The main challenge reported with accessing the online sessions was constraints on their time, although having access to physical resources as well as the online sessions helped overcome this.

Delivery and feasibility of the home learning activities

Parents engagement with and completion of activities

Parents and practitioners reported high engagement with the home learning activities.

Views of the home learning activities

Parents overwhelmingly reported having positive experiences of engaging in the home learning activities with their child and practitioners said that was their impression too from their interactions with parents and the children.

Parents reported engaging with the activities in different ways, with some adapting the activities using guidance offered in the Programme while some practitioners replicated some of the activities at the same time in the setting to help reinforce the learning.

Home-play packs

The home-play pack contained information sheets and the physical materials needed for parents to complete the home-play activities with their child, which was convenient and cost-saving for parents and also facilitated their engagement. Parents and practitioners reported that the pick-up time also offered the opportunity for practitioners to support parents and discuss their child's progress with the Programme. All parents interviewed found it helpful to be provided with the home-play packs and were satisfied with the content.

Engagement with WhatsApp

WhatsApp broadcasts (or in one setting, their existing communication platform) were set up to send weekly reminders to parents to complete home activities and other nudges generated by the trainers. Feedback on the broadcast was generally positive, with parents finding the nudges useful and enhanced their engagement with the Programme. WhatsApp groups (and other sharing platforms used in settings) were also valued for their support and idea-sharing among parents. Those less engaged cited reasons such as not needing help or confusion about group functionality. Where parents had access to multiple platforms, some expressed a desire for clearer guidance on participation.

Activities working well

Parents and practitioners reported that the activities worked well and were generally popular with the children. The main reasons given by parents for activities working well were that they engaged both the children and parents, helped explain STEM concepts effectively, and parents felt they could incorporate the concepts and language into daily life. The child's existing preferences for different types of activities was a factor in their engagement with particular home learning activities.

Activities working less well

In the small number of cases where parents reported that something had worked less well, they believed this was due to their child's age, ability or level of interest. Some feedback was that the Magic of Gloop activity was quite messy for parents.

Using the ShREC approach

Practitioners and parents reported having confidence in using the ShREC approach. Parents reported finding it particularly helpful in gaining their child's attention and facilitating interaction during activities and their confidence increased over time, with support and encouragement from practitioners.

Barriers and enablers to delivery

Practitioners and parents were asked about barriers and enablers to delivery. Enablers also include factors which helped overcome certain barriers. A selection of barriers and enablers reported are listed here.

Practitioners reported the following barriers:

- Finding the time to engage in the intervention and support parental engagement with the Programme.
- Being the only practitioner in their setting that participated in the intervention.

Enablers reported by practitioners included:

- Flexible, pre-recorded training modules that could be watched at a time to suit the practitioner.
- Support from trainers including help setting up the WhatsApp broadcast list and providing nudges for it.
- Support from managers e.g. one practitioner was given time out of class to do the training.

Parents reported the following barriers

- Struggling to get a child's attention.
- Lack of time to dedicate to watching sessions and completing activities.
- Not being able to collect home-play packs e.g. if busy or practitioner not available.
- Language barriers for parents with English as an Additional Language (EAL).
- Some activities being difficult/not age appropriate.

Enablers reported by parents included:

- Using the ShREC approach helped with attention.
- To overcome time constraints:
  - adapting activities to fit into existing daily routines.
  - having home-play packs provided with all the resources needed for activities as well as physical handouts.
- For parents with EAL, translation is offered on request and the videos had transcripts which could be translated.
- For activities that were difficult/not age appropriate:
  - Making it clear that activities can be adapted and used flexibly to fit in with the child's interests/age/level of development.

- Time on the Programme and the passage of time meant that parents learnt their children were more capable than what they had originally thought (rendering adaptations unnecessary).
- Engaging with WhatsApp helped motivate some parents to engage with the Programme, develop their own ideas of activities and acted as a source of support.
- Support from practitioners and trainers.

Findings: Perceived impacts of the intervention

Maths and science - Home Learning Environment

The HLE questionnaire analysis found that parents reported undertaking both maths and science-based activities with their children at a significantly higher frequency immediately post-Programme compared to pre-Programme.

Impacts on children

Parents were overwhelmingly positive about the impact of the Programme on their child, reporting developments in their confidence (including self-belief and confidence in STEM), curiosity, STEM skills, language and communication and the benefits of increased parent-child time.

Maths skills improvements were noted most frequently around the child's improvement in counting and simple sums such as addition/subtraction, as well an improved knowledge of shapes and weights. Children were also reported to exhibit greater interest in STEM concepts, often in the subject of science and topics of particular interest to that child e.g. space, the natural world.

Noted improvements in children's language and communication skills following participation in the Programme included more verbal communication, increased vocabulary, and improvements in listening.

Although not explicitly evaluated, some parents reported observed improvements in the executive functioning skills of their child and fine motor skills.

Impacts on practitioners

Practitioners universally reported enjoying and learning from the Programme. They often felt that the Programme impacted their practice positively and helped them to feel more confident in their interactions with parents. Practitioners also reported that the Programme boosted their STEM confidence and knowledge, and they intended to incorporate the learning into their practice, including by repeating the activities with different children.

Although all practitioners reported having used the ShREC approach in their setting prior to participation in the Programme, some also felt their involvement may have further enhanced their understanding and awareness.

Impacts on parents

Parents were universally positive about the impacts of the Programme, describing a range of impacts upon themselves individually as well as changes in their day-to-day interactions with their child.

Most parents interviewed felt more confident in their ability to support their child with improving their STEM skills at home through play and learning, and that the Programme had made STEM more relatable. This also included incorporating STEM subject concepts and language into the home learning environment in daily activities such as cooking, repeating the home-play tasks or coming up with new STEM-related activities to do with their children. No parents reported any difficulties using the STEM lens.

The Programme was also found to have positively impacted on some parents with EAL, with one saying it helped improve their own language capabilities related to STEM and another saying it enabled them to incorporate STEM more into daily life.

Discussion and conclusions

Feasibility

Exploring Together has been found to be feasible, with feedback from parents and practitioners overwhelmingly positive. Parents and their children were able to engage with the Programme. Parents were encouraged to adapt the Programme activities to align with family routines and their children's interests, and some reported doing so. Practitioners found the training useful and informative, and they were able to support families through the duration of the Programme. Some questions were raised around the degree of practitioner involvement and whether there could have been more however, it was also acknowledged that this would be an additional resource constraint on an already stretched sector.

Impact

Positive perceived impacts were found for practitioners, parents and children in relation to STEM skills, confidence and knowledge with learnings being incorporated in future practice in settings and in the home learning environment. Improvements were also noted in terms of interactions and relationships between practitioners and parents and between parents and children due to improvements in confidence, skills and understanding.

From the parents' perspective, the impacts on children were evident in a wide range of areas including: confidence in themselves and in STEM, curiosity, STEM skills, language and communication and the benefits of increased parent-child time.

The ShREC approach was seen as a positive by parents and practitioners, including the latter who had previously used this it but who felt this experience further enhanced their understanding and awareness.

Limitations of the study

A few limitations of the study were identified, one of which was the possible selection bias (by practitioners) in their recruitment of parents. In addition to some variations in prior-STEM knowledge among parents, these factors may have had an effect on engagement with the Programme and the time practitioners needed to encourage parents to engage.

Future development and delivery

The training for practitioners and online Programme for parents is considered easily scalable and sustainable with a few adaptations.

The Programme

The confusion over whether the children needed to watch the Padlet or look at the resources needs to be addressed so it is clear that the children do not need to participate in this way. Some parents did not use the Padlet and other preferred physical resources. The digital format of the Programme may not suit all families and further adaptations may be needed to support parental engagement with the content.

In addition, some parents could not engage fully or easily due to language barriers. Future iterations of the Programme could ensure that all staff and parents are aware of the option for translated resources and subtitles for the videos. The option of an in-person session with the practitioner(s) and parents (as initially intended) may address some of the variations between parents discussed above.

The evaluation noted that adaptations to activities (to fit the child's household context) are an integral part of the Programme. Emphasising that the home activities are adaptable (for example for children with SEND) will help families engage more fully with the programme.

Having the collection of home-play packs on set days might help ensure the practitioner is available at the same time as the parent. Alternatively, ensuring that more than one practitioner in each setting is involved in the Exploring Together Programme in each setting to provide another point of contact and peer support (which would also take some burden off the trainers). Future delivery models may also want to consider how practitioners tailor their support, based on variations including the age of the children and whether they have any special educational needs and/or disabilities.

Parental selection in future scale-ups may need written guidelines to ensure there is no unintended bias (as this could affect not only engagement but any evaluation results).

Resources and logistics

Finding the time for the activities could sometimes be difficult parents for (who are often time-poor) and while the evaluation found some enablers to overcome this, the issue may require further consideration in future programmes, including strengthening messages on

the importance and impact of quality parent-child interactions. Similarly, as time was occasionally reported as an issue for staff, this also needs to be considered.

The Programme required considerable resources from Peeple, including the development of the training, the materials and the support to nursery staff and parents. At scale-up, these costs will need to be considered and data on such costs, both in terms of resources and staff time, will need to be collated and reported on.

As WhatsApp was used for this evaluation **only**, one issue for future delivery would be whether all settings have an existing feedback platform and would be willing to use this. Another issue would be whether they would have the time to set up and prepare these materials, as Peeple's support in preparing the parent communications was reported as an enabler for practitioners.

Regarding understanding of the ShREC approach, although practitioners involved in this study were familiar with the approach and had used it previously this may not be the case in other settings. A future consideration would be whether any Programme adaptations are needed to allow for this, for example the provision of additional practitioner training or support materials. Although most parents reported that they felt confident using the ShREC approach to support their child's STEM learning at home and found it helpful, a couple commented that they felt they needed some further support in this, so they could (continue to) support their child's STEM skills and help them improve,

1 Introduction

This chapter begins with an introduction to the rationale for and set-up of Peep Exploring Together, supporting the foundations of Science, Technology, Engineering and Maths (STEM). The chapter then outlines the proposal initially submitted to the Mercers' Company, followed by a description of the changes made to the original plan, including those made to the independent evaluation.

1.1 The project – supporting the foundations of STEM in young children

1.1.1 Rationale

STEM skills are vital for citizens to realise their potential in a changing, technologically driven world. The demand of professions reliant on STEM skills is increasing. However, there is a lack of 'STEM capital' (the interest, knowledge, confidence and appreciation of available opportunities) in society and a serious STEM skill shortage in the UK (e.g. 97% of STEM-related organisations struggled to recruit in 2019)[5]. The lack of STEM skills and capital is magnified in disadvantaged families and in girls. This contributes to the equity gap in attainment and impacts on social mobility; the need for STEM skills and qualifications is reflected in significant economic rewards for those who possess them.

Research from Kings College London highlights that young people's STEM capital "correlates with the likelihood of them pursuing a career in STEM and is less prevalent in disadvantaged groups"[6]. In 2019, poorer students were four times less likely to enter STEM-based careers than their wealthier peers.[7]

The Early Years (EY), both in the home and in settings, are crucial in igniting curiosity and providing a foundation for STEM skills. However, some members of the EY workforce and parents (particularly parents experiencing multiple forms of disadvantage) are often under skilled in supporting STEM. A Nuffield Foundation Study found that EY practitioners said they would like more training across areas of numeracy because they felt ill-equipped to support young children beyond vocabulary and phonics.[8]

[5] Blair 2019
[6] House of Commons 2017
[7] Roche 2019
[8] King's College 2013

Policy UK-wide acknowledges the problems, and their origin in EY, but practical initiatives to address them are almost exclusively found in primary, secondary and further education.[9][10]

In response to the lack of STEM capital in the EY and the absence of initiatives to address this, Peeple wanted to design and test an intervention to support practitioners and parents to encourage the foundations of STEM in very young children through everyday activities in their settings and at home. The new intervention (which came to be known as the Peep Exploring Together Programme) would equip practitioners to recognise and build on ways in which parents already help their children learn.

In addition, research on improving child outcomes in the EY has primarily focused on language and literacy with some exploration of numeracy, so Peeple considered a STEM focused intervention under-researched as well as innovative.

1.1.2 Project partners

Peeple is a charity that supports parents and their children to learn together. They develop interventions and train practitioners nationally. Their flagship Programme is Peep Learning Together (LTP) which aims to improve child outcomes by supporting relationships between parents and their very young children and the quality of the home learning environment. A randomised controlled trial of the Learning Together Programme, carried out by Queen's University Belfast, found that the Programme had the greatest impact for the most disadvantaged children who made an additional four months progress in their core language and their communication skills and an additional three months progress in their early literacy skills over the 20-week duration of the intervention.

The project included a number of partners and was led by Peeple. Sheringham Nursery School and Children's Centre is an Education Endowment Foundation Research School and leads a network of settings, focused on using evidence to improve the life chances of children and young people in East London and beyond.[11] As part of the project, a member of staff from Sheringham (who at that time was a class teacher and room leader) was seconded to be the Project Coordinator and provided invaluable practitioner level expertise, insight and support.

Dr Alexandra Hendry from the Department of Experimental Psychology at the University of Oxford specialises in early Executive Function. Dr Hendry contributed her expertise throughout the project. Executive function contributes to both early numeracy and early scientific skills and was to be embedded throughout the Exploring Together Programme.

[9] MacLachlan and Scheuber 2019

[10] DfE 2019

[11] Sheringham Nursery and Children's Centre also leads the *We are A Brighter Start: East London's Stronger Practice Hub*, partnering with Koolkidze Ltd (St Barnabas Pre-School) and Honey's Childcare. As an Early Years Stronger Practice Hub, they provide advice, share good practice and offer evidence-based professional development for early years practitioners.

1.2 The proposal

In Autumn 2020, Peeple successfully submitted a proposal to the Mercers' Company, as part of their philanthropic Special Initiative in Early Years, Literacy and Transitions.[12] The proposal combined expertise from Peeple, the University of Oxford, Sheringham Nursery School and Children's Centre and the Institute for Employment Studies (IES) and planned to:

Phase 1: develop a 10-week intervention to upskill Early Years practitioners with the confidence, knowledge and skills to support STEM skills in their setting, and to help parents encourage the foundations of STEM through everyday activities.

Phase 2: pilot and refine the intervention with practitioners and parents from Sheringham Nursery (eight parents and eight children).

Phase 3: train and support 40 practitioners from Sheringham Early Years hub settings to deliver the intervention to 80 families.

Phase 4: evaluate the intervention using a small randomised controlled trial (n=112 families).

Phase 5: develop and pilot an accredited unit for parents based on their participation in the intervention (eight parents).

In addition, IES designed an implementation and process evaluation to:

- develop the theory of change including an exploration of mechanisms of change.
- explore the evidence of promise of the intervention on child outcomes in executive function and perceived child outcomes on numeracy, executive function, early language skills and confidence and curiosity (practitioner and parent perspectives) using a small-scale RCT (Phase 4 above)
- explore perceived outcomes on practitioner capability to support STEM and their STEM confidence, as well as parent confidence, knowledge and skills.
- explore the feasibility and scalability of the Exploring Together Programme.

1.2.1 Changes to the proposal

The project faced a number of challenges which had an impact on the planned phases. The challenges included:

- Systemic issues within the early years sector relating to staffing, health, financial concerns, and the additional time and effort required to plan for and support children's development needs in the wake of the Covid pandemic.
- The high number of interventions competing for London settings within which to pilot, sometimes requiring exclusivity.

[12] https://www.mercers.co.uk/philanthropy/young-people-and-education

The impact of these challenges was minimised through the understanding and flexibility of the funder and agility of partners to respond to the needs of the sector.

The project phases were delivered and adapted where necessary as follows:

Phase 1 (Summer 2021-Spring 2022)

The intervention, the Exploring Together Programme, was developed for practitioners to deliver face-to-face with parents and their children. The Exploring Together Programme comprised session plans to support practitioner delivery and resources/ handouts for parents to support the weekly STEM based activities to do with their child at home. Parents received nudges during the Programme via a WhatsApp group and shared their experiences of supporting early STEM at home. The Programme, originally intended to be 10-weeks, was shortened to 8-weeks, to allow for a longer delivery period to accommodate illness, holidays etc., and to facilitate its delivery within a single term.

Phase 2 (Summer 2022)

The Exploring Together Programme was delivered as planned by the Project Coordinator to 8 parents and their children from Sheringham Nursery (Pilot 1). A creche was provided for younger children to enable parents to attend the face-to-face sessions. Parents' feedback (focus group) and WhatsApp exchanges evidenced the quality of the home learning environment (HLE) activities and STEM interactions. WhatsApp nudges and home-play packs kept parents engaged, enabled dialogue between parents and practitioner, and contributed to retention.

Phase 3 (Autumn 2022- Summer 2023)[13]

This phase was split into three stages:

a) (Autumn 2022) Modularised online/ pre-recorded practitioner training was developed to address identified barriers to staff attending 1-2 day in person training.

b) (Spring 2023) Three practitioners from three settings within the Newham Early Years hub were trained and supported to deliver the Exploring Together Programme to 23 parents (Pilot 2). There were difficulties recruiting settings who were overwhelmed with staffing problems, illness, financial issues etc. Recruitment of families also proved challenging with many parents working or not able to attend the set day/ time for the sessions. Whilst Peeple's internal evaluation indicated increased practitioner and parent confidence, knowledge and skills in supporting early STEM, the face-to-face delivery was demanding for busy, time poor practitioners. These factors strongly influenced the next steps.

[13] In October 2022, the network of Stronger Practice Hubs was established and Sheringham started to lead the *We are A Brighter Start: East London's Stronger Practice Hub*

c) (Summer 2023) An online adaptation of the 8-week Exploring Together Programme was developed for parents with guidance videos; resources to support STEM-based activities; extension ideas and information to deepen STEM knowledge; songs/rhymes and books/stories linked to the topic. Rather than practitioners delivering the Programme to families, the parents accessed the materials directly on a weekly basis via Padlet using their mobile phones or tablets etc. Parental engagement was supported by practitioners through WhatsApp nudges and interactions as well as 1:1 conversations with parents when dropping off/ picking up their children. This approach eased the time pressures on setting staff and increased the reach of the Programme to include working/ busy parents.

Phase 4 (Autumn 2023- Spring 2024)

The methodology for the independent evaluation was changed from a small scale Randomised Controlled Trial (RCT) with a focus on child outcomes, to a mixed method evaluation focused on the home learning environment. This was to avoid asking over-stretched staff to accommodate data collection from the children and to reduce the total number of settings required.

It was decided by the team to run an independent evaluation looking at evidence of promise and the potential for scalability, and to include perceived child outcome data gathered at pre and post Programme through parental surveys regarding the HLE (discussed in more detail in the methodology section below).

Seven practitioners from six settings were trained and supported to deliver the online adaptation of the Exploring Together Programme to 48 parents (Pilot 3).

Phase 5

The accredited unit for parents was replaced by the development of an online adaptation of the Exploring Together Programme (See Phase 3c).

2 The Exploring Together Intervention

This chapter outlines the content of the Exploring Together Intervention as delivered in Pilot 3 (see section 1.2.1). The intervention aims to improve practitioners' and parents' confidence, knowledge and skills to support early STEM learning by providing them with:

- the underpinning knowledge to enable them to draw out STEM potential within a range of simple, everyday, fun activities
- STEM vocabulary (word bank provided)
- the skills to engage in high quality interactions with children which stimulates scientific thinking
- the confidence to transfer STEM knowledge and ideas into everyday activities within the Home Learning Environment (HLE).

The intervention comprises the Exploring Together Training for practitioners and the Exploring Together Programme for parents.

2.1 Exploring Together Training (for practitioners)

Exploring Together Training aims to support practitioners to:

- help parents make the most of everyday opportunities for STEM learning with their children
- develop skills knowledge and confidence to encourage children's early STEM learning in settings
- understand how to support parents' engagement with the Exploring Together (online) Programme
- share ideas and reflect on practice with peers.

The online training, provided through Padlet (see Figure 1) comprises a combination of recorded and live modules with additional reading/resources available.

Module 1: Getting started (30-minutes, live, *recorded)*

Module 2: Exploring early STEM (60 minutes, live)

Module 3: High quality interactions (ShREC) (60 minutes, live)

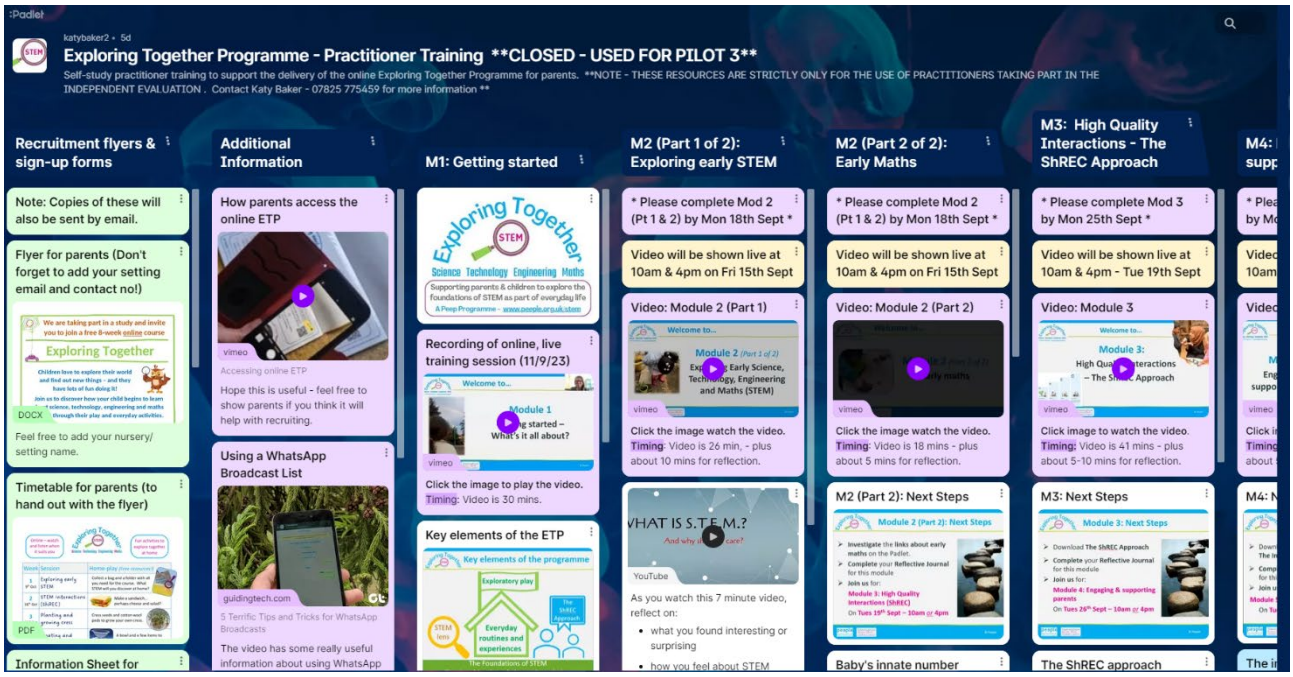
Module 4: Engaging and supporting parents (60 minutes, live)

Module 5: Supporting parents the online ETP – 30-minutes, live, *recorded)*

Recordings of Modules 1 and 5 and pre-recorded versions of Modules 2, 3 and 4 were available to practitioners via the Padlet.

The training was delivered by two trainers from Peeple over a period of four weeks.

Figure 1: Practitioner Padlet dashboard display (screenshot)



At the end of Modules 1-4, practitioners completed a short Reflective Journal[14] to consider what they had learnt and how they might implement the concepts in their practice. Practitioners were also required to join a WhatsApp group to receive support from the trainers throughout the training and Programme delivery.

In addition, to increase their subject knowledge and to support parents, practitioners were asked to watch the weekly activity videos from the Exploring Together Programme Padlet (see Figure 2) and to familiarise themselves with the materials and resources provided to parents.

2.1.1 Implementation Support

Flexible implementation support was provided by the trainers to practitioners during the Programme delivery:

- 3 x 30-minute drop-in sessions – live, online. As needed – dates and times agreed with practitioners during Module 5.
- Email, telephone and support visits as required (alongside the practitioners' WhatsApp group).

[14] The Reflective Journals were designed to take 10-15 minutes to complete

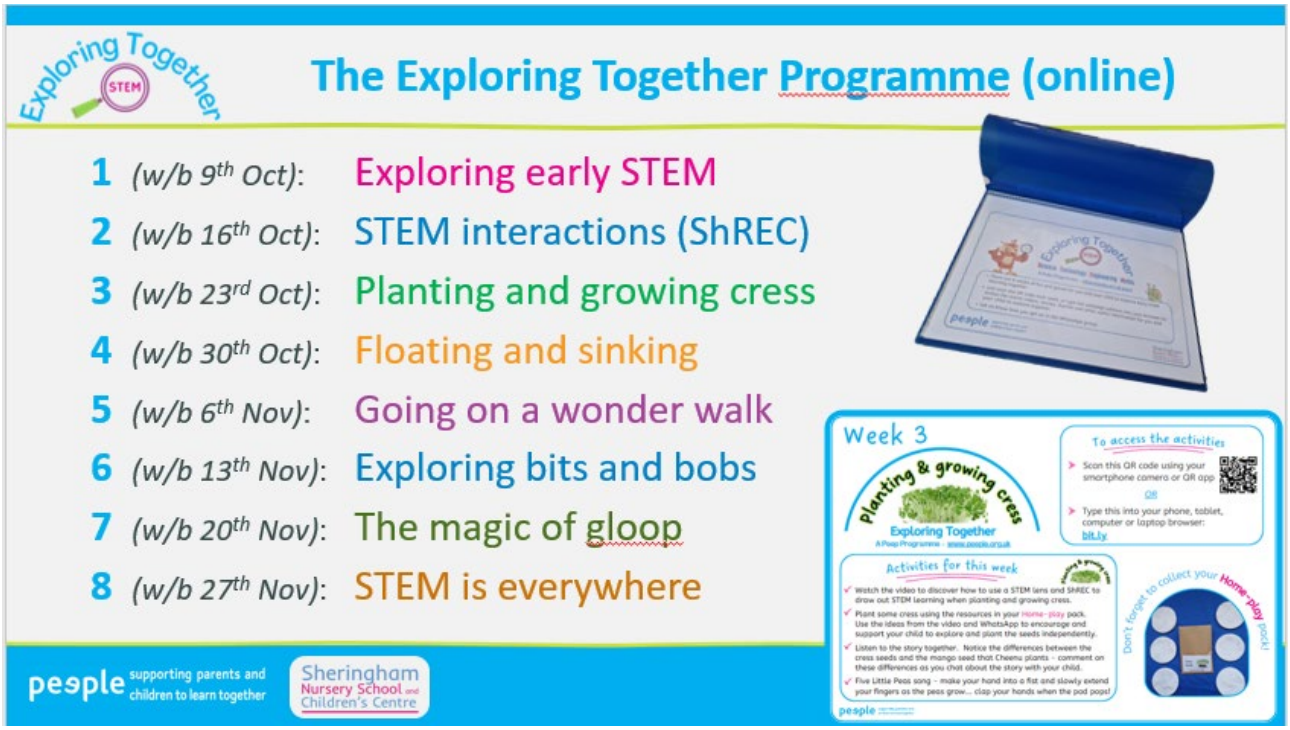
2.2 Exploring Together Programme (for parents)

The Exploring Together Programme (for parents) comprises:

- 8 weekly sessions accessed online using Padlet with an A4 folder containing hardcopies of all the online materials.
- Home-play packs with free resources to support the suggested activities and to encourage parents to explore together at home.

The folder and home-play packs were given to each setting to distribute to participating parents. The folder was given on Week 1. The home-play packs were given weekly.

Figure 2: The Exploring Together Programme



The weekly online sessions included short videos, information and ideas to:

- give simple definitions for the foundations of STEM;
- share the concept of a STEM lens to identify and make the most of everyday opportunities to support STEM learning;
- encourage high-quality interactions using the ShREC *(Sh-Share attention, R-Respond, E-Expand, C-Conversations)* approach; and
- share a range of simple, everyday ideas and fun activities for parents to put their learning into practice and develop their skills, knowledge and confidence in supporting their child's early STEM learning at home. Parents were encouraged to adapt and/or extend the ideas and activities to fit with their daily lives and their child's interests or stage of development.

Parental engagement with the online materials and home-play activities was supported through:

- a WhatsApp group, moderated by Peeple or the setting practitioner, where parents could share their experiences of exploring STEM and home, and where the moderator offers ‘nudges’, i.e. prompts, information, ideas and support.
- Exchanges and brief 1-1 conversations between practitioner and parent when dropping off/ picking up children.

Whilst not part of this evaluation, it should be noted that there is also the option for practitioners to deliver the Programme face-to-face with parents.

3 Methodology

This chapter will describe the range of methodologies applied in the independent evaluation activities across the period. It starts with the development of the research questions and the theory of change for the project before moving onto a description of the primary data collection methods applied in the qualitative interviews with parents and staff. The final part of the section outlines how surveys for maths and science in the HLE were used with parents at two time-points.

IES worked closely with Peeple in a 'critical friend' model throughout the project. During phases 1 and 2, this was of a light touch and included supporting the team to carry out some of their own evaluation work and reviewing the practitioner training. Following these phases, all partners worked closely to adapt and develop the design of the independent evaluation. Due to the difficulties with recruitment and the move away from an RCT discussed in section 1.2.1 Phase 4, the independent evaluation became more exploratory. It did not try to explore robust impact or causality at this stage of Programme development. Instead, the evaluation focussed on the quality of the home learning environment in relation to science and maths, and the perceived impact of the Exploring Together Intervention (Chapter 2) on practitioners, parents and children.

The methodology of the independent evaluation consisted of:

- three theory of change Intervention, Delivery and Evaluation (IDEA) workshops (two pre-Programme and a third at post-Programme);
- telephone/online interviews with setting managers/trained practitioners and
- telephone interviews with parents.

The report also includes a brief summary of the analysis of parent-reported changes with regard to maths and science in the HLE carried out by the research team at the University of Oxford and discussed below.[15]

3.1 Research questions

The research questions were developed and then used to design the evaluation's research tools. [16] All of the research questions were investigated using the research methods detailed below and are reported accordingly:

[15] The University of Oxford team also plan to publish a journal paper. Details are to be confirmed.

[16] Copies of which are included in the appendix.

1. Is the intervention feasible for practitioners to take part in and adequate to enable them to support parents implementing STEM learning in the Home Learning Environment?
   a. What are the barriers and enablers to supporting the Programme?
2. Is the Exploring Together Programme feasible for parents to take part in?
   c. What are the barriers and enablers to parents taking part in the Programme and transferring STEM learning to the Home Learning Environment?
3. What are the perceived impacts of the intervention on children's skills and confidence?
4. What are the perceived impacts of the intervention on practitioners' and parents' skills and confidence in supporting STEM learning?
5. What factors may need to be considered to scale-up the intervention?

3.2 Research methods

The research methods applied in the independent evaluation are outlined below.

3.2.1 Theory of change

Three Intervention Delivery and Evaluation Analysis (IDEA) workshops were carried out following the model set out by the Education Endowment Foundation (Humphreys et al., 2016). The first workshop (in June 2021) discussed the theory of change for the intervention, include the rationale and mechanisms of change for the programme. The second IDEA was workshop was split into two parts, the first happened in October 2022 and the second in December 2022. In these workshops, the team reviewed the development of the intervention and discussed any appropriate updates that Peeple wanted to make to the programme's theory of change (TOC). These meetings were all held via Microsoft Teams and included IES, Peeple, the University of Oxford and Sheringham Nursery.

The third and final IDEA workshop was completed once the programme had ended in January 2024.[17] Part of the discussions in the workshops were also around the outcomes and measures that could be used in the evaluation, in particular, whether there would be a focus on early executive functioning. Throughout the Project, there were discussions about the TOC model at the regular 'project review' meetings for the team, which happened at key points, such as when changes to the models arose or were emerging as possibilities. The TOC model was updated by Peeple, with input from the wider team, following the final workshop to cover the programme that was delivered in the Autumn term of 2023. The final TOC is included below. An accessible version of this diagram is available here: Theory of change - Accessible.

[17] The University of Oxford did not attend this workshop due to shift away from executive functioning in the independent evaluation.


Mercer's/ Peeple – Theory of Change – Supporting the foundations of STEM (Science, Technology, Engineering & Maths)
RATIONALE / NEED FOR INTERVENTION
There is a lack of STEM capital and a shortage of STEM skills in the UK. 1,2
Lack of STEM skills is magnified in disadvantaged groups, contributes to the attainment gap & is a barrier to social mobility. 3,4
Opportunity to address the social normalisation of discrimination (e.g. male pilot/female cabin crew), and lack of inclusion of women and other groups in STEM.
Strong maths skills correlate with health, wellbeing, social mobility and significant economic rewards.
The quality of the Home Learning Environment (HLE) is an important predictor of long-term outcomes for children. 5
The quality of interactions improves long term outcomes for all children including EAL/SEND. ShREC (Share Attention, Respond, Expand, Conversations) is used as an evidence informed strategy to support all children's early communication & language. 6,7
Supporting early STEM thinking will encourage positive learning dispositions across all domains including curiosity, collaboration, teamwork and engaging others – rather than a solo endeavour. These are recognised as transferrable skills. 8
There are few interventions to support STEM in the early years – the focus is on older children in a more formalised way. 9,10
The programme will support *parents' sense of self-efficacy in their ability to support their children's learning.
All parents have the potential to benefit from access to interventions that are universal and accessible to all.
Practitioners lack skills, confidence and knowledge to support STEM in the early years and want more training in maths, yet they have limited capacity for time consuming, out of setting training. 11
Practitioners lack accessible professional development offered by modular, pre-recorded training & implementation support. 12
Providing prompts and cues that nudge and remind practitioners to carry out certain behaviours will support the behaviour change needed to support early STEM. 13
Long term outcomes/ Impacts
Challenge misconceptions about STEM including gender & cultural bias against STEM subjects.
Children are confident in their STEM skills and belief that they can become a STEM person regardless of their socio-economic status. (Narrowing the gap)
Improve quality of the HLE & *parent/practitioner knowledge of how to effectively support it.
Improve quality of interactions between parents/ practitioners and children – benefitting all children including EAL & SEND.
Address the over-formulisation of STEM – Parents understand the significance of play as learning and become advocates for promoting the importance of STEM in the early years.
Improve practitioners' confidence & skills in supporting children's early STEM. As the EY workforce is predominantly female, this will help challenge misconceptions around STEM.
Childrens' individual learning and development needs are supported through improved relationships and communication between setting practitioners and parents.
Long term societal impacts
Better employment opportunities and life chances.
Mitigating the STEM skills shortage – contributing to social change.
Address the deficit of maths skills in society by improving attitudes towards maths and STEM for practitioners, parents and children as they grow older.
Theory of change
To provide an 8-week online programme for 3-4-year-olds & their *parents that:
supports children to explore the foundations of STEM through everyday activities.
values what parents already do & builds on this to help them support their child's STEM thinking.
supports parents & practitioners to use high quality interactions (ShREC) to facilitate STEM learning.
upskills EY practitioners with the confidence & knowledge to support STEM skills in their settings & with families.
Inputs
Funding & time to develop & pilot an 8-week programme ready for delivery to *parents & their 3-4-year-old children.
Funding & time to develop & pilot online modular practitioner training.
Funding & time to source & collate resources to support HLE activities.
6 intervention settings from A Brighter Start East London Stronger Practice hub.
1-2 practitioners per setting (total 6-12).
≈8 parents & ≈8 children per setting (total ≈48 parents / ≈48 children).
Time for practitioners to attend training & complete Reflective Journals – 4 hrs over 4 weeks online, live & pre-recorded modules.
Time for practitioners to engage in implementation support from Peeple via WhatsApp/ telephone plus 3 x 0.5 hrs online 'drop-in' Q&A sessions.
Time for practitioners to engage with & familiarise themselves with the programme content – 0.5 hrs x 8 to review the online materials.
Time for Peeple/ practitioners to set up & send/ respond to nudges on WhatsApp – 8 x 0.5 hrs/week
Time for practitioners to recruit parents, handout home-play packs & follow up with families to support engagement. Times based on need.
Time for families to engage with the online programme content – 8 x weekly sessions. Times based on need,
Time for families to carry out HLE activities with their child(ren) – 8 x weekly sessions. Times based on need.
Time for families to share their experiences on WhatsApp. Times based on need.
Activities
Practitioner training for 6 settings to support programme delivery.
Practitioners support *parents to engage with an 8-week online programme.
First two sessions share the foundations of STEM & introduce ShREC. Remaining sessions support the development of these skills through STEM-based activities.
Resources help parents recognise the foundations of STEM & encourage STEM thinking through:
Video explanation & modelling to share how the activity supports the foundations of STEM.
Fun & engaging practical explorations of everyday activities linked to the HLE.
Home-play activities - resource packs provided with information sheets to support early STEM & promote high quality interactions (ShREC) between parents & children.
Songs/rhymes & books/stories linked to the topic & STEM.
Extension ideas for things to do at home using low/no-cost resources with guidance to deepen & extend STEM knowledge.
WhatsApp nudges provide prompts to support engagement & encourage reflection of how ideas are implemented at home.
Practitioners work with families to support engagement issues/ barriers to participation.
Peeple provide implementation support to practitioners – encouraging peer support & sharing practice, ideas etc.
Outputs
≈48 *parents/children take part (6 settings, ≈8 families in each)
Practitioners complete Reflective Journal linked to training modules.
Review & reflection by Peeple, practitioners & parents through WhatsApp.
Evidence of STEM ideas being implemented at home – through WhatsApp exchanges, home-play activities & interactions with practitioners.
Minimal level of compliance: Engagement with 5-8 sessions, with S1 & S2 being compulsory.
Peeple/ practitioners post on WhatsApp weekly.
Parents post on WhatsApp weekly (optional – based on need).
Parents engage with practitioners about the programme when they drop-off/ pick-up their child.
Implementation support (based on practitioner needs).
Peeple / IES / University of Oxford
V4 (28.02.24)

Mercer's/ Peeple – Theory of Change – Supporting the foundations of STEM (Science, Technology, Engineering & Maths)

Enabling factors / conditions for success

- Positive relationships with settings and buy-in from staff supporting the delivery of the online programme to ensure they understand the project.
- Ideally, a minimum of two practitioners from each setting are trained to support *parents' engagement with the online programme to circumvent illness/ staff turnover etc. Training formation and delivery meets setting needs.
- IT equipment, access and skills of both practitioners *(to access training and implementation support)*, and families *(to access online programme materials and nudge interactions)*.
- Potential barriers to engagement with STEM are addressed along with cultural openness for both parents and practitioners.
- Accommodation of families with siblings, including multiple births, has been considered and addressed.
- Programme and resources are accessible to all. Inclusion of practitioners, parents and children with EAL and SEND are factored in by building on the ShREC approach and supporting practitioners and parents to respond just above the child's level of development and being adaptive and responsive. Interpreters/ translation needs addressed on request.
- Families are interested and are able to allocate time to take part.
- Practitioners hand out resources to parents for them to engage with the home-play activities.
- Flexibility in response to the potential ongoing impact of Covid – including further lockdowns; restrictions (limits on group numbers); managing transitions into settings.

Short term outcomes/ Mediators

- *Parents have more confidence, knowledge and skills to support children's early STEM skills are part of everyday activities and interactions.
- Improved quality of interactions between parents and child.
- Children show curiosity and inquisitiveness about their world - ask more questions.
- Children show improved maths and science skills.
- Enriched HLE through using a STEM lens and ShREC.
- Practitioners have more confidence, knowledge & skills to support children's early STEM skills.
- Practitioners have an increased awareness of using an evidence-based approach to support communication and language (The ShREC Approach).
- Practitioners have more confidence, knowledge and skills to engage with parents and support the HLE.
- ▲ Enriched setting environment – sharing knowledge and understanding with colleagues about using a STEM lens and ShREC.
- ▲ Improved relationships and communications between practitioners and parents.

* *The term 'parent' is used throughout this document to refer to parents, carers and anyone who has responsibility for looking after children – granny, uncle, childminder, foster carer etc.*

References:

1 Are the Education Secretary's new technology institutes enough to address the #STEM skills gap? (fenews.co.uk)

2 Action needed across Government to secure a high-skilled STEM workforce for the UK - Committees - UK Parliament

3 ASPIRES-final-report-December-2013.pdf (stemglasgow.co.uk)

4 Science Education in England Summary.pdf (stem.org.uk)

5 https://www.gov.uk/government/publications/pre-school-and-early-home-learning-effects-on-a-level-outcomes

6 *Law J, Charlton J, Dockrell J et al. (2017) Early language development: Needs, provision and intervention for pre-school children from socio-economically disadvantaged backgrounds. Education Endowment Foundation.*

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8 The 12 Transferable Skills | UNICEF

9 Imperial to widen access and increase diversity as ambitious plans launched | Imperial News | Imperial College London

10 The First Twelve Institutes of Technology Announced Backed by £170 million of Government Funding (fenews.co.uk)

11 Are the Education Secretary's new technology institutes enough to address the #STEM skills gap? (fenews.co.uk)

12 Remote Professional development | EEF (educationendowmentfoundation.org.uk) & Effective Professional Development (Oct '21) | EEF (educationendowmentfoundation.org.uk)

13 Effective Professional Development (Oct '21) | EEF (educationendowmentfoundation.org.uk)

3.2.2 Practitioner interviews

Six settings were recruited to take part in the independent evaluation. The original plan had been to carry out semi-structured interviews with two practitioners in each of the six settings in November and December 2023. However, despite multiple attempts to contact practitioners and secure participation, the evaluation team were only able to interview two practitioners and one manager from three settings. Practitioners declined to participate in most instances due to staff illness, noting that the end of the winter term was time of particularly high levels of staff sickness in early years settings, and therefore created staffing issues in some cases. All interviewed practitioners were interviewed after the last week's activity had been made available to parents.

Practitioners were asked for their views and experiences of the Exploring Together Training modules, as well as their experience of supporting parents to engage with the Exploring Together Programme at home. Additionally, they were asked for any observed effects of the Programme on the parents and children, and on themselves. However, due to the very small sample size, caution must be exercised when reading the findings from these interviews. Generalisations across larger groups of practitioners cannot reliably be drawn based on the small cohort interviewed but give an indication of the themes and concerns that may be reported.

3.2.3 Parent interviews

Telephone interviews were carried out with parents in all six settings, and two parents from each setting were interviewed[18]. Parents were asked about their views and experiences of the Exploring Together Programme and about the support they received from the setting practitioner. They were also asked if they had observed any effects of the Programme on themselves and/or their child.

All parent interviews took place between November and December 2023, towards the end of the Programme, either by telephone or online and recordings were taken. Most parents were interviewed at the end of the Programme, after the final week of activities. Three parents chose to be interviewed during the final week as that suited their circumstances better, meaning not all had completed the last week's activity before being interviewed..

Following the interviews, the responses were inputted into an excel framework, where each interview is in a row and the results are organised in columns, according to the topics and themes covered, with the topics taken from the interview guides. The evaluation team created separate frameworks for staff and parents, although the broad topics and themes were similar. Analysis of the framework enabled the evaluation team to carry out a thematic approach, which compare interviewee's answers within each theme or topic.

[18] As part of the recruitment process, settings provided parents with an information sheet and consent form, in addition to links to a privacy notice developed for the Programme and Peeple's organisational privacy notice.

3.2.4 Review of programme materials

For the independent evaluation, the review of programme materials included a visual analysis of the materials provided to staff and parents (in the Padlets and WhatsApp messages), primarily to inform the development of the interview guides and subsequent analysis and reporting. The research team also carried out a brief, descriptive analysis of the data provided by members of staff (seven) in the reflective journals they were asked to complete at the end of each training module. These details were used to prepare for the staff interviews themselves and informed the analysis and reporting.

3.2.5 Home learning environment questionnaires

The Home Learning Environment (HLE) questionnaire was administered at pre-, in September 2023 and again at post-Programme, in December 2023. The University of Oxford research team designed the questionnaires, using questions from the home science and home mathematical environment scales in the Early Home Learning Environment (EHLE) Dataset Codebook (Ellis et al).[19] The aim was to capture baseline (and then follow-up) data from parents on the HLE, particularly in relation to maths and science. The questionnaire also asked parents to provide information on their relationship to the child taking part in the study, some optional questions about family background (parent's highest qualifications and ethnicity, plus the child's gender and age in months) and a question about their confidence in relation to supporting their child's early STEM learning.

The link to the online questionnaire was sent to all parents who consented to take part in the evaluation via email and took approximately 15 minutes to complete. Peeple supported the process by contacting practitioners to ask them to remind parents to complete the questionnaire, as well as providing paper copies for parents who would prefer to complete a physical version instead. Time was of the essence to ensure that the baseline surveys were completed by parents prior to the Programme starting and to maximise the completion rate. The team were successful and achieved a 100% unique response rate at pre-Programme and a 90% unique response rate at post-Programme (n=48, n=43).

Analysis was conducted by the team at the University of Oxford who first checked that items for each of the scales (maths and science) for the Early Home Learning Environment Science hung together coherently: as per their pre-registered plan,[20] items with low internal consistency (1 item for the maths scale only) were omitted from calculations of the composite scale score. Paired-sample t-tests were used to compare composite scores pre- and post-Programme for each of the scales.

[19] Ellis et al (2022)
[20] https://osf.io/kha93

4 Findings: Feasibility of the intervention

This chapter reports on findings from the parent and practitioner interviews on the feasibility of the intervention delivery as well as examples of reflective journal feedback received from practitioners, which are listed below for the modules and, collected by Peeple immediately following each session.

4.1 Exploring Together Training (for practitioners)

4.1.1 What was practitioners' prior understanding of STEM?

The three practitioners interviewed had different levels of understanding of what STEM was. One practitioner had a STEM-related degree and felt confident encouraging STEM in others. The other practitioners felt less confident in their knowledge and could see the benefits of improving this.

The statements below are selected examples of reflective journal feedback received from practitioners by Peeple following each module session and reflect practitioners' thoughts immediately after completing the module. They cover themes such as motivation to take part and expectations for the intervention.

Reflective journal feedback on Module 1: Getting started

Comment on any of your responses:

"The module facilitators were very clear in the aims of the project and how to deliver it. I feel that I will fully understand the process once parent/ child engagement has started."

"I would like to know more (and learn) about STEM in early years. I would like to learn about approaches and best practices."

Thinking about the module content, tell us about anything you found particularly interesting or useful?

"Explicit instruction is needed to teach children about STEM. Setting up an activity and allowing them to explore is not enough."

Reflective feedback on Module 3: High quality interactions - the ShREC approach

Tell us about anything else you found particularly interesting or useful from this module

"I found the serve and return video clip played during the session to be very useful and visual to see how the ShREC strategies could be used day to day in practice to stimulate brain building."

"I enjoyed watching the video materials. It is always good to see theory in action."

"Watching the videos provided [a way] to see how SHREC should be done."

4.1.2 How did practitioners engage with the modules?

All practitioners interviewed reported engaging positively with the modules and had completed all four online modules, as well as completing reflective journal entries prior to being interviewed.

Practitioners reported that the modules simplified STEM concepts, which made them feel more confident and able to communicate them to parents. They also felt that module topics were broken down in an accessible way, and the use of simple terminology helped them to understand how STEM concepts could be used in everyday life:

> *"I thought the training was good as it kind of helped me and my perspectives because I used to hold certain views about engineering and technology, and realising, you know that we use it every day, we use it as part of our everyday lives, meant I could embrace it and use it more."*
>
> Practitioner ID1257

Practitioners reported that they found it useful to have the online videos to refer back to as needed, and appreciated being given access to the modules, which is where they got most of their information about the Programme, including how it would be shared with parents. All practitioners said they felt supported by the Peeple trainers, were comfortable talking to them and asking them questions and felt that they were quick to respond.

4.1.3 What did practitioners think could be improved?

Overall, feedback about the Programme from practitioners was very positive, and there were few suggestions for improvement. One practitioner sometimes had to move the time of their attendance at the Implementation support sessions from 10am to 4pm, dependent on staffing levels at their setting. However, they found the afternoon session harder because they were more tired. They also found the reflective journal practice too long for the time they had and so felt they rushed through it sometimes.

One practitioner reflected on the Programme and advocated for the benefits of having more science terminology in the activities to help parents. Although, they felt there was also a fine line between giving parents extra vocabulary and bombarding them:

> *"There's a lot of nice language going on and a lot of talking but maybe if it's specifically more STEM, with a few more science-y words. Not to bombard parents*

but a bit more to guide them in terms of science, and I think the maths was just right. Maybe a bit more, but there was quite a lot though, although science is such a broad subject - maybe more here for parents so they've got a [bigger] bank of words to use."

Practitioner ID1257

They reflected that in week 5, Going on a Wonder Walk, for example they wanted to add in words about trees such as 'deciduous' or 'non-deciduous' but were unsure about doing as this as they did not know where the parent went with their child on the walk.

One practitioner reflected that they would find a face-to-face session between themselves (as the setting practitioner) and the parents participating in the Programme beneficial to discuss the Programme together and build engagement between parents and practitioners and to increase their involvement in the Programme.

4.2 Exploring Together Programme (for parents)

4.2.1 What were parents' prior understanding of STEM?

During initial interviews, parents' prior understanding of STEM was explored. Before starting the Programme, their understanding of STEM was varied. Around half the parents interviewed said they had a STEM background, which tended to come from having degrees in STEM-related subjects or coming across STEM in their jobs.

"We didn't start with zero knowledge about it, but we were both looking forward to applying it and reading more about it."

Parent ID93

"I have used the acronym. I did a computing degree and I heard it when I was in education. STEM is a thing you hear that is a priority for education and economically. Since having kids, it was something in the back of my mind, as something that wasn't really a focus when I was a kid, wasn't really a term that was around."

Parent ID13

"I feel like if someone asked me to give a basic explainer of what [STEM] is and why it's important, I feel like I would be able to do that."

Parent ID6

Two parents said they developed an understanding of STEM through their older children, who learnt about it at school.

Parents with less understanding of STEM were mostly aware of the acronym and that it incorporated science, technology, engineering, and maths. A minority of parents said they had no prior knowledge of STEM before starting the Programme.

4.2.2 What were parents' motivations to take part?

When asked why they joined the Programme, a common theme among parents was that they were looking for a Programme which would support their children's knowledge and development. When asked to specify which aspects they meant, they said they were looking for something to improve their child's communication, maths and/or science skills.[21]

> *"He does a little bit of science and maths, and this could be good for him, and he is interested in."*
>
> Parent ID4

A couple of parents also mentioned using the Programme as an opportunity to support their child's social and emotional development. One parent, whose child was waiting for an autism assessment, said they were keen to find ways to support their child during this wait:

> *"[This Programme] is another opportunity for me to enhance his vocabulary and also for me to understand how my son thinks and how he is getting along with anything...I would jump on any activity that would help in building communication skills."*
>
> Parent ID95

Before starting the Programme, parents said they were unsure about how to incorporate STEM into everyday life with their children. One parent said that they subsequently realised some activities they already did at home fell under STEM subject areas:

> *"I didn't know much about STEM, but we used to do activities like building blocks at home which is kind of engineering."*
>
> Parent ID52

4.2.3 How did parents complete the online sessions?

Around half of parents interviewed had missed at least one weekly session (although each session and associated resources remained open and accessible for parents to return to should they wish to do so). Reasons for missing sessions centred on the child being ill, or a lack of time. The latter was often attributed to having younger children, including one parent with a newborn, who had not been able to access the Programme Padlet every week. Parents who said they were time-poor relied on the printed materials to guide them with the concepts and how to complete each activity. One parent reported that physical copies of Programme resources were helpful because they could quickly read and digest information, especially while they were doing other things.

[21] Parents who said this sometimes mentioned maths without science, but none mentioned science without maths.

“It was more convenient to just sit with the packs sometimes, if I wanted more information, I watched the videos."

Parent ID13

Some parents reported difficulties in watching the videos when their children were around, and so had to plan ahead to fit the online sessions into their routine each week. In addition, a few parents were confused as to whether they should watch all the videos for each session with their child. Those who attempted to do so reported struggling to keep their child engaged, and so not fully concentrating on the videos themselves. One parent, who tried to watch the videos with their child, also reported that the physical handouts were more helpful Programme resources than the videos, as it saved them time each week:

“The handouts definitely, they were more useful than the videos, because it was just summarised, this is what you're doing this week, this is how it relates to STEM and then here are some ShREC ideas...the videos, I would watch them, but then I found myself kind of skipping through to find what is this video about.”

Parent ID93

4.2.4 What did parents think about the sessions?

Parents’ feedback on the content and quality of the Programme was extremely positive. All said they felt as though they had received enough support from the Peeple trainers, and most felt as though the resources and explanations were detailed and easy to understand:

"Following it step by step, reading it, watching the videos, got an idea of what to do and how to do it. It was great because then it was explained what we had to do with science and maths and technology bit by bit."

Parent ID25

The online sessions were also seen as helpful to refer back to, and the amount of content was viewed as appropriate by most parents. However, some parents who said they were time-poor sometimes said the videos were too long.

Parents reported that concepts such as the STEM lens and ShREC approach were generally well-explained. One, who had English as an additional language, felt the STEM lens was explained clearly, and found the pointers and examples very helpful. Another parent who had English as an additional language asked their partner to explain if they got confused and reported taking time to understand it. A few parents found it took them time to understand the concept and how to use it. When asked how easy it was to understand the STEM vocabulary, one parent initially found it a bit hard:

"It was a bit difficult, because some of the words you don't naturally use them every day. Trying to get your own head around it, then explaining it to a three-year-old can be quite difficult."

Parent ID4

Parents also reported using the information sheets to supplement their understanding of the STEM lens. One said that the information on the STEM lens was helpful and reading the materials before the activity meant they were more prepared and could use specific words from the word bank intentionally.

Similarly, some parents reported that the ShREC approach took some time to understand, and felt that it was a bit unnatural to start with. Typically, parents highlighted the usefulness of having the videos show how to use the approach outside the house.

4.2.5 What do parents think could be improved?

Few parents had anything negative to say about the online sessions. The biggest issue reported was having the time to sit down to watch the videos. When asked if and how the Programme could be improved, some parents said they would have liked guidance on when it is best to watch the online sessions, such as directly before starting the home-play activities as well as when to engage children in activities.

> *"What may be useful is some guidance, and I know every child is different and every child has a different situation, but some guidance on when is the best time for them to do these things? So, for example, last week as soon as they got back from nursery, rather than them sitting down and unwinding from their day at nursery, we got straight to the table, and actually they need to unwind, they need to chill for a bit after a long day at nursery and then you get into the evening portion of the day. So maybe some guidance at some point."*
>
> Parent ID57

Some parents reported not realising how much content the Padlet contained before they started the sessions. A couple of parents found the amount of information tricky to get through with the limited time they had each week. One parent suggested having a way to bookmark and save the Padlet so they could dip in and out when they had time to go through it. Another said they found themselves skipping through content depending on how much time they had available in the week, although nevertheless finding the content useful when they did have time to watch it all. Again, the handouts were seen as a useful resource to help with time management because of their summarised nature.

Most parents reported no problems with accessing the Padlet. Where issues were experienced these centred on casting to the TV – in one case audio did not cast and in another not all videos casted. Some parents could not return to Padlet sessions they had already used or needed the QR code to be able to do this.

4.2.6 What did parents think about the frequency and duration of the Programme?

Generally, parents felt that an eight-week, weekly Programme was appropriate and feasible. They reported that one home learning activity a week was appropriate, especially as they could complete the activity at the weekend, although one felt a slower pace would fit better into busy schedules and one felt that releasing the home learning packs all at once would be an improvement. However, given these were minority views

and particularly, the impact on children's engagement of having a pack weekly, such changes may not be necessary.

The time of year that the Programme took place, before Christmas, was perhaps not an ideal time for many parents and potentially practitioners who tend to be busy. One practitioner reported that some parents were keen to do multiple sessions in a week, and a parent also reported they could have done two sessions in a week. These latter points also make the case for not changing the pace generally but may suggest flexibility in pacing the Programme is needed. Overall, practitioners felt that once a week was ideal for parents and practitioners, as it keeps them in touch with parents more regularly.

One practitioner reported that although they felt eight weeks was right, some parents were disappointed when the eight weeks was over. There were other views that a longer Programme or planned follow ups would be well received.

> *"The concepts for the children are wonderful, it's easily accessible by parents, I just think it should be available throughout the year maybe and then parents can book in when they choose, when they feel they've got a bit of time maybe."*
>
> Practitioner ID1256

4.3 Delivery and feasibility of the home learning activities

Parents and practitioners were asked questions around the delivery of the home learning activities with the children and how it went.

4.3.1 Parents' engagement with and completion of activities

Most of the parents interviewed had completed all the home-play activities from the previous weeks with their children. A couple had not completed the week 5 activity, going on a Wonder Walk due to time constraints or poor weather but indicated they intended to do it in future. Similarly, time affected the Magic of Gloop activity when a parent did not have time to collect the pack.

Parents were encouraged to adapt the home-play activities to fit in with their daily routines or the interests and/or development stage of their child. Some parents reported doing this. Often these were extensions of the activities as suggested in the Programme resources, demonstrating that many interviewed parents were willing to adapt and extend their interactions. For example, some parents reported making or cooking something other than a sandwich in week 1, such as one who reported baking cookies, as this was something they needed to do anyway. This parent reporting adapting most of the activities in this way, including playing with light/heavy objects in the bath instead of doing the floating week, and they built the exploring bits and bobs into a similar activity that they were doing that weekend anyway. They also said they do the wonder walk activities on a normal walk anyway.

The way in which parents were invited to take part, may have affected engagement with the Programme and completion of activities. For example, one practitioner reported selecting parents who were likely to take part in the Exploring Together Programme and saw high engagement from this. Practitioners generally agreed that where parents did not complete the activities, this was due to illness or being time poor. In contrast, one said some parents consistently did not engage. They suspected this was due to the way in which they had offered the Programme which aimed to be inclusive but carried the risk of non-engagement implicitly.

> *"In retrospect maybe I should have been a bit more selective, but there was a reason why I chose not to select certain families, because I wanted to avoid the Matthew effect[22], where 'those who have will get more' so for example families who are already engaged, they already do engage with their children."*
>
> Practitioner ID1256

One practitioner expressed concern that several parents in their setting had English as an Additional Language, which may have been a barrier to engagement. They reported that one parent with English as an Additional Language wanted to take part in the activities but struggled with the videos and understanding the science behind it. It should be noted that translation was offered to parents, for example, practitioners were told to contact the delivery team if this was needed and the videos had transcripts which could be translated if requested.

4.3.2 Views of the activities

Parents overwhelmingly reported having positive experiences of engaging in the home learning activities with their child. One parent said the design of the activities took into consideration the parents' time, which they appreciated – although this view was not shared by all. Another parent noted the uniqueness of the Programme and said that they would not have thought to do the home learning activities without the resources provided.

Parents reported engaging with the activities in different ways, with some adapting the activities using guidance offered in the Programme (see chapter 5).

Parent ID6

One parent reported completing most of the home-play activities by adapting them and using concepts in other activities such as building the Bits and Bobs activity into another similar activity they were doing that weekend. They also had not watched the videos on the Padlet, as they avoid using technology, especially with their child. However, they reported that they had found a way to engage that worked for their family. The parent had experience with STEM through their job and felt they already did similar activities with their child before starting the Programme, such as the Going on a Wonder Walk (week 5) activity so they felt confident to make those

[22] The 'Matthew Effect,' or cumulative advantage theory, refers to 'a pattern in which those who begin with advantage accumulate more advantage over time and those who begin with disadvantage become more disadvantaged over time.' *Handbook of Aging and the Social Sciences (Eighth Edition)* by Linda K. George, Kenneth F. Ferrar (2016) https://bit.ly/3SZ7J35

adaptations using only the written resources. The adaptations made were done to fit the activities into family life, rather than completing them as separate activities. For example, baking cookies as part of the STEM Interactions (week 2) activity as this was something they were meaning to do anyway, as well as playing with both light and heavy objects during bathtime, rather than using the bowl provided in the home-play pack for Floating and Sinking (week 4).

Practitioners were positive about the home-play activities and said their conversations with parents suggested that parents had positive experiences with them. One practitioner reported that children and parents enjoyed the Programme.

> *"You can tell because the children are coming back into school and they're talking about what they did at home. They absolutely loved them!"*
>
> Practitioner ID1257

A practitioner described replicating some home-play activities at the setting, running them in the same week as the Programme, which they saw as helpful reinforcement for children.

> *"The junk modelling one happened in school as well… And the gloop, they really liked that, and we had that in school that week. We had them come and talk about it, how they were doing it at home, which was really nice."*
>
> Practitioner ID1257

Another parent reported they were planning to repeat some of the concepts again when their child is a little bit older (their child is currently three).

> *"The physicality, as I said with the magnifying glass, just because she's a toddler and she sticks it right in her face - I think it was great, because now she gets it…I don't think there was anything that I would say [less useful], I think I said we would come back to it as she gets older, six months' time, things that maybe didn't stick we can reintroduce it."*
>
> Parent ID13

A small number of parents mentioned they would access the physical or online resources in the future. One parent reported that having physical copies as well as online resources was very helpful, and they have kept the hardcopy resources from the Programme to use again. Another parent reported they were keeping physical copies to use when their youngest child is the appropriate age.

While views and experiences of the parent interviewed were very positive, some reported difficulties with dedicating time to the Programme. This theme is explored in section 4.4.

4.3.3 Home-play packs

For all eight Programme sessions, parents were given a home-play resource pack that they collected from their early years setting each week. The home-play pack contained information sheets and the physical materials needed to complete the home-play activities with their child. While most parents were content to receive the packs on a weekly basis,

one suggested that if they received all the packs at once it would have given them more flexibility, for example, to pick an indoor activity instead of an outdoor one if the weather was bad.

> *"It could have been a value to have everything upfront so you can think okay, what are we doing, what's the weather this weekend? Like, if the outdoor prompts are arriving on a weekend where it's cold and really miserable outside, then doesn't make it very easy to get outside, and to be honest I can't remember if I did."*

Parent ID6

In terms of distributing home-play activity packs, one practitioner said their setting had a set day each week, and used the collection time to talk to parents about how they were getting on with the Programme and offer support. While this worked for some, one parent reported issues with picking up the pack from the setting due to the 'person in charge' not being available at the time the parent could attend. A couple of parents reported that their child came home from the nursery with the packs, which was helpful as it made them excited to complete the activity and increased their engagement.

> *"He would ask when we're going to do it and look forward to it, and also letting him know what was coming up, he was a bit more excited to get down and do it."*

Parent ID10

Practitioners agreed that the home-play pack was significant to increasing engagement as it was novel and exciting:

> *"Having their own activity pack that they get to keep - I think this added to their [the parents'] excitement and then that added to the children's excitement as well, because of what's in the bag, we're doing something new this week and a lot of the parents are saying that their children wanted to do what's in the bag."*

Practitioner ID1258

All parents interviewed found it helpful to be provided with the resources to support the home learning activities and that this increased their engagement. They appreciated that the home-play pack contained everything needed as not having to shop for these saved them time and money – important facets to make engagement easy.[23] It was especially helpful for a parent whose child's needs meant it could be problematic to shop with them:

> *"It helps because you don't need to go and buy stuff for these activities, you're already provided everything and that helped me a lot because sometimes I can't take my son anywhere because he gets very irritated when I go in a shop, so I avoid that most of the time, so it was very helpful having that provided."*

Parent ID50

[23] Possible links with the EAST behavioural model Easy, Attractive, Social, and Timely (EAST) https://thedecisionlab.com/reference-guide/management/east-framework

4.3.4 Engagement with the WhatsApp group

In most settings, the trainer set up a WhatsApp broadcast list for parents. Through these groups the trainer sent weekly nudges to complete the home activities Groups were closed for safeguarding purposes, so only the trainer who had set up the WhatsApp broadcast list could see each parent's response and there were no interactions between parents. A couple of settings chose to use their own systems (in addition to the closed group) to enable parents to interact with each other. One of these created their own WhatsApp group, where parents interacted with each other, while another used their school's digital platform (Tapestry) which had group inbox messaging where parents could communicate with each other.

Parents and practitioners discussed their engagement with the WhatsApp and/or other digital platforms in the interviews. Feedback on the closed WhatsApp and broadcast groups was generally positive. The nudges, which were sent by the trainers, were viewed as useful, encouraging and motivating. However, the engagement of parents in these digital groups varied and was somewhat dependent on which groups they had access to. When using the groups set up by the trainer, parents said they engaged by sending photos, videos and messages discussing the home activities and their child's enjoyment of them. To a lesser extent, they used these groups to ask the trainer questions and parents felt that the trainer was good at responding to all their messages. One parent, who took part in a settings-level WhatsApp group, asked the other parents for help, so did not need to ask the trainer in the broadcast group. One parent chose not to engage with the WhatsApp group and was not comfortable with sending photos or videos of their child to a person they did not personally know. Another parent said they were not assigned to a WhatsApp or broadcast group but did not raise this with anyone as they felt they would not have time for it anyway.

The practitioner in the setting using Tapestry said that parents used this to send photos, videos, and messages instead of using the WhatsApp broadcast list set up by the trainer. However, the WhatsApp broadcast list was only set up for evaluation purposes, the intention for future iterations is for settings to use their own platforms to communicate with parents. This practitioner also said they would have liked to have a group where parents could interact with each other, and with the practitioner.

> *"I kind of just felt like I was giving them the packs and saying try this activity…it would have been nice if I had them altogether as a group, and we talked about the videos as a group. I know that wasn't possible, but it would have been nice."*
>
> Practitioner ID1257

Parents using their setting's WhatsApp group valued the support from other parents completing the Programme, and they liked having a community feel, whereas those who

did not have this option would have liked it. It could also build parents' understanding and engagement in activities, which could be particularly helpful for time-poor parents[24].

> *"We've been sharing pictures and discussing things on the [nursery] WhatsApp. It was easy...having people posting pictures and asking questions and answering questions felt more like a team spirit. It was amazing and we never felt like we were the only ones doing this."*
>
> Parent ID93

> *"[It was] really helpful, because it could give you some ideas of what to do for activities, because as parents you are really busy and rushing around, you've got this activity and maybe you don't actually know what to do with it, then you see what other parents have done and elaborate on that."*
>
> Parent ID4

Parents who engaged with the groups less said this was because they felt they did not need help, because they forgot, or they did not understand how the digital group worked. In one case, a parent who was solely in the broadcast group was initially confused about why other parents were not responding until the nursery manager explained what a broadcast group was. Another parent solely in the broadcast group said that they rarely used it as the messages often came in whilst they were at work, and a third said they simply forgot to use the broadcast group.

One further parent was initially confused about whether they had to participate in the group or whether it was voluntary. In this case the parent was also using the nurseries own platform to share feedback, so felt confused about using broadcast as well.

4.3.5 Activities that worked well

All parents interviewed reported that their children enjoyed participating in the weekly home-play activities. Almost all parents reported that their child engaged well with the majority of the activities. As noted above, most parents had completed all the home-play activities from the previous weeks with their children, and that positive enablers were the quality of the home learning activity packs, Programme materials, and support from the WhatsApp and/or broadcast group where applicable. A small number of parents reported that their child engaged less well than expected with one or two of the weekly home learning activities, but that overall, their engagement for the duration of the Programme was very good.

The activities that worked well and were most popular with parents were the Magic of Gloop, Floating and Sinking, Planting and Growing Cress, Going on a Wonder Walk, and STEM Interactions (ShREC), and the Making a Sandwich activity. The main reasons

[24] The intention for the WhatsApp broadcast lists was to prevent any safeguarding issues arising around sharing info/images which had been highlighted by settings as a concern about open WhatsApp groups, where interaction between practitioners and parents could take place. However, some settings chose to set up their own WhatsApp groups anyway after the Programme started.

given by parents for activities working well were that they and their children enjoyed and engaged with them, the activities helped explain concepts, and parents felt they could incorporate the concepts and language into general play and daily life. The child's existing preferences for different types of activities was a factor in their engagement with particular home-play activities also. In terms of conceptual understanding, parents reported that the Magic of Gloop activity was popular with children and parents.

> *"Mixing the colours and making the hard gloop and the liquid instantly, was really interesting to him."*
>
> Parent ID50

The STEM Interactions (ShREC) activity was similarly popular due to its applicability to daily interactions with their child. One parent reported said that the magnifying glass activity held their child's interest for a long time, and they even took it with them on excursions. Another reported it was useful to be given scientific terms they could use in their cooking and baking activities with their child in the future.

> *"Even that had science, making a sandwich and a cup of tea. Having some science terms that you can use in future when you're making food, that's really useful."*
>
> Parent ID20

Another parent reported finding the vocabulary useful, mentioning that they would not have normally thought to use the word 'submerging' when playing in the bath. One parent (who lived a small flat) reported that they particularly enjoyed the Going on a Wonder Walk activity as it encouraged them to explore outside more and utilise the opportunities for developing skills like counting, observations, and descriptions.

> *"We enjoyed exploring outside, seeing water in the puddles, counting the buses, looking at the planes, trees around him. He will tell me what he can see and hear, and he definitely enjoyed being outside, because we live in a small flat."*
>
> Parent ID63

Similarly, a couple of parents reported that their children enjoyed Planting and Growing Cress, with one saying that their children enjoyed observing the progress of the cress over time.

A couple of parents mentioned the Floating and Sinking activity as working well, with one suspecting that their child enjoyed the hands-on element of the activity because they enjoyed bathtime so much. Another parent reported that the Floating and Sinking activity had given them ideas to incorporate into their play.

> *"[The Floating and sinking activity was] simple but introduced me to a load of things that I realised I could introduce into general play".*
>
> Parent ID20

4.3.6 Activities that worked less well

In the small number of cases where activities were reported by parents as working less well, this was largely attributed to the young age of the child: the parent of a three-year-old said their child found it physically difficult to use the magnifying glass due to being young but would come back to the activity once their child is older. Another parent said they thought some of the songs on the Padlet like Wheels on the Bus were too young for their child.

A few other cases where activities worked less well were explained by the ability or attitude/interests of the child. One parent, whose child had a speech delay and was waiting for an autism assessment, reported that Planting and Growing Cress was confusing for their child as they found it difficult to understand a concept where the activity had no immediate effect. Their child was four years old, and the parent suggested that this activity might be more appropriate for them in a couple of years. A couple of parents said making things out of recycled material for the Exploring Bits and Bobs activity worked less well. One attributed this mostly to their child not being in the mood to engage while the other said that although their children played with the materials, this did not translate into making things because “the interest wasn’t really there”. This parent did not attempt to facilitate a ‘making’ activity.

One parent said that they did not know how to long to water the cress for and suggested that the instructions should clarify this.

A practitioner said some parents found the Gloop took a long time to clean up and one parent reported that they did not like messy play so missed the Magic of Gloop activity altogether. Another parent said that the materials went everywhere, and the dye stained their nails and hands. They suggested the activity should come with gloves and/or be completed at nursery instead:

> *"Maybe they could all do that one together at nursery, because that went everywhere, and stained everything, including nails for weeks. Or maybe just send some gloves in the packs, as everything was bright blue for weeks."*
>
> Parent ID 93

When asked about activities, some parents mentioned making tea with their child, although this was not one of the home-play activities. As an introductory exercise for parents to help their understanding of the STEM lens, parents were provided with a teabag and asked to make a cup of tea by themselves whilst using the STEM lens. Although it was made clear in the video that this was not intended for children, one parent involved their child in this exercise.

4.3.7 Using the ShREC approach

All parents interviewed reported using the ShREC approach, for example as a prompt when doing the activities. A couple said the ShREC approach really helped them gain

their child's attention and facilitated their engagement in the activities, especially the 'sharing attention', where children are used to playing alone a lot.

> *"Sitting down, getting his attention and being at his level helped in him listening more. Usually when talking to him I stand, but now I go down to his level, talk to him and we have the eye contact, and he understands and listens more."*
>
> Parent ID63

Whilst many parents reported that the ShREC approach was easy to use, one said they would have liked more support on incorporating the approach into their thinking and daily routines. They nevertheless found it helpful for approaching the activities as they could see how the activity related to interactions. A couple of parents reported that, although it was quite helpful to have the ShREC approach included in the Programme, they felt they had been using the principles from the approach with their child already.

Practitioners also said that parents typically adopted the ShREC approach and found it helpful. Due to their familiarity with ShREC before the Programme, and the additional content in the Padlet modules, practitioners felt confident to help parents to understand the concept. One said it was also helpful for parents to understand more about what practitioners do at the setting:

> *"I found myself explaining it to them more, I didn't really explain to the parents what it was before… but now I can tell the parents a bit more about what we're doing in school. Because it was in the Home Learning packs to use the ShREC approach as well."*
>
> Practitioner ID1257

Another practitioner who reported using ShREC in the setting said that parent feedback was very positive, which enabled parents to understand how the practitioners work with their children, whilst also enabling them to take the same approach at home too. Practitioners noted that some parents could find it challenging initially, especially waiting for the child to respond, or having to accept less control over the interactions and activities. However, with support and reassurance, they felt parents' confidence increased over time.

4.4 Barriers and enablers to delivery

Parents and practitioners discussed the challenges parents had engaging with the Programme and completing the activities, and what made it easier for them to engage with the activities. The table below shows these barriers and enablers to engagement and delivery experienced by parents. In some cases, the barriers correspond with examples of enablers which helped parents overcome them.

Table 1 Barriers and enablers to parents engaging with the Programme

Barriers	Enablers
Struggling to get a child's **attention**. Some parents had difficulty in keeping the child's attention and getting them to listen when interacting, which was a barrier to completing the activities.	- **Using the ShREC approach,** encouraged by practitioners**.** - **Practitioners supporting parents** to recognise that this is a normal part of early child development**.**
Lack of time to dedicate to watching sessions and completing activities.	- **Adapting/incorporating the activities to fit into existing daily routines** e.g. bathtime, making cookies (see chapter 5). - **Frequency of sessions** - once a week worked well for most parents (see chapter 5). - **The home-play packs** were valued by parents as they did not need to spend time collecting their own materials, they could look at physical handouts when stuck rather than looking online and the videos in the Padlets were short.
Not being able to **collect home-play packs** e.g. if busy or practitioner not available	
Language barrier for parents with EAL	- **Translation** is offered to parents - practitioners are told to contact the delivery team if this is needed, the videos had transcripts which could be translated upon request.
Activities too **difficult**/not age appropriate	- Making it clear that **activities can be adapted** and emphasising that activities should be used flexibly to fit with the child's interests as well as their age and/ or level of development. - **Time** was also an enabler, both in terms of the passage of time and what parents learnt from spending time on the Programme, as during this process parents who may have initially made adaptations to activities, learnt that their children were more capable than they had previously thought. - Engaging with the **WhatsApp group** helped motivate some parents to engage with the Programme and developing their own ideas of activities and acted as a source of support, especially when in a group with other parents rather than a broadcast. - **Practitioners and trainers** were **supportive** and answered any questions the parents had.

Source: IES analysis of qualitative data (2024)

Barriers for practitioners included finding the time to support parents' engagement with the Programme and being the only practitioner in their setting that participated in the intervention. Generally, practitioners found the Programme very manageable, but sometimes it was difficult for them to dedicate time in their day to the Programme. One said their setting allowed them time out of class for the training which was helpful. One said they were classroom-based so had more flexibility to spend time with parents than others might. However, when settings were understaffed, practitioners might have to use their own time.

Having support from the trainers was a key enabler and practitioners reported that they felt well supported by the trainers, which contributed to successful delivery of the Programme. One had been nervous about being the only practitioner in their setting taking part however, this was overcome through their regular contact with trainers who supported them and answered any questions they had. Support from trainers was especially helpful for running a setting's open WhatsApp group for parents[25]. One practitioner found that the short weekly synopsis provided by the trainer was helpful and could be copied and pasted to share with parents. This support was particularly helpful where practitioners felt under time pressure. Practitioners did not report receiving support from colleagues, except one who had help from the setting's Business Administration Support Officer to set up the WhatsApp broadcast so they could send broadcasts to parents and understand how it works.

[25] Some settings set up their own WhatsApp group or broadcast, whereas other parents received a broadcast from Peeple (the trainer). In a small number of cases, settings had both their own group alongside a broadcast from Peeple.

5 Findings: Perceived impacts of the intervention

This chapter explores the perceived impacts of the Exploring Together Programme on children, parents and practitioners who took part. It includes quantitative data from the maths and science Home Learning Environment (HLE) surveys sent to parents pre-and-post participating in the Programme (copies of the surveys are in the appendix). In these quantitative findings, the perceived impacts of the Programme as reported by parents are based on a comparative analysis of pre-and-post intervention stages.

The evaluation also collected qualitative data on perceived impacts through the interviews with parents and practitioners. Although a minority of parents had not accessed the Padlet for every week, most were still able to comment on observed impacts so far. Practitioners were also asked about perceived impacts on children and parents taking part in the Programme. Additionally, they were asked if the Programme had any impact upon themselves and their practice. Practitioners had all completed the Training, but some were still gathering parent feedback on the final weeks of the parent Programme when interviewed.

5.1 Home learning environment

The HLE questionnaire analysis compared the frequency of parents and children engaging with a series of science and maths activities at two time points: once pre- and once post participation in the Programme.

5.1.1 Sample

A total of 48 parent contacts were sent the questionnaire at both the pre- and -post timepoints. The demographic characteristics of the sample are described below.

Table 2 Demographic characteristics

2a) Ethnicity

Asian/Asian-British	White	Mixed	Black British/ Black African or Caribbean	Declined to answer
27	11	5	4	1

2b) Highest education level

Primary school or secondary school without formal qualifications	Secondary school (GCSEs or equivalent)	A-levels or equivalent	University: First degree/bachelor's degree	University: Postgraduate Degree
3	7	8	15	15

2c) Relationship to child

Mother	Father
41	7

2d) Sex of child

Female	Male	Missing
24	23	1

2e) Child age (months*)

Mean	36.42
SD	14.23
Min	24
Max	63

* n=42 invalid child age data provided by six participants (reported year instead of months)

Source: HLE results, University of Oxford 2024

Parent's responses to the following question were asked for both maths and science STEM subjects at each timepoint (full details of the HLE questionnaires and scales can be found in Appendix 2):

> *"In the past month, how often did you and your child engage in the following?" for 10 items relating to science activities and 10 items relating to maths activities on a scale of 1 ("Never") to 6 ("Multiple times daily")*

(Paired) significance testing was used to identify if there were any differences in the data between the two timepoints that were unlikely to have occurred by chance, and therefore are likely to indicate a genuine effect. An effect size is calculated to provide a standardised measure of the 'size' of the difference, and therefore how meaningful the result is likely to be in the real world. The larger the effect size, the more meaningful the finding.

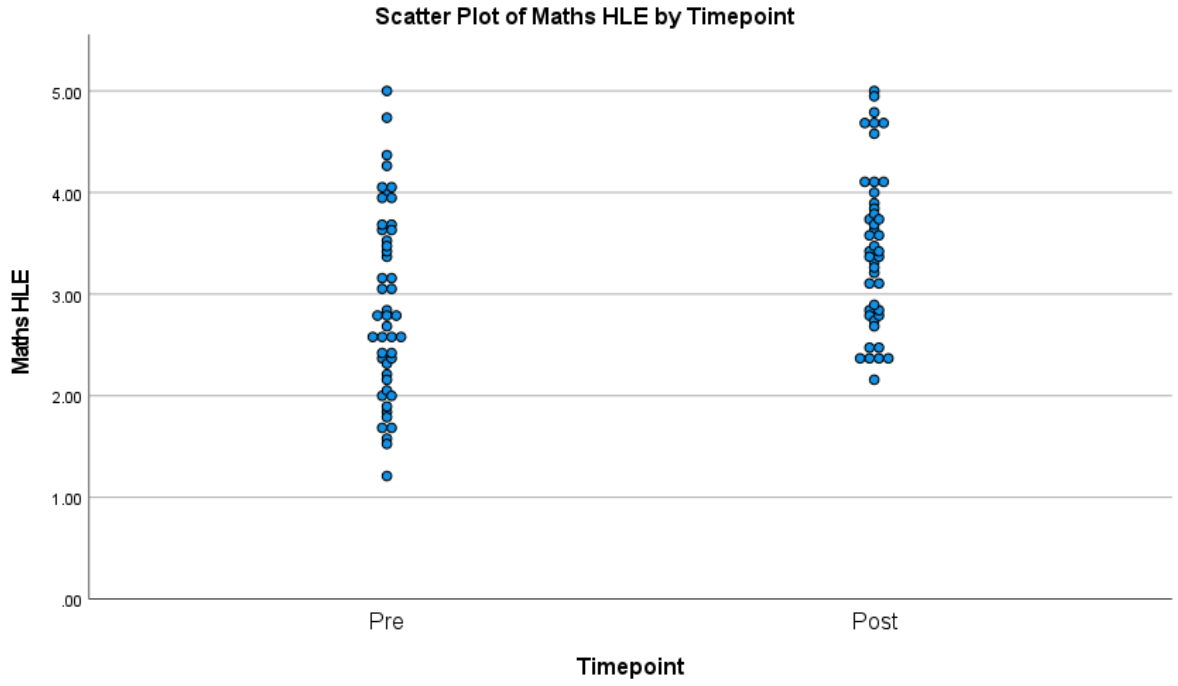
However, it is important to note that the significance tests performed in this analysis, in the absence of a control group, cannot prove a causal relationship. So, it cannot be said for certain that the Programme 'caused' the changes in STEM activity frequencies.

The scores for both the science and maths items in the HLE were then analysed and the results are presented below.

5.1.2 Maths

Parents were asked to indicate how often they engaged in the same ten maths activities both pre-and-post Programme. The results show a significant increase[26] from pre-Programme (Mean = 2.85 (SD=.91)) to post-Programme scores, for the parents who responded (Mean = 3.46 (SD=.78)); (t(43)=4.92, p<.001, Cohen's d=.82). This can be interpreted as a large effect size. Please see Figure 3 below.

Figure 3: Scatter plot of Maths HLE by timepoint



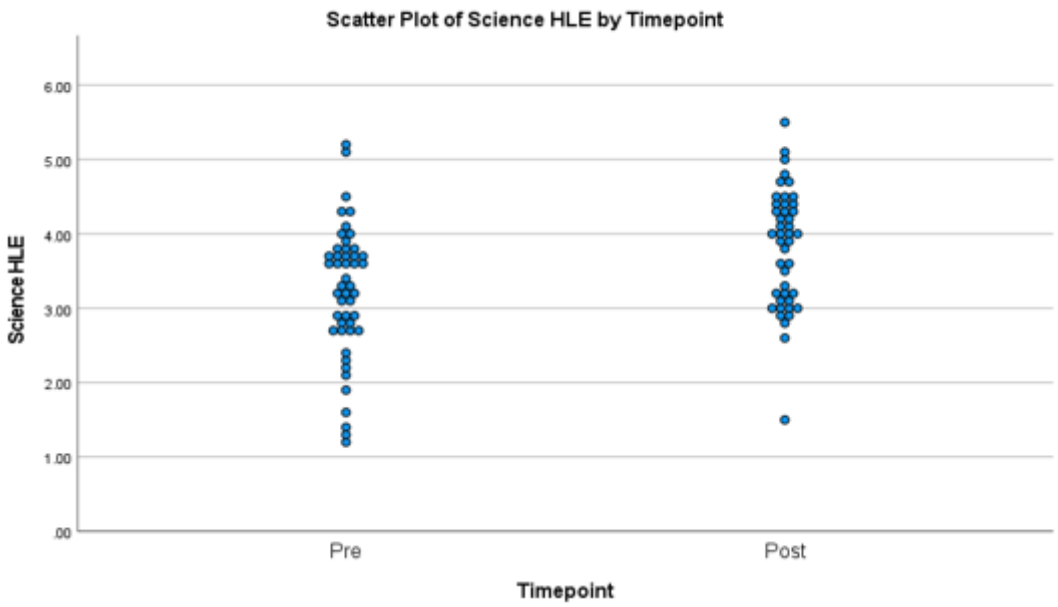
Source: HLE results, University of Oxford 2024

5.1.3 Science

Parents were also asked to indicate how often they engaged in the same ten science activities with their child at pre-and-post Programme. Again, there was a significant increase[27] from pre-Programme (Mean = 3.20 (SD=.93)) to post-Programme scores, for the parents who responded (Mean = 3.82 (SD=.79)); (t(43)=4.61, p<.001, Cohen's d=.89). This can be interpreted as a large effect size. Please see Figure 4 below.

[26] (p<0.001)
[27] (p<0.001)

Figure 4: Scatter plot of Science HLE by timepoint



Source: HLE results, University of Oxford 2024

5.1.4 HLE findings and limitations

The analysis found that this sample of parents reported undertaking both maths and science-based activities with their children at a significantly higher frequency immediately post-Programme compared to pre-Programme.

The completion rate for the HLE pre and post questionnaire was very high (90%), with 43 of 48 parents providing a post-Programme questionnaire response. It should be noted that families who were less engaged with the Programme may be less likely to have completed the post-Programme questionnaire but given the small number missing data (10%) this is unlikely to be a great issue. Similarly, there is no evidence that the families who provided post-Programme data were more engaged in STEM activities at home.

5.2 Impacts on children

The findings below are all from the interviews with parents.

Parents were overwhelmingly positive about the impact of the Programme on their child, reporting improvements in their confidence, STEM skills, language and communication and the benefits of increased parent-child time. The most frequently observed impact on children reported by parents was increased levels of confidence and self-belief. Where parents reported increases in their child's confidence levels, several also linked this to a range of additional subsequent impacts on their child, such as:

- Being able to retain more information and STEM concepts.
- Exhibiting more speaking and listening in day-to-day activities.

- Feeling empowered to take part in new activities.
- Engaging more with their environment when out of the home.

Where these additional impacts were noted, it was either attributed by the parent to the home learning activities or reflected in observed changes in the child's day-to-day behaviour: either at home by the parent or by their practitioner. For example, a parent explained that their child's nursery had commented that their child now appeared to be more confident and talkative in class and that they too had observed this change:

> *"The nursery were saying that he's changed so much, speaking more, coming in with ideas...I think it helped him a lot." … "He's very shy, he's one of those kids who's just quiet, but I feel like this Programme made him come out [of himself]."*
>
> Parent ID63

The parent whose child has a speech delay and is waiting for an autism assessment, said following the Programme, they now like to interact with their parent and give more eye contact. Another parent said that at the beginning of the Programme, they found it difficult to get their child's attention who would sometimes walk off when interacting but that has changed as a result of taking part.

5.2.1 STEM confidence

Nearly all parents interviewed reported their child had improved STEM confidence levels following participation. Parents who reported an impact in this regard were further asked to rate their child's level of STEM confidence on a scale from one to ten, both prior to, and after participating in the Programme. More than half of parents interviewed (seven out of 12) were able to provide a numerical estimate of their child's level of STEM confidence both before and after taking part in the Programme. All seven parents noted an improvement in the perceived score at the two time points: four parents reported an increase of more than three points, with the remaining three parents noting an increase of between one and two points. This indicates that many parents felt from their observations that their child's STEM confidence had positively improved following participation in the Programme.

Table 3 Parent reported change in child STEM confidence on a 1-10 scale

STEM confidence prior io Programme	STEM confidence post Programme	Change in score
6	8	+2
4 or 5	9 or 10	+5
7	8	+1
2 or 3	8	+5
5	8	+3
5	10	+5
7	8.5	+1.5

The remaining five parents interviewed were asked but did not provide a numerical score; three of these parents instead gave qualitative statements on changes and improvements observed in their child's STEM confidence, and two parents felt it was too early to say whether their STEM confidence had improved. None of the parents interviewed noted a decrease in their child's perceived level of STEM confidence or reported concerns about the impact of the Programme on their child's confidence.

Where parents were prompted for or expanded on the reasons why the Programme had contributed to an increase in STEM confidence, they attributed this to a range of reasons. The most prominent of these was greater general confidence and increased levels of self-efficacy, and/or curiosity. One parent explained that by completing the home learning activities, their child is now more motivated and confident in trying out activities for herself, which also translated to her behaviour in nursery school as well as in the home:

> *"Before starting the Programme, I would tell her we need to do this. Now she says 'mama, I can do it'. She used to say she couldn't and needed to be told what to do. Now wants to be told how to do activity so she can do it. Lots of difference in her confidence level. Spoke to teachers and they all say she didn't use to comment in class but now she is doing that."*
>
> Parent ID21

Several parents noted that by completing home learning activities in a structured timeline and manner (for example every week, at the same time or on the same day) that their child's personal confidence levels and self-belief had improved through having a routine. A parent who said this commented that having the set routine of activities improved their child's curiosity to explore new activities and ideas, or to repeat activities that they had particularly enjoyed.

> *"Knowing that it was a Programme and getting it [home learning pack] from nursery worked very well, knowing what happens on what day...he would ask when we're going to do it and look forward to it, and also letting him know what was coming up, he was a bit more excited to get down and do it."*
>
> Parent ID10

Two parents felt the way the Programme had encouraged their child to complete activities independently and without interference was key. This encouraged them to become more confident to do things themselves, which in turn improved their STEM confidence by encouraging them to seek out answers themselves.

Parent ID67

One parent commented that activities from the home-play pack such as making a sandwich or pouring liquids would have previously required their input to direct the child in what to do. After participating in the Exploring Together Programme, and by doing all the steps outlined in the home learning activities, their child had become more confident in doing other STEM activities. Additionally, the parent noted an improvement in their child's motor skills and co-ordination:

"This is something new for him and he can do it. Pouring things like water, his motor skills have become better and it's easier for him to use his hands."

The parent noted that although the time commitment involved in the Programme was quite substantial as they had two children at home as well as the parent having EAL, they nevertheless found that the child enjoyed the activities 'so much' and had noticed positive impacts in his confidence and independence. The parent said their child's increasing independence had in turn built their own confidence to let them lead activities in the future:

"I see him as still little, and I have to do things for him. If he wants to do it, he will do it. I got more confident that my child is able to think by himself and take initiative by himself without me pushing him."

Two further parents also commented that frequently asking their child for their ideas and involving them in activities where they lead the play had contributed to the overall improvement to STEM confidence in their child.

> *"Getting him involved in the activity, speaking to him more and asking him ideas...it was tricky at first, but he got the hang of it and now he's speaking more 'Mummy shall we do this one again?' 'I like this one mummy.' He's speaking more, whereas before If I tried to get him to do activities he wouldn't. On this Programme you know what you're doing, and then he knows, ok we're doing this today."*
>
> Parent ID63

Another parent felt their child's improved STEM confidence was due to their increased motivation and engagement, commenting that her child is more positive and is more determined to be able to show she can do an activity now. This parent felt that an increase in one-to-one time with their child was because of delivering the Programme, as well as gradually introducing the new STEM words and concepts in the home-play activities, had contributed to improvements in their STEM confidence:

> *"It has worked because of the one-to-one…because of the different approach. For me it was because I was giving him attention on a one-to-one basis." … "When I was doing the one-to-one, I was using the maths words, but technology, science or engineering, you can't use some of those words right away with a four-year-old. You can introduce them little by little."*
>
> Parent ID52

5.2.2 STEM skills

Impacts upon skills in individual STEM subjects were also reported by some interviewed parents when they were asked to consider whether the Programme had impacted the maths and science skills of their child. Around three-quarters of parents interviewed were able to directly comment on the changes in the maths and/or science skills of their child. However, some parents felt it was too early for them to attribute any changes to the Programme and were unable to answer this question.

Maths

Maths skills improvements were noted by just over half of the parents interviewed, most frequently around the child's improvement in counting and simple sums such as addition/subtraction, as well an improved knowledge of shapes and weights. Almost all parents who reported improvements in their child's maths skills, commented that this was most visible in the improvements in their counting skills, both in the accuracy and frequency of counting activities taking place in the home environment. Where parents noted improvements in counting, this was linked to the increased verbalisation of numbers, and confidence in their counting skills. Two parents said their child already enjoyed counting pre-Programme, but that they nevertheless noticed an improvement.

A small number of parents noted improvements in other areas of maths, such as awareness of forces (such as mass and weight), or a greater awareness of shapes and colours (including the ability to count and order them). There was some crossover with science skills reported by parents when asked about maths. This could indicate that parents viewed STEM skills as a group in relation to the Programme and activities completed, rather than separating the STEM subjects out as distinct from one another.

One parent gave examples of how their child's maths activities had been extended further in additional activities completed to follow the child's greater interest in counting since taking part in the Programme. In this example, the parent bought magnetic numbers to supplement the child's increased preference for maths activities and explained that they now make simple equations on the refrigerator door together. Another parent also reported that their child was more confident in leading maths activities, such as counting and gave the example of the Magic of Gloop activity where the child measured and counted the spoons of cornflour and adding water with the pipette.

One further parent said that although they felt unsure whether their child's maths skills had improved, they felt that their child was more aware of the subject, and that this had enabled them as a parent to feel prepared to 'push him more in maths' so that they can do more activities together in the future. The parent felt that the increased awareness of the subject would be of benefit to them soon.

Science

Several parents noted that their child exhibited greater interest in STEM concepts following participation and where this was the case, it was often in the subject of science and topics of particular interest to that child. For example, areas such as space, the natural world, and technology were mentioned by interviewed parents. In one case, a parent said their child was already interested in changes of forms of water or other substances, but that they had become much more interested in activities where matter changes form following participating in the home learning activities. They found this was especially the case after doing the Magic of Gloop activity together.

One-third of parents interviewed said their child was retaining more information on STEM concepts following participation. Several noted that their child now enjoyed using words they were previously unfamiliar with in conversation and during activities. In one example,

a parent noted that their child used concepts and terms such as fluids, gases, and solids more often in their activities and it helped their child to repeat and understand the science concepts being explored in day-to-day discussions. For this parent, the repetition of the correct terminology that had been covered in the Programme was most helpful in reinforcing concepts and ideas with their child.

> *"After we did the gloop, we were talking about solids, fluids and gases. Today we were discussing the planets and the sun he said, 'you know the sun is very hot and is a gas and we will not be able to walk on it because it is not solid, it's a gas.' So, we definitely noticed he is retaining the concepts and applying it day-to-day."*
>
> Parent ID26

Several parents commented that they felt it was harder for them to ascertain whether their child saw any improvement in science skills, compared to other areas such as maths, language, or communication. This was further demonstrated by some parents who were either not able to say or were hesitant to make a judgement. One, for example, found it harder to relate the growing cress home learning activity to science – which might suggest the need for increased guidance on this. In this instance, the parent said that the child enjoyed the cress growing and floating/sinking activities, after having the concepts explained to them.

Curiosity

Greater levels of curiosity and engagement were reported by several parents in relation to the observed improvements in STEM confidence. However, greater curiosity levels were also linked to improvements in language and communication skills for some children, as observed by their parents. Some parents noted observing greater levels of curiosity and exploration in their children since participating in the Programme. This was most reported in relation to increased curiosity in their local environment and the world around them, and in several cases had resulted in the child asking more questions and communicating more.

Where parents reported increased levels of curiosity in their children, several linked this to the Wonder Walk week activity (week 5). As the activity was outside and had an exploration element, several parents commented that this prompted several children to become more curious about the world around them. It was also something that households did generally in some cases so this expanded existing contexts, but it could also work when the activity was less familiar. One parent noted that this activity was particularly good at expanding her child's awareness as they lived in a small flat, and that being outside had been beneficial for them. Doing this activity could mean children had much more curiosity about the outside world and this led to suggesting ideas for more activities they can do together such as going outside and collecting flowers. It could also be embedded into family activities meaning the impacts are wider reaching.

> *"We are enjoying exploring outside, seeing water in the puddles, counting the buses, looking at the planes, trees around him. He will tell me what he can see and hear, and he definitely enjoyed being outside, because we live in a small flat so it's*

not that big." … "My other son he was getting involved as well, so we were all doing it together and enjoyed it as a family…it's something I can go back to and do again."

Parent ID63

A couple of parents also linked their child's increased curiosity to the receipt of the home learning activity packs each week, which they reported having been a point of excitement and curiosity each week. Having the home learning activity packs provided weekly, not only was an enabler of the Programme in terms of child engagement, but also became linked each week with a sense of curiosity for some of the children participating in the Programme.

5.2.3 Language and communication skills

Language and communication skills are important in the context of this Programme as they can be considered a potential precursor to other STEM-focussed skills. Improvements in communication and language skills among the children were commonly reported by parents. Around three-quarters of the parents interviewed noted a perceived improvement in their child's language and communication skills following participation in the Programme. Where the reasons for this were expanded by parents, they fell into three main areas: verbal communication, increased vocabulary, and improvements in listening.

Several parents reported a perceived increase in verbal communication of their children because of Programme participation, where they were either now speaking more frequently or for a greater length of time:

"The nursery were saying that he's changed so much, speaking more, coming in with ideas...I think it helped him a lot."

Parent ID63

Some parents also observed that their child's was now using new STEM-focussed vocabulary by in communication exchanges with them. Several parents commented that they had noticed their child using new science-based vocabulary for example:

"He's using more scientific words and terms."

Parent ID26

This indicates that the Programme enabled children to develop the necessary language to expand their communication exchanges with parents and care givers, and that the home learning activities provided an effective vehicle to facilitate this.

" Because of new words, because of [the] activities [it] creates a situation where he can communicate".

Parent ID50

Improvements in listening skills were another reported language and communication impact by several parents. In several cases, a perceived improvement in listening skills was also linked to perceived improved levels of understanding in their child. One parent

exemplified these points and attributed the use of the aspects of the ShREC approach to the improved listening and cognition skills of their child.

> *"His* listening and understanding *of what I've asked is better and then he'll reply to me." … "I really enjoyed doing the activities with him, I get to see* him listening and understanding *things."… "Sitting down, getting his attention and being at his level helped in him listening more. Usually when talking to him I stand, but now I go down to his level, talk to him and we have the eye contact, and he understands and listens more. "*
>
> Parent ID63

Parent ID50

One parent reported a positive experience with the home learning activities and observed significant communication skills in their child, who has a speech delay and is currently awaiting a SEND assessment. The parent was highly engaged with the Programme from the outset, due to a desire to help improve their child's language and communication skills. This parent noted that their child had spoken the longest sentence they had ever during the Magic of Gloop activity. This was notable as their child usually communicates only with one or two words, but while making the gloop he said two sentences.

"He doesn't use long sentences, sometimes he doesn't even use one word and we came a long way [in the Programme]. With gloop making, he was so happy, suddenly he said the biggest line of all time in his life, he said 'Wow! I love it so much, it's the best gift ever!' which is two sentences basically, and he used it in the right manner, because he was loving it...it was very unexpected!"

This parent was positively surprised by the improvement in their son's communication and directly attributed this improvement in communication to the scenarios for communication the home learning activities had created.

Some parents described their child as more willing to explore and engage with their environment and scenery or ask questions outside of the activities, particularly following completion of the Wonder Walk activity. Several also noted that the communication and language impacts were linked to areas of interest for the child such as space, the natural world (leaves and trees), or technology and how things are put together and work (robots, cars). In one case, a parent noted that the activities had prompted their child to ask more questions about space and the planets, an area he already had a particular interest in:

> *"It has improved his confidence in exploring, asking questions, the vocabulary in science…he is really curious about the planets."*
>
> Parent ID52

Two parents reported that it was difficult to say if their child had improved their language and communication skills due to their participation in the Programme because they were at a good level prior to delivery. In one case, the parent suspected the child had improved, but were hesitant to definitively attribute this to the Programme as their child was also doing similar types of activities in the nursery. The other parent commented that they felt their child had been making progress in the months prior to the Programme

anyway. This may indicate that for children already demonstrating a greater level of communication, it could be harder to identify improvements in language and communication attributable to the Programme itself.

5.2.4 Increased time with parent

Several parents reported that the increased time with their child while participating in the Programme had resulted in positive impacts upon their child. Most often, parents reported that the time spent together completing the home learning activities was viewed as 'special,' 'bonding,' or 'one-to-one' time by their child. As well as being a positive enabler for the engagement in the home learning activities, some parents saw this as the source of perceived positive impacts. In several cases it was framed in the context of the number of other children in the home learning activities. Where there were two or more children in the home, the dedicated one-to-one time that the activities facilitated was viewed as a special time for just that child and their parent. For example, in a case where the child had two older siblings, the parent commented:

> *"I think we've bonded quite a lot over the Programme, because it was just me and him. I have two other children as well and they're always asking for my attention, so this Programme has given us activities for just him and me doing it. It's just for me and mummy, that's it, nobody else can come."*
>
> Parent ID47

Elsewhere, increased time for parent and child was reported, but parents reported that the activities took place in conjunction with and included the other children in the home. Where the second child was younger (we spoke with two parents who had young children around one year old) parents felt they showed interest through for example reaching for materials in the activity. Other parents reported that they had older children who became interested in participating in the activities and took part in some of them, and one parent reported a much younger sibling showing interest in the activities, noting that they would like to also deliver the home learning activities with them once they were a little older.

5.2.5 Other outcomes

Although not explicitly measured by the Programme, some parents reported observed improvements in the executive functioning skills of their child following their participation in the Programme. Parents noticed improvements in depth of understanding of their children, but linked to the language and communication impacts, had also elicited new language and ideas being communicated by their child.

> *"She knows so many new words and can understand so much. She has a different method of thinking...she understands to a much higher level."*
>
> Parent ID21

One practitioner also reported that a parent had commented on the language impacts they had observed whilst completing one of the activities in the Programme, noting that the abstract thought exhibited by their child was unexpected:

"It could be because it was one of the first activities…. But a parent said to me that she was amazed at the language and the abstract thought that her daughter had when making the sandwich."

Practitioner ID1256

It was decided not to explicitly include executive function skills in this research, as discussed above in Chapter 3 however when discussing other impacts, several parents observed changes in their child's behaviour in this area.

A small number of parents also noted an improvement in the fine motor skills of their child during their participation in the Programme and linked this to the activities in the home learning packs that include tasks such as cutting, pouring, and collecting.

5.3 Impacts on practitioners

Practitioners universally reported enjoying and learning from the Programme. They often felt that the Programme changed their perspectives on their own practice as early years professionals and helped them to feel more confident in their interactions with parents.

Reflective journal feedback on Module 2: Exploring early STEM

Thinking about the definitions for the Foundations of STEM:

What are your thoughts about these definitions? Tell us about any impact they have had on your views or attitudes towards STEM?

"I found that the definition of the foundations of STEM was very concise and explicit in terms of what is expected at EYFS. These definitions had a positive impact on my view/confidence and helped me clarify what STEM actually is. Moreover, I found that the definitions helped me identify a STEM lens and recognise that routines and activities I usually do with preschoolers' day to day do in fact support children's early STEM learning without realising."

"STEM can be fun, and it doesn't have to be a sit-down learning session. There isn't an age limit to when children can be introduced to STEM."

"The definitions are very clear and breakdown STEM and what they include. This is very helpful as I have a clear picture to support children in their STEM learning."

"Knowing that [STEM] is simple part of everyday life and routines will help me to spot it when we are teaching."

Tell us about anything else you found particularly interesting or useful from this module:

"I found it interesting to know how early maths develops in young children over time and over what processes of development (subitising, perceptual subitising, conceptual subitizing, cardinality. I found it useful to know that while it may seem to us that a child comprehends numbers, it does not necessarily mean that they have a solid understanding of what it is."

Reflective feedback on Module 3: High quality interactions - the ShREC approach

Tell us about anything else you found particularly interesting or useful from this module

"Some changes that I will make to the way that I interact with children to support their STEM learning will include conducting high-quality interactions by asking more open questions and expanding on their experiences/ knowledge with subject-specific vocabulary. The challenges I think will occur with embedding the ShREC approach into my daily practice will include ensuring that there is sufficient time to carry out high-quality interactions with all of the children 1-1 and ensuring that the ShREC strategies are being applied throughout the day across different activities/routines and not just during focus activities."

"Looking at the ShREC approach and the way I interact with children, I would say I do well as I share their attention and let them take the lead in play. I also build on what they are saying to extend their learning. I could improve myself by asking less questions and using more comments."

Reflective journal feedback on Module 4: Engaging and Supporting Parents.

Was there anything that will have a direct impact on your practice, or change the way you work with families?

"I am hoping to use more research statements in conversation with others about effective practice."

"I particularly enjoyed learning about ShREC and how I embed it into my practice. I just need to question less and comment more."

"I would like to host a parent get together or a coffee morning to introduce SHREC to parents who are not familiar with the approach hoping they could use it at home."

5.3.1 Skills and confidence in supporting STEM learning

For two of the interviewed early years practitioners, participation in the Programme had changed their perspective on their day-to-day practice within the setting, which had boosted their confidence as practitioners, and both felt that the Programme had built their STEM knowledge.

> *"I'm definitely more aware of the language I'm using and the way I feel about science and maths and making sure I'm not reflecting that or portraying that on to the children… it's definitely helped boost my confidence as well for me to do it in a positive way for them, in a fun way for them, where I know they're getting the most from me."*
>
> Practitioner ID1258

Another reported that they had now had greater understanding of the benefit of one-to-one time with a child and would like to see more of this in the nursery environment as well as the home learning activities to improve practice in the future. Practitioners reported that they had or would repeat some of the home learning activities with their own children and other children at the setting.

Practitioners also reported that participating in the modules impacted their practice positively. One practitioner said the modules were especially useful in explaining concepts, such as the STEM lens and ShREC approach and enhancing their understanding. Another practitioner particularly valued the module which demonstrated ways to use research with parents, to support parents in understanding how effective the ShREC approach would be with their child. Another practitioner noted how they supported parents experiencing challenges with the Programme content by suggesting they bring it back to the ShREC approach for example. When asked about their understanding of the STEM lens and ShREC approach, practitioners said the models and real-life examples used in the modules were hugely helpful.

Some settings also used the Programme materials on the Padlet for additional in-house all-staff training, for example one setting which was already using the ShREC approach used the handout on the Padlet for staff refresher training. Of the practitioners we spoke with, all reported having used the ShREC approach in their setting prior to participation in the Programme and described having a good level of familiarity with the approach to interactions using this protocol. One found it good to be able to pass this knowledge on to the parents through the Programme, noting that this had an impact on their practice by increasing the number of conversations with parents on the topic. They reported conversations with parents about the ShREC approach when they were handing out the home learning activity packs each week.

> *"I found myself explaining it to them more, I didn't really explain to the parents what it was before. But now I can tell the parents a bit more about what we're doing in school. Because it was in the home learning packs to use the ShREC approach as well, to use the ShREC approach while doing the Programme, and we use it in the school as well."*
>
> Practitioner ID1257

One practitioner was extremely positive about the impact of the Programme materials on the practice of other staff in their setting, who had not been involved in the Programme. They also commented further that their setting is undertaking other training for setting practitioners around incorporating maths into daily practice, something that they appreciated in the structured, ‘mathematical’ approach to communication of ShREC:

> *"One of the great things about that project and the ShREC approach is that it asks practitioners to be very mathematically aware when they're communicating with children...drip feeding mathematical terms into the everyday."*
>
> Practitioner ID1256

Practitioners typically felt that the Programme changed their perspectives and helped them to incorporate STEM into everyday practice. Where the STEM lens was mentioned specifically, practitioners felt it was easy for them to understand, however, they tended to discuss this in conjunction with the ShREC approach, which was mentioned more frequently than the STEM lens. This could possibly be due to the practitioners interviewed having previous experience with this approach. One commented that concepts such as STEM lens were easy to understand in the Programme, because of the clarity of the materials and because concrete models were given.

Some practitioners reported being more aware of the STEM lens and/or ShREC approach in their daily practice due to their involvement in the Programme, and that this had benefits for the interactions with parents of the children who were on the Programme, facilitating greater frequency of communication. For example, one practitioner reported that the Programme helped her to engage with parents a lot more in her role, by giving her a 'mission' and that this gave her more purpose as a practitioner. She also said parents were now able to come and ask her for guidance on how to have positive ShREC interactions with children at home, which had further boosted her confidence as a practitioner:

> *"It's really helped me engage with parents; I feel like I've kind of got a mission to talk about. I'm quite shy and quiet and find it hard sometimes to talk to parents but it's really nice having this thing that we do every week to talk to them about."*
>
> Practitioner ID1257

5.4 Impacts on parents

Interviewed parents were asked about impacts that they had observed for themselves due to the Programme. Responses were universally positive, with parents describing a range of impacts upon themselves individually as well as changes in their day-to-day interactions with their child and with the setting.

5.4.1 Confidence and attitude towards STEM

Some parents reported an increased self-confidence in STEM subjects, for example a greater understanding of STEM terminology and how this can be incorporated into daily activities with their child. Some parents also reported being able to relate STEM to everyday life as an impact of the Programme, in several cases explaining that they now felt equipped to incorporate STEM ideas into future activities due to their increased confidence levels with the subjects. Increased confidence towards STEM subjects and ability to relate STEM to everyday life was also reported by most parents who previously had some knowledge or experience of STEM prior to the Programme. One parent also reported that the Programme had resulted in an improvement in their personal self-confidence, reinforcing their self-belief in their parenting abilities. The parent felt the Programme was designed to help parents become more confident to support their child, and because they were already doing similar activities at home, it confirmed that they were already good at parenting.

> *"For me, feeling like I'm doing the right thing as a parent. Initially when nursery said do you want to take part in this, I said yes... it has been a surprise that the impact on me personally has been a confidence boost."*
>
> Parent ID33

Another parent reported feeling like they now needed to 'brush up' on their own knowledge of STEM subjects a little more, as the Programme had highlighted where they had a few gaps in their understanding. This parent reported not feeling that this had

negatively impacted their confidence, but it had highlighted some areas that they would like to feel more confident in, to support their child's learning, and that the Programme has motivated them to return to this at a future date.

A parent who spoke English as an additional language (EAL), said the Programme had helped them to be able to explain STEM concepts more confidently to their child, due to having the materials and support of the Programme improving their own language capabilities related to STEM. A further parent with EAL whose partner also had EAL but a different first language, explained that they previously did not talk about science, technology, or engineering together with their child, but that the content of the Programme had given them the support and ability to now incorporate these STEM subjects into daily life. The parent noted that they had delivered the Programme and activities to the child in one language, and that the child would usually respond in English, however this parent noted that they would both occasionally switch between languages, which could cause a little confusion. To overcome this, the parent reported finding the ShREC approach very helpful in this multi-lingual home environment, having the space to able to count to ten in between interactions.

> *"When I talk[ed] to my kids, maybe I talked a bit about maths, but I didn't feel like I talked about science or technology or engineering. So now whenever I feel like I have an opportunity, for example on the way to school, to the nursery, I talk about the weather, I introduce the plants, the leaves."*
>
> Parent ID26

5.4.2 Confidence to support STEM skills and use ShREC

Parents were asked about any impacts upon their confidence in supporting their child with improving their STEM skills at home, and if they felt confident using ShREC interactions to do so (see Appendix for further information).

Confidence in ability to support child with STEM skills at home

Three-quarters of parents we spoke with indicated that they felt more confident in their ability to support their child with improving their STEM skills at home through play and learning. Two commented that they felt more confident using ShREC but felt that they still needed some further support in the future to continue to support their child's STEM skills to improve. Several parents also reported that they felt more confident with STEM as they were now aware of how STEM was present in the world around them due to participation in the Programme. This had made STEM more relatable for them, and in one case, this had been reported as the largest benefit of the Programme for the entire family, changing how they now viewed the world together:

> *"I think the largest impact was probably on us, and being aware of what there is and how it exists in the world around us. That level of awareness means that we can start to look at the world a little bit differently and the way in which we engage with the girls."*
>
> Parent ID11

Confidence using ShREC interactions at home to support STEM learning

Again, three-quarters of parents reported that they felt confident using ShREC interactions to support their child's STEM learning at home. For several, the ShREC approach led to parents realising their child needed additional time to process and respond in interactions. Parents reported that allowing the child more time to speak and respond, rather than feeling like they need to fill gaps in interactions was a positive impact that had increased their confidence to use the ShREC approach. Several indicated future intentions to repeat activities or find new STEM based learning activities using the ShREC approach. Two parents interviewed commented that they initially found doing this difficult, but since adopting the ShREC approach their confidence had improved.

> *"For me it was really good as I had to follow the ShREC approach and let him lead an activity, so I had to count up to ten and if he wasn't talking, I would then give him some guidance."*

Parent ID52

Confidence in ability to support child with improving their maths and science skills at home

Half of parents interviewed agreed that they were confident in supporting their children with improving their maths and science skills going forwards. Four parents we spoke with discussed repeating maths or science-based activities from the Programme or incorporating new activities into their home learning. One parent commented that the resources enabled her to feel more confident approaching maths and science activities with her child in the future and that this would enable her to think about new activities they could take part in.

Another parent felt that the Programme had made maths less intimidating to her, as she now recognises how it exists in the world everyday. This parent went on to say her confidence supporting her child with maths had improved, and she saw her participation in the Programme as a way of learning and developing herself, and as a reminder to keep revisiting STEM topics. Another parent who commented that they felt more confident supporting maths and science at home also commented on the need to revisit the resources and activities in the future. This parent felt that the home learning activities needed some more repetition for their child to fully understand all the concepts covered, but that she felt confident repeating the STEM activities.

> *"Maths is not just one-plus-one, it's lets count, do percentages… it's not complex, it's basic and simple".*

Parent ID11

5.4.3 Incorporating learning in the home learning environment

Parents reported they had or planned to incorporate learning from the Programme into their everyday lives, as well as repeat some of the home learning activities. Parents did

not report any difficulties using the STEM lens, incorporating the learning from the Programme into daily life, or coming up with new STEM-related activities to do with their children. Parents referred to repeating some of the activities (such as the Magic of Gloop) and ongoing use of the concepts introduced in the Programme extending them to other activities, for example, adapting the Exploring Bits and Bobs activity to use an art box their child has already.

> *"With the bits and bobs one, [child] wasn't really in the mood and didn't really engage with the activity. I tried to make things and it didn't quite take off...we have an art box which is a similar sort of thing, where she likes to keep things together, if she decides to do drawing and painting, she might start wanting to make a something other than a robot. It's a reminder that you can use art with a science-y thing. You've got more tools in your toolkit."*
>
> Parent ID13

A practitioner reported that one parent had positively built on the Wonder Walk activity by having their child make a book about autumn which included sticking leaves in the book and drawing pictures and saying what autumn meant to them. The parent shared this in the Whatsapp group. This practitioner felt this was a positive adaptation for this child.

Parents were asked whether they had come up with any new STEM activities or ideas. One said the Magic of Gloop activity had prompted a discussion about the planets, and they went to an art shop to buy materials to draw and colour in the planets. However, they felt they did not need to come up with any other new activities as they were able to repeat the activities from the Programme. Another parent reported having a lot of ideas, including going outside and collecting flowers, for example. They reported that the Programme prompted their child to come up with ideas for activities, and they kept wanting to make new things such as buses and wheels out of boxes and Sellotape.

> *“My son said… ‘can we make boxes of buses; can we not build frames?’ And he was using actually Sellotape to make wheels and just getting ideas, we’re getting ideas from it [the Programme].”*
>
> Parent ID25

Parents also reported incorporating STEM subject concepts and language into their daily life, especially when cooking and making things in the kitchen with their child. One reported they were using the concepts often to explore outside, talk about colours and shapes, and making a lot of tea and coffee with their child.

5.4.4 Parent-child relationship

Several parents reported that the Programme enable them to see that their child was more knowledgeable and independent than they had previously thought. This meant that parents learnt to be more ‘hands off’ in activities and allowed their child to lead the interaction more. Several were surprised at their child, as they had not previously realised the depth of understanding of STEM concepts their child had.

"I think I've learned quite a lot of things that my son is able to do. Some of the things that I've recapped on myself, and activities we can do together."

Parent ID47

"She knows so many new words and can understand so much. She has a different method of thinking...she understands to a much higher level." … "I think she is a child, so I need to explain more. But she will understand more than what we think. I need to explain the way things are and let her take what she understands – she will ask if she is unsure. She wanted to learn more and she's asking me more."

Parent ID21

One parent reported struggling to let the child do the activities by himself sometimes and not intervene to play with them, but they saw this as a positive learning experience for them. This was further reinforced by a practitioner who reported that, for her, one of the biggest impacts they had observed for parents taking part was an improved understanding of the knowledge and questions their children may have.

"It's about parents understanding. They underestimate the knowledge that their children have or underestimate the questions about the world around them that children have."

Practitioner ID1256

6 Discussion and conclusions

6.1 Summary of findings and discussion: Exploring Together feasibility

Overall feedback from practitioners and parents was very positive. The combination of modules and activities worked well for both practitioners and parents. It was widely reported that children found the Programme enjoyable and parents found participation beneficial. No parents reported negative STEM, language, or other impacts on their child as a result of taking part in the Programme.

The research did find some instances where parents changed some elements of the activities but these were considered acceptable within the Programme design. Also, during the course of the Programme, parents often realised adaptations were not necessary and that their children were more capable than they had originally thought.

There are questions around whether there should be greater practitioner involvement in future Programme delivery. For example, one practitioner felt that she had limited contact with parents and would like a greater 'expert' role in the Programme should she do it again. Some practitioners noted that although their main contact with parents took place mainly during drop off and pick up times, and was usually very brief - sometimes only a minute or two however, they were often able to gain valuable feedback on how the Programme was being implemented in the home learning environment at these times.

A greater role for practitioners in the Programme would however need to be carefully balanced with resourcing/time constraints facing EY practitioners in the sector. For example, one practitioner mentioned sometimes encountering resource constraints affecting her ability to attend the implementation support sessions, despite having time scheduled/allocated, so greater practitioner involvement would need to be carefully considered against existing resource and staffing demands that EY practitioners may face.

6.2 Summary of findings and discussion: Impact on children

Parents were overwhelmingly positive about the impact of the Programme on their child, reporting developments in their confidence (including self-belief and confidence in STEM), curiosity, STEM skills, language and communication and the benefits of increased parent-child time.

Maths skills improvements were noted most frequently around the child's improvement in counting and simple sums such as addition/subtraction, as well an improved knowledge of

shapes and weights. Children were also reported to exhibit greater interest in STEM concepts, often in the subject of science and topics of particular interest to that child e.g. space, the natural world.

Noted improvements in children's language and communication skills following participation in the Programme included more verbal communication, increased vocabulary, and improvements in listening. Although not evaluated this time, some parents reported observed improvements in the executive functioning and fine motor skills of their child. In fact, the home learning context for some parents also presented opportunities for referring to Programme resources again at a later stage, to repeat or try activities when the child is older.

6.3 Summary of findings and discussion: Impact on practitioners

Practitioners universally reported enjoying and learning from the Programme. They often felt that the Programme impacted their practice positively and helped them to feel more confident in their interactions with parents. They also felt that the Programme had boosted their STEM confidence and knowledge and they intended to incorporate the learning from the Programme into their practice, including by repeating the activities.

Although all the practitioners we spoke with reported having used the ShREC approach in their setting prior to participation in the Programme, they also felt that taking part in the Programme may have enhanced their understanding and awareness of ShREC further.

Practitioners reported that parents had all the resources they needed and seemed confident using the online materials, so they often did not need a lot of help. Overall, practitioners did not experience any significant difficulties in supporting parents' engagement in the Programme.

6.4 Summary of findings and discussion: Impact on parents

Parents were universally positive about the impacts of the Programme, describing a range of impacts upon themselves individually as well as changes in their day-to-day interactions with their child.

Most parents reported feeling more confident in their ability to support their child with improving their STEM skills at home through play and learning, and that it had made STEM more relatable. This also included parents incorporating STEM subject concepts and language into the home learning environment in activities such as cooking and repeating the home-play tasks. A couple of parents with EAL reported that the Programme had impacted them in ways specifically related to their language status with one saying it helped improve their own language capabilities related to STEM and another saying it enabled them to incorporate STEM more into daily life.

Several parents also reported realising that their child was more knowledgeable and independent than they had previously thought. This led to improved parent-child relationships with parents reporting being more 'hands off' in activities and allowing their child to lead the interaction more.

6.5 Limitations of the study

Selection of parents - some practitioners reported selecting parents based either on who were more likely to engage (more advantaged typically) or less likely to engage (less advantaged typically). Some parents were also more familiar with STEM subjects from their work or education histories, than other parents who may have less knowledge of STEM.

6.6 Implications for future development and delivery of the Exploring Together Programme

The final section of the report looks at factors to be considered for scaling up the Exploring Together Intervention in the future, and for any potential future evaluations.

6.6.1 The programme

Regarding findings relevant to the programme itself, the evaluation found that the training for practitioners and online Programme for parents is easily scalable and sustainable. However, due to there being some confusion over whether the children needed to watch the Padlet or look at the resources, it should be made clearer that the children do not need to participate in this way.

In addition, while the digital elements of the Programme were received positively by parents, this may not suit all contexts and could be adapted in future to ensure digital engagement is not essential and other Programme formats are available, i.e. for those with no access to IT or limited technical knowledge, as well as those who may have a preference for printed, physical materials to deliver the Programme. Parents who said they were time-poor relied on the printed materials more to guide them with the concepts and how to complete each activity.

Due to some parents not engaging fully or easily with the Programme due to language barriers, at scale-up, it may be necessary to improve awareness amongst practitioners and parents of the availability of translated resources and subtitles for the videos (although this may be costly as some settings will have multiple languages).

For future iterations of the intervention, the option of an in-person session with the practitioner(s) and parents may also be considered (as initially intended) to address some of the variations between parents discussed above.

The evaluation has highlighted that supporting adaptations to activities to reflect the child's level of development and household context is an integral part of the Programme.

Emphasising that the home activities are adaptable (for example for children with SEND) will help families engage more fully with the programme.

Specifically on the home-play packs, parents picking these up was an issue for some so having collections on a couple of set days might help ensure the practitioner is available at the same time as the parent. Also, ensuring more than one practitioner per setting takes part in the intervention may also be helpful to ensure another point of contact, and offer peer support, taking some burden off the trainers.

Future delivery models may want to consider how practitioners tailor their support based on things like a child's age or whether they have special educational needs and/or disabilities. For example, identify concepts or words that are more challenging for younger children, or adaptations based on a child's need. This would ensure all can engage most effectively with the Programme.

Finally, parental selection in future scale ups may need written guidelines to ensure there is no unintended bias which could affect not only engagement but the evaluation results.

6.6.2 Resources and logistics

Looking specifically at issues around resourcing and logistics for future iterations. As time could be an issue for parents, this would require further consideration, particularly where parents are time-poor. In addition to showing how the activities and learning can be fitted into daily life, stronger messages may be necessary about the importance and impact of quality parent-child interactions. Similarly, as time was occasionally reported as an issue for staff, this also needs to be considered in the future.

The Programme required considerable resources from Peeple, including the development of the training, the materials and the support to nursery staff and parents. The logistic input required to deliver the Programme was also considerable i.e. the collation and delivery of the HLE packs to the settings. At scale-up, these costs will need to be considered and data on such costs, both in terms of resources and staff time, will need to be collated and reported on. There was also a recommendation of adding gloves to the Magic of Gloop home-play pack (which would add to the cost).

WhatsApp was set up for this evaluation only and the current intention for future iterations of the Programme is that settings use their own platforms to communicate with parents (e.g. Tapestry). One issue for future delivery would be whether all settings have an existing feedback platform and would be willing to use this (to reduce the time burden on parents and/or involve practitioners more in the intervention). Another issue would be whether they would have the time to set up and prepare these materials, as Peeple's support in preparing the parent communications was reported as an enabler for practitioners. One question for any future evaluators would be whether these platforms need to be accessed for research purposes and, if so, what the implications would be for issues such as data-sharing.

Regarding understanding of the ShREC approach, although practitioners involved in this study were familiar with the approach and had used it previously this may not be the case

in other settings. A future consideration would be whether any Programme adaptations are needed to allow for this, for example the provision of additional practitioner training or support materials.

6.6.3 Future evaluation

Finally, some additional questions for future evaluations could include:

- which primary and secondary outcomes might be appropriate (including communication and language, executive function, self-regulation, independence/autonomy, fine motor skills);
- whether outcomes could be linked (through the National Pupil Database) to other Early Years Foundation Stage outcomes such as literacy, numeracy, PSED;
- what randomisation model to used (cluster/waitlist);
- how long for outcomes to emerge, what outcome measures to use; and
- what the focus of an Implementation and Process Evaluation in a scaled up might look like.

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Appendix 1: Development of the theory of change

Changes to the theory of change (TOC) are detailed below. These focus on the main changes discussed in the second IDEA workshop (Autumn 2022) before the pilot and those made during the third workshop, after the independent evaluation had concluded.

Rationale/need for intervention

Pre-pilot - Added 'These are also recognised transferable skills' to the end of Supporting early STEM thinking will encourage positive learning dispositions across all domains including curiosity, collaboration, teamwork and engaging others – rather than a solo endeavour. To the bullet regarding Practitioners lack skills, confidence and knowledge to support STEM in the EY and want more training in maths, also added the following 'yet they have limited capacity for time consuming, out of setting training'.

Added the programme's accessible training/CPD which had been adapted to meet the needs of the settings and taken on board EEF guidance regarding remote offerings (and included reference).

Included the ShREC approach as an evidence informed strategy for improving children's early communications – high quality interactions are known to improve long term outcomes (and included reference).

Included the concept of a 'nudge' and how this connects to drip-feeding and supporting playful insights (and included reference).

Post-evaluation –Executive Function skills (and reference) was removed as these were no longer being included in the Programme.

Theory of change

Pre-pilot - The programme changed from a 10-week to an 8-week programme (these changes were made throughout the TOC).

The age range was changed to reflect the inclusion of 3- and 4-year-olds (rather than just 3-year-olds). A new bullet was added to show that parents & practitioners are supported to use high quality interactions (ShREC) to support STEM learning.

Post-evaluation – no further changes.

Inputs

Pre-pilot - Delivery team: From Sept 2022, the project coordinator would be working on the project for two days a week, one of which was ring-fenced (down from 2.5 days). Funding and time added to develop and pilot the new online/blended training for practitioners. Settings – specified seven settings from Sheringham EY Hub with one-to-two practitioners per setting. Practitioners - removed reference to attending training face to face (two days) and replaced with six hours online live and pre-recorded modules. Included time to complete the reflection booklet. Specified time for practitioners to deliver the intervention (three hours per week). Added time for practitioners to set up and send/ respond to nudges on WhatsApp group (eight x 30 minutes per week).
Families – one-to-two parents per setting. Removed children participating in the programme. Added optional creche facilities for siblings - to enable parents to attend the programme (to address the issue of multiple children identified earlier). Amended time for families to attend the programme (one hour per week).

Post-evaluation – Adapted funding and time to develop and pilot online modular practitioner training. Added funding and time to source and collate resources to support the HLE activities. Added time for Peeple/ practitioners to set up & send/ respond to nudges on WhatsApp – eight x 0.5hrs/week.
Updated to specify six settings from A Brighter Start East London Stronger Practice hub and changed total number to 48 (eight parents and eight children per setting). Updated one-to-two practitioners per setting (total 6-12). Removed 'optional creche facilities' as no longer face-to-face (so no demand). Time for practitioners to attend training - changed to four hours. Removed time for practitioners to engage with intervention and replaced with time for practitioners to engage with parent programme content. Added in support via WhatsApp and three x 30 minute online drop in Q&A sessions. Added practitioners handing out resources to bullet point and include following up with parents to offer support (times based on need).
Changed order so family inputs at the bottom (and practitioner inputs together in the middle). Removed one hour specification for time parents spent on engaging with online Programme. Added time for families to carry out HLE activities with their children eight weekly sessions (times based on need). Added time for families to share their experiences on WhatsApp (times based on need).

Activities

Pre-pilot – Changed the number of staff involved in each setting (one-to-two, from one-to-three). Removed pre-programme information for parents. Confirmed that the first two sessions were parent only to share the foundations of STEM and introduce ShREC and added that the remaining sessions to start with parent only with children joining for the activity. Specified the Home-play activities - resource packs provided with information sheets to support EY STEM & ShREC (removed sharing songs, rhymes and stories as to be included in activities). Added in the WhatsApp nudges providing prompts, STEM knowledge to ideas for the home using low/no-cost resources – an extension to the session.

Post-evaluation – Changed the number of settings to six. Removed the time about practitioners supporting parents to engage. Removed bullet about first two sessions being parents only. Changed wording to the first two sessions share the foundations of STEM and introduce ShREC. The remaining modules support the development of these skills through STEM-based activities.
Under the resources section, removed 'online', changed 'materials' to 'resources', and changed 'ShREC' to 'C&L', with ShREC added in brackets in home-play activities bullet point. Changed text to Home-play activities - resource packs provided with information sheets to support early STEM & promote high quality interactions (ShREC) between parents and children. Added in bullet about time for parents to share experiences on WhatsApp groups.
Edited 'practitioners work with families to resolve attendance issues/barriers to participation' bullet point. Attendance issues refer to face to face training, as still did some of that, changed wording from 'attendance issues' to 'support engagement'.

Outputs

Pre-pilot – Added detail to the Review and reflection point by specifying for practitioners & parents in the sessions & WhatsApp group. Also added detail to the Evidence of STEM ideas being implemented at home output (through WhatsApp exchanges and home-play activities). Removed Parent & practitioner attitudes and confidence towards STEM (as already in short term outcomes). Agreed to review compliance definition in Spring 2023 (removed reference to 70% of sessions attended as too simplistic).

Post-evaluation – Changed the number of parents/children to 48. Removed timeframe for practitioners completing Reflective Journals and instead link to the training modules. In the bullet Review & reflection by Peeple, practitioners & parents through WhatsApp, removed the word group (as there is a difference between WhatsApp group and WhatsApp broadcast and did not want to get the terminology mixed up). In Evidence of STEM ideas being implemented at home – through WhatsApp exchanges, home-play activities also added interactions with practitioners. Added Peeple to practitioner's post on WhatsApp weekly. Added Parents post on WhatsApp weekly (optional – based on need) and Parents engage with practitioners about the programme when they drop-off/ pick-up their child – based on need. Implementation support - added based on practitioner need. Agreed minimal level of compliance to be engagement with five-to-eight sessions with session one and two being compulsory.

Short term outcomes/mediators

Pre-pilot – Added a reference to STEM lens and ShREC in reference to Enriched HLE and Enriched setting environment and replaced 'STEMEFI-ing' activities with using a STEM lens and ShRec.

Post-evaluation - Removed Executive Function. Added Children show improved maths and science skills. Added: Practitioners have more confidence, knowledge and skills to engaged with parents; Support HLE and Practitioners have an increased awareness of using an evidence-based approach to support communication & language (The ShREC

Approach) and Improved relationships & communications between practitioners & parents.

Enabling factors/Conditions for success

Pre-pilot - programme accessibility updated to clarify how EAL/ SEND is being considered. Also, to reflect all parties involved, i.e., 'practitioners, parents and children' rather than just 'families'. The project coordinator also included a detailed response for reporting purposes: *Supporting high quality interactions benefits all children including EAL/ SEND children. The ShREC approach supports the development of communication and language of EAL and SEND children. Supporting practitioners and parents to develop attuned responses will enable them to respond just above the child's level of development - being adaptive and responsive. Exploratory play with outcomes that can be adapted to the child is inclusive of SEND children and allows for sensory exploration*.

Post-evaluation - Added in 'interpreters/translation needs addressed on request'. Removed point on catch-up sessions as these were not needed. Added in that practitioners are trained to support parents' engagement with online Programme and practitioners needing to hand out home-play resource packs. Added in equipment to the bullet point.

Long term outcomes/impacts section

Pre-pilot – Section split into two with Long term outputs/impacts and Longer term societal impact to distinguish the two. Moved Better employment opportunities and life chances – contributing to the STEM skills shortage into the societal box. Also moved into the societal impacts section the maths and STEM attitudes point and specified the programme's beneficiaries - Address the deficit of maths skills in society by improving attitudes towards maths and STEM for practitioners, parents and children as they grow older.

Post-evaluation – Added three new outcomes: Improve quality of the HLE and parent/practitioner knowledge of how to effectively support it; Improve quality of interactions between parents/ practitioners and children – benefitting all children including EAL/ SEND; Children's individual learning and development needs are supported through improved relationships and communication between setting practitioners and parents.

Longer term societal impacts

Pre-pilot – please see above

Post-evaluation – separated out the first two bullets into: Better employment opportunities and life chances and Mitigating the STEM skills shortage – contributing to social change. A note was added to define the use of parent:
Note* – The term 'parent' is used throughout this document to refer to parents, carers and anyone who has responsibility for looking after children (granny, uncle, childminder, foster carer etc).

Appendix 2: Research Tools

HLE questionnaire - Pre-course parent questionnaire

This questionnaire is part of a study which aims to find out whether the Exploring Together Programme – supporting the foundations of STEM (Science, Technology, Engineering & Maths) will support you and your child to become more aware of and confident in making the most of everyday opportunities for exploring science, technology, engineering and maths. If you have any queries or concerns about any aspect of this research, please contact Dr Alexandra Hendry (alexandra.hendry@psy.ox.ac.uk, Tel: 01865 271444), and she will do her best to answer your query.

Please read the following carefully, and tick the boxes if you are happy to proceed.

☐ I confirm that I have read and understand the information sheet dated 12 July for the above research. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

☐ I agree to take part in the above study

Name _____

Signature _____

Date _____

.....

What is your relationship to the child taking part in this study?

○ Mother ○ Father ○ Grandmother ○ Grandfather

○ Other (please specify) _____

How confident do you feel to support your child's early Science, Technology, Engineering and Maths

Not at all confident	Not very confident	Somewhat confident	Confident	Very confident
○	○	○	○	○

(STEM) learning?

Admin use only Participant ID: _____

In the past month, how often did you and your child engage in the following?

	Never	1-2 times a month	About once a week	2-5 times per week	Daily	Multiple times a day
Talk about planets, stars, or outer space (e.g., "Do you think the moon has bumps and holes, or is it smooth?" or "Saturn has rings")	O	O	O	O	O	O
Talk about the weather (e.g., "There are a lot of clouds! Do you think it will rain?" or "What do you need to wear when it is cold outside?")	O	O	O	O	O	O
Talk about plants (e.g., "What do plants need so that they can grow?" or "We should water our tomatoes every day")	O	O	O	O	O	O
Talk about animals (e.g., "I wonder where elephants sleep" or "Where does an octopus live?")	O	O	O	O	O	O
Talk about what objects are made of (e.g., "I think this block is made of wood" or "This tower is made of sticks and glue")	O	O	O	O	O	O
Compare the weights/masses/ heights/densities of objects (e.g., "The apple feels heavier than the lime" or "The ducky floats but the block sinks. Why do you think that happens?")	O	O	O	O	O	O
Use tools like scales, magnifying glasses, telescopes, binoculars, cameras, or thermometers (e.g., *"Let's take a picture of the trees"* or *"The thermometer says 8 degrees. Do you think that is hot or cold?"*	O	O	O	O	O	O
Observe, describe, and ask questions about what is happening in their environment	O	O	O	O	O	O
Test and/or retest ideas to find the best answer to a question	O	O	O	O	O	O
Ask your child to predict/guess what might happen when trying something new	O	O	O	O	O	O

In the past month, how often did you and your child engage in the following?

	Never	1-2 times a month	About once a week	2-5 times per week	Daily	Multiple times a day
Count objects	O	O	O	O	O	O
Count down	O	O	O	O	O	O
Identify names of written numbers	O	O	O	O	O	O
Print numbers	O	O	O	O	O	O
Use number or arithmetic flashcards	O	O	O	O	O	O
Measure ingredients when cooking	O	O	O	O	O	O
Being timed	O	O	O	O	O	O
Play with calculators	O	O	O	O	O	O
Use calendars and dates	O	O	O	O	O	O
"Connect-the-dot" activities	O	O	O	O	O	O
Use number activity books	O	O	O	O	O	O
Read number storybooks	O	O	O	O	O	O
Play board games with a die or spinner	O	O	O	O	O	O
Play card games	O	O	O	O	O	O
Learn simple sums (i.e., 2+2 = 4)	O	O	O	O	O	O
Sort things by size, color, or shape	O	O	O	O	O	O
Make collections	O	O	O	O	O	O
Recite numbers in order	O	O	O	O	O	O
Sing maths songs	O	O	O	O	O	O
Guess the number of things	O	O	O	O	O	O

What is the highest educational level that you have completed? (We will use this information to check whether the families in this study are representative of the general community.)

- ○ Primary school
- ○ Secondary school (without any formal qualifications)
- ○ Secondary school (GCSEs or equivalent)
- ○ A-levels or equivalent
- ○ University: First degree/Bachelors Degree
- ○ University: Postgraduate Degree (Masters, PGCE or equivalent)
- ○ University: Doctoral Degree (PhD, EdD, DClinPsych or equivalent)
- ○ Specialist training. Please provide details: _____

What is your ethnic group? (We will use this information to check whether the families in this study are representative of the general community.)

- ○ White: English/Welsh/Scottish/Northern Irish/British
- ○ White: Irish
- ○ White: Gypsy or Irish Traveller
- ○ Any other white background, please describe:
  _____
- ○ Mixed/Multiple ethnic groups: White and Black Caribbean
- ○ Mixed/Multiple ethnic groups: White and Black African
- ○ Mixed/Multiple ethnic groups: White and Asian
- ○ Any other Mixed/Multiple ethnic background, please describe:
  _____
- ○ Asian/Asian British: Indian
- ○ Asian/Asian British: Pakistani
- ○ Asian/Asian British: Bangladeshi
- ○ Asian/Asian British: Chinese

- ○ Any other Asian background, please describe: _____
- ○ Black/ African/Caribbean/Black British: African
- ○ Black/ African/Caribbean/Black British: Caribbean
- ○ Any other Black/African/Caribbean background, please describe: _____
- ○ Arab
- ○ Any other ethnic group, please describe: _____
- ○ Prefer not to answer

What sex is your child?

○ Male ○ Female ○ Prefer not to answer

What is your child's age in months? _____

Thank you

Post-course parent questionnaire

This questionnaire is part of a study which aims to evaluate the Exploring Together Programme. This questionnaire will take about 15 minutes to complete. If you have any queries or concerns about any aspect of this research, please contact Dr Alexandra Hendry (alexandra.hendry@psy.ox.ac.uk; Tel 01865 271444), and she will do her best to answer your query.

Name: _____ **Date:** _____

In the past month, how often did you and your child engage in the following?

	Never	1-2 times a month	About once a week	2-5 times per week	Daily	Multiple times a day
Talk about planets, stars, or outer space (e.g., "Do you think the moon has bumps and holes, or is it smooth?" or "Saturn has rings")	○	○	○	○	○	○
Talk about the weather (e.g., "There are a lot of clouds! Do you think it will rain?" or "What do you need to wear when it is cold outside?")	○	○	○	○	○	○
Talk about plants (e.g., "What do plants need so that they can grow?" or "We should water our tomatoes every day")	○	○	○	○	○	○
Talk about animals (e.g., "I wonder where elephants sleep" or "Where does an octopus live?")	○	○	○	○	○	○
Talk about what objects are made of (e.g., "I think this block is made of wood" or "This tower is made of sticks and glue")	○	○	○	○	○	○
Compare the weights/masses/heights/ densities of objects (e.g., "The apple feels heavier than the lime" or "The ducky floats but the block sinks. Why do you think that happens?")	○	○	○	○	○	○
Use tools like scales, magnifying glasses, telescopes, binoculars, cameras, or thermometers (e.g., *"Let's take a picture of the trees"* or *"The thermometer says 8 degrees. Do you think that is hot or cold?"*	○	○	○	○	○	○
Observe, describe, and ask questions about what is happening in their environment	○	○	○	○	○	○
Test and/or retest ideas to find the best answer to a question	○	○	○	○	○	○
Ask your child to predict/guess what might happen when trying something new	○	○	○	○	○	○

Admin use only Participant ID: _____

In the past month, how often did you and your child engage in the following?

	Never	1-2 times a month	About once a week	2-5 times per week	Daily	Multiple times a day
Count objects	○	○	○	○	○	○
Count down	○	○	○	○	○	○
Identify names of written numbers	○	○	○	○	○	○
Print numbers	○	○	○	○	○	○
Use number or arithmetic flashcards	○	○	○	○	○	○
Measure ingredients when cooking	○	○	○	○	○	○
Being timed	○	○	○	○	○	○
Play with calculators	○	○	○	○	○	○
Use calendars and dates	○	○	○	○	○	○
"Connect-the-dot" activities	○	○	○	○	○	○
Use number activity books	○	○	○	○	○	○
Read number storybooks	○	○	○	○	○	○
Play board games with a die or spinner	○	○	○	○	○	○
Play card games	○	○	○	○	○	○
Learn simple sums (i.e., 2+2 = 4)	○	○	○	○	○	○
Sort things by size, color, or shape	○	○	○	○	○	○
Make collections	○	○	○	○	○	○

Recite numbers in order	O	O	O	O	O	O
Sing maths songs	O	O	O	O	O	O
Guess the number of things	O	O	O	O	O	O

Tell us how confident you felt to support your child's early Science, Technology, Engineering and Maths (STEM) learning before and after the course.

	Not at all confident	Not very confident	Somewhat confident	Confident	Very confident
Before the course	O	O	O	O	O
After the course	O	O	O	O	O

Has the course had any impact on your skills and knowledge to support your child's STEM learning at home?

○ No change ○ Some improvement ○ Significant improvement

Please tell us a little bit about any changes you have noticed:

Has the course made any difference to the time you spend talking and listening with your child?

○ No change

○ Yes, I spend a little more time talking and listening with my child

○ Yes, I spend a lot more time talking and listening with my child

What impact has the course had on your child's early learning and development?

	Strongly disagree	Disagree	Agree	Strongly agree
My child is more curious	O	O	O	O
My child is more confident in exploring STEM ideas	O	O	O	O
My child asks more questions	O	O	O	O
My child's vocabulary has improved	O	O	O	O
My child is more confident to solve problems	O	O	O	O
My child is more interested in maths (numbers, shapes, measures, patterns, sorting or matching)	O	O	O	O
My child is more focused on any activity they are doing	O	O	O	O
My child remembers more details when they tell me about things they have done	O	O	O	O
My child shows more patience when learning new things	O	O	O	O
My child is more interested in the world around them	O	O	O	O

How useful did you find the Exploring Together Programme?

	Not at all useful	A little useful	Very useful
How useful were the Home-play packs?	O	O	O
How useful was it being part of the WhatsApp group?	O	O	O
How useful did you find the weekly online videos and information?	O	O	O
How would you rate your overall experience of the Exploring Together Programme?	O	O	O

If there is anything else you would like to tell us, please use the box below.

Thank you

Interview guide - parent/guardian

Thank you for agreeing to take part in this interview.

The Institute for Employment Studies and the University of Oxford have been commissioned by Peeple to undertake an evaluation of the Peep Exploring Together Programme supporting the foundations of Science, Technology, Engineering and Maths (STEM), being delivered by parents and guardians in their homes to their children between October and November this year. The STEM programme is an intervention which aims to support parents to identify and make the most of STEM learning opportunities at home by talking, listening, and playing with their children.

The aim of our research is to understand how well the Programme works. We will also be seeing how the Programme in this format might be evaluated in the future. This will support its development to improve it for other families.

A key part of this work involves gathering feedback from early years staff and parents.

Key topics for our discussion today are:

- Your views on the online training sessions and ongoing support
- Your views and experiences of using the project at home with your child, including what worked well and less well
- Any effects of the Programme on yourself and your child.

Everything discussed in the interview is confidential and will only be used for the purposes of this research. We will write a report based on our findings which will be published in 2024. The information you share today will be anonymised in the report so no names will be used. This means that we will write about the main themes that came out of all the discussions we have had with parents and other stakeholders; however, no one will be identified. Please feel free to answer the questions as openly and honestly as possible, but if you prefer that we don't report something you say, please tell us.

The interview will take around 30 minutes and is voluntary which means you do not have to answer any questions that you do not want to and can choose not to continue the discussion at any time.

Before we begin, do you have any questions?

With your permission, I would like to record the interview. The recording will be kept securely within our research team and will be deleted six months after the end of the project. Would that be ok with you?

Exploring Together Programme

In these first questions we want to find out what you thought of the Programme itself.

1. First of all, what was your understanding and experience of STEM **before** starting the Programme? *(Probe for experience in the area e.g. have they got related jobs or done any other training)*
2. Can I just check, have you completed all the sessions on Padlet?
3. (If not completed all) How many have you done? What prevented you from doing more?
4. What did you think of the online sessions? [allow unprompted]
    a. Prompt where needed: What did you think of:
        i. The content of the sessions?
        ii. The quality of the presenters?
        iii. The quality of the folder content and online information (Padlet)?
        iv. The volume of content/length and pace of the online videos?
    b. Did you find the language and concepts (such as the STEM lens) easy to understand?
    c. What worked well about it? Were there any sessions you felt were more useful than others?
    d. What worked less well? Were there any sessions you felt were less useful?
5. Do you feel you had enough support from the trainers?
6. Was online Programme convenient and appropriate for you?
    a. Would you have preferred for example, face to face training or remote training at other/set times?
    b. How did you access the Programme? (e.g. laptop, tablet, phone)
    c. Did you have any problems with accessing the Padlet?
    d. Was the Padlet easy to use? How well did the videos work?
7. Do you think the Programme could be improved? If so, how? Probe for online mode, videos, Padlet, home activities etc

Taking part in the Programme / Home learning activities

I'm now going to ask some questions about your experience with the home learning activities.

8. Can I just check, have you done all the STEM home learning activities with your child?
    a. (If not all completed) How many have you completed? What prevented you from doing more?
9. How did you find completing the home learning activities with your child? [allow unprompted]
    a. What worked well? Were there any activities you found particularly useful?
    b. What worked less well? Were there any activities you found less useful?
    c. Have you found the ShREC approach useful for supporting your child's STEM learning?
10. What made it easier to complete the activities? (Probe: ongoing support from nursery staff, the resource pack, other training materials, child's level of engagement and age/ability appropriateness)
11. What were the challenges in completing the activities? (Probe: lack of ongoing support, the resource pack, other training materials, child's level of engagement; age/ability appropriateness)
    a. Was there anything that made it more difficult for your child to do the activities? (e.g. lack of interest)
    b. Were you able to overcome them? If so, how?
12. What are your views on the frequency of the sessions?
    (would bigger or smaller gaps between the sessions have been good?)
    a. Is 8 weeks an appropriate duration for the Programme?
13. Did you have any difficulties dedicating time to the activities or otherwise completing them?
14. Did you adapt any of the activities? (Probe: did you stick to the structure)
15. Are there any changes you would suggest to the activities?
16. Have you been or would you in the future repeat the activities from the Programme with your child? Why/why not?
    a. Have you come up with any new STEM-based activities?
    b. Have you had any difficulties using the STEM lens to come up with STEM based learning opportunities?

c. How about with incorporating the learning from the Programme into daily life?

Materials and ongoing support

17. Were you satisfied with the home-play resource pack? Why/why not? (Probe: receiving the pack, sufficient contents, break down for each session)
    a. How useful was it?
18. Did you use the additional resources available online and in hardcopy such as the STEM lens information sheet for each activity? If so, were these helpful?
    a. If yes, will you continue to access the resources in the future? Why/why not?
19. Were you part of a Whatsapp group or broadcast? Researcher note: some settings set up their own Whatsapp group or broadcast, whereas other parents received a broadcast from Katy at Peeple (the trainer)
20. What did you think of the Whatsapp /broadcasts? [allow unprompted]
    a. What worked well/less well about it?
    b. What did you think of the content of the messages sent once a week consisting of prompts, and links to a Padlet with STEM knowledge and ideas for things to do at home using low/ no-cost resources?
    c. Did you feel they were useful? Did you generally put them to use at home or not?
    d. If not, why not? How could they be changed to be more useful?
    e. What worked well and less well about it? (Probe: frequency of nudges, ease of fitting them into normal day)
21. Did you engage with Whatsapp in any of the following ways:
    a. Asking questions?
    b. Sharing practice and ideas?
    c. Any other ways?
22. Was this useful?

Impact on child

In these questions we want you to think about your child and what difference you think the Programme made to them.

23. Do you think that your child enjoyed the activities?
24. How well did your child engage in the activities?

25. Do you think the Exploring Together Programme has made any impacts on your child? (For example are they displaying more curiosity around STEM, asking scientific questions?)
26. What was your child's level of confidence with STEM prior to starting the Programme, on a scale of 1-10? Has that improved since starting the Programme?
    a. If yes, in what ways? Where are they now from 1-10?
    b. If yes, which elements of the Programme contributed to this, if any?
    c. If not, why not?
27. Do you think your child has become more skilled in maths since starting the Programme? (Prompt: e.g. counting, subitising, ordering objects, measurements)
    a. If yes, in what ways?
    b. If yes, which elements of the Programme contributed to this, if any?
    c. If not, why not?
28. Do you think your child has become more skilled in science since starting the Programme? (Prompt: e.g. understanding of forces such as density of floating objects, space)
    a. If yes, in what ways?
    b. If yes, which elements of the Programme contributed to this, if any?
    c. If not, why not?
29. Do you think your child has become more skilled in language and communication since starting the Programme (e.g. using more vocabulary)?
    a. If yes, in what ways?
    b. If yes, which elements of the Programme contributed to this, if any?
    c. If not, why not?
30. Do you think the STEM Programme has had any other impact on your child? *(Prompt: confidence, teamwork, socio-emotional and behavioural changes, focus, self-control, adaptability to change, memory/recall)*

Impact on parent

These questions are about what difference the STEM training made to you.

31. Has your own confidence and attitude towards STEM changed since the beginning of the Programme? In what ways?

32. Do you feel more confident in your ability to support your child with improving their STEM skills at home through play and learning? (Probe: using STEM vocabulary, asking 'what if' / 'I wonder' questions; transferring STEM ideas into everyday activities) Why/why not?
    a. Do you feel confident in using ShREC interactions to support their STEM learning?
33. Do you feel more confident in your ability to support your child with improving their maths skills at home (e.g. providing opportunities for counting)? Why/why not?
34. Do you feel more confident in your ability to support your child with improving their science skills at home (e.g. providing opportunities to demonstrate forces)? Why/why not?
35. Has the Programme made any other impact on you? (Prompt: time spent playing with child, skills, future plans in STEM, likelihood to take up more training)

Unexpected impacts

36. Have you had more or less involvement with the child's setting/practitioner as a result of taking part in the Programme (e.g. to discuss further support)? If yes, how?
37. Has anything unexpected happened while taking part in the Programme? (either for yourself or for your child)?
38. Have there been any negative consequences of the Programme on yourself or your child?
39. Have there been any unexpected costs of the Programme?

Conclusions

40. Were you satisfied with the Programme overall?
    a. Are there any changes you would suggest to make the project easier to engage with or to have a greater impact?
41. Is there anything else you would like to add that we have not discussed already?

Thank and close

Interview guide - practitioners

Thank you for agreeing to take part in this interview.

The Institute for Employment Studies and the University of Oxford have been commissioned by Peeple to undertake an evaluation of the Peep Exploring Together Programme supporting the foundations of Science, Technology, Engineering and Maths

(STEM), being delivered by parents and guardians in their homes to their children between October and November this year. The STEM Programme is an intervention which aims to support parents to identify and make the most of STEM learning opportunities at home by talking, listening, and playing with their children.

The aim of our research is to understand how well the Programme works. We will also be seeing how the Programme in this format might be evaluated in the future. This will support its development to improve it for other families.

A key part of this work involves gathering feedback from early years staff and parents.

Key topics for our discussion today are:

- Your views on the online training sessions and home learning activities
- Your views and experiences of supporting parents to deliver the Programme at home
- Any observed effects of the Programme on parents and children.

Everything discussed in the interview is confidential and will only be used for the purposes of this research. We will write a report based on our findings which will be published in 2024. The information you share today will be anonymised in the report so no names will be used. This means that we will write about the main themes that came out of all the discussions we have had with staff and other stakeholders; however, no one will be identified. Please feel free to answer the questions as openly and honestly as possible, but if you prefer that we don't report something you say, please tell us.

The interview will take around 30 minutes and is voluntary which means you do not have to answer any questions that you do not want to and can choose not to continue the discussion at any time.

Before we begin, do you have any questions?

With your permission, I would like to record the interview. The recording will be kept securely within our research team and will be deleted six months after the end of the project. Would that be ok with you? *[If individual does consent, please ask them to confirm once the recording has started so that we have a record].*

Training

In these first questions we want to find out what you thought of the training itself.

1. First of all, what was your understanding and experience of STEM **before** starting the Programme? *(Probe for experience in the area e.g. have they done any other training)*
2. Can I just check, have you completed all the STEM training sessions?
3. (If not completed all) How many have you done? What prevented you from doing more?
4. What did you think of the training sessions? [allow unprompted]

a. *Prompt where needed:* What did you think of:
    i. The content of the training?
    ii. The quality of the trainers?
    iii. The quality of the training materials?
    iv. The volume of content/length and pace of the training?
b. *Do you think the language and concepts (such as the STEM lens) were easy to understand (for yourself and for parents)?*
c. *What worked well about the training? Were there any sessions you felt were more useful than others?*
d. *What worked less well? Were there any sessions you felt were less useful?*

5. Do you feel you had enough support from the trainers during the training?
    a. *Were you able to ask questions? If so, did the answers help?*
6. Was online training convenient and appropriate for you?
    a. *Did you watch it at the set times or watch the recording?*
    b. *Would you have preferred for example, face to face training or remote training at other times?*
    c. *Did you have any problems with using Padlet to access the training and other materials?*
7. How did you find filling out the training Reflective Journals?
    a. Did it seem an appropriate amount of reflection? Too much/too little?
    b. Was it helpful to you?
8. Do you think the training could be improved? If so, how? Probe for online mode, videos, Padlet, reflective journal, home activities etc

Delivering the Programme and implementation support from Peeple

9. How did you find supporting delivery of the Programme (including using the Whatsapp group and support for families continued engagement)?
    a. What did it involve?
    b. Did you feel confident to support delivery after the training?
10. Did your setting set up a Whatsapp group/broadcast? *Researcher note: some settings set up their own Whatsapp group or broadcast, whereas other parents received a broadcast from Katy at Peeple (the trainer)*

11. Did you have any challenges dedicating time to the Programme or otherwise supporting delivery?
    i. [If relevant] Time to set up and send/ respond to nudges on WhatsApp group
    ii. Time to follow up with families to support continued engagement
    b. If so, how did you overcome these challenges?
12. Outside of the training, what kind of support and advice did you receive from Peeple? (e.g. encouraging peer support and sharing practice, through the Whatsapp group)
    a. How often did you receive support from them?
    b. Did you feel adequately supported by them?
    c. Were you able to ask them any questions? If so, did the answers help?
13. Did you receive support from colleagues? (for example, other practitioners or your manager?)
14. (If covered) Did you find the Whatsapp group for practitioners helpful? Why/why not?

Parents engaging with the Programme

I'm now going to ask some questions about your experience of supporting parents to engage in the Programme.

15. Did parents engage and participate in the Programme?
    a. What barriers did parents have to participating?
    b. What did you do to try to resolve these barriers/ any disengagement or non-attendance? Was this helpful?
16. How did you think parents found completing the home learning activities with their child? [allow unprompted]

    Prompt where needed (using timetable):

    a. What worked well? Were there any activities they found particularly engaging/ useful?
    b. What worked less well? Were there any activities they found that were less engaging/ less useful?
17. Have parents found the ShREC approach useful for supporting children's STEM learning?

18. What made it easier for parents to complete the activities? (Probe: ongoing support from Whatsapp group, the resource pack, other training materials, child's level of engagement and age/ability appropriateness)
19. What were the challenges for parents in completing the activities? (Probe: child, lack of ongoing support, the resource pack, other training materials, child's level of engagement; age/ability appropriateness)
    a. Were you able to support them to overcome these challenges? How?
20. What are your views on the frequency of the sessions?
    (would bigger or smaller gaps between the sessions have been good?)
    a. Is 8 weeks an appropriate duration for the Programme?
21. Did parents adapt any of the activities? (Probe: did they stick to the structure)
22. Are there any changes you would suggest to the activities?
23. Did parents have any difficulties using the STEM lens to come up with STEM based learning opportunities as part of the activities?
    a. Were you able to help them overcome these difficulties? If so, how?
24. How about with incorporating the learning from the Programme into daily life?
25. Was there evidence of STEM ideas being implemented at home?

Materials and ongoing support

26. Were parents satisfied with the home-play resource pack? Why/why not? (Probe: receiving the pack, sufficient contents, break down for each session)
27. Did you use the online resources available to practitioners such as the ShREC information sheet? If so, were these helpful?
    a. **If yes**, will you continue to use the resources in the future? Why/why not?
28. What did you think of the Whatsapp Broadcast for parents? [allow unprompted]
    a. What worked well/less well about it?
    b. What did you think of the content of the messages sent once a week including the prompts, STEM knowledge and ideas for things to do at home using low/ no-cost resources?
    c. Did you feel they were useful? Did parents respond to them and appear to put them to use at home or not?
    d. If not, why not? How could they be changed to be more useful?
    e. What worked well and less well about it? (Probe: frequency of nudges, ease of fitting them into normal day)

29. (If set up own Whatsapp group) In what ways did parents engage with the Whatsapp group? Prompt:
    a. Asking questions to the setting practitioner?
    b. Peer support e.g. Asking questions to other parents?
    c. Sharing practice and ideas?
    d. Any other ways?
30. Was this useful to parents?

Impact on child

In these questions we want you to think about what difference you think the Programme made to the children in your setting who were involved.

31. Do you think the STEM Programme has made any impacts on the children in your setting? (For example are they displaying more curiosity around STEM, asking scientific questions?)
32. Do you think their confidence in STEM has improved since starting the Programme?
    a. If yes, in what ways?
    b. If yes, which elements of the Programme contributed to this, if any?
    c. If not, why not?
33. Do you think the children have become more skilled in maths since starting the Programme? (Prompt: e.g. counting, ordering objects, measurements)
    a. If yes, in what ways?
    b. If yes, which elements of the Programme contributed to this, if any?
    c. If not, why not?
34. Do you think the children have become more skilled in science since starting the Programme? (Prompt: e.g. understanding of forces such as density of floating objects, space)
    a. If yes, in what ways?
    b. If yes, which elements of the Programme contributed to this, if any?
    c. If not, why not?
35. Do you think the children have become more skilled in language and communication since starting the Programme (e.g. using more vocabulary)?
    a. If yes, in what ways?

b. If yes, which elements of the Programme contributed to this, if any?

c. If not, why not?

36. Do you think the STEM Programme has had any other impact on the children? *(Prompt: confidence, teamwork, socio-emotional and behavioural changes, focus, self-control, adaptability to change, memory).*

Impact on parent

These questions are about what difference the STEM training made to the parents

37. Do you think the Programme has had an impact on parents? In what ways?

38. Has the parents' confidence and attitude towards STEM changed since the beginning of the Programme?

39. Do you think that parents are more confident in their ability to support their child with improving their STEM skills at home through play and learning? (Probe: using STEM vocabulary, asking 'what if' questions; transferring STEM ideas into everyday activities) Why/why not?

    a. Do you think they are using ShREC interactions to support their STEM learning?

Impact on practitioner

40. Has the Programme had any impact on your own practice? In what ways?

Unexpected impacts

41. Have parents had more or less involvement with you/the setting as a result of taking part in the Programme (e.g. to discuss further support)? If yes, how?

42. Has anything unexpected happened while taking part in the Programme? (either for yourself or the parents or children in your setting)?

43. Have there been any negative consequences of the Programme on yourself, the parents and/or the children?

44. Have there been any unexpected costs of the Programme?

Conclusions

45. Were you satisfied with the Programme overall?

    a. Are there any changes you would suggest to make the project easier to engage with or to have a greater impact?

46. Is there anything else you would like to add that we have not discussed already?

Thank and close

Parent Research Information Sheet

Evaluation of the Exploring Together Programme - *Supporting the foundations of Science, Technology, Engineering & Maths (STEM)*

What is this project about?

- The Institute for Employment Studies and the University of Oxford have been commissioned by Peeple (Peeple - charity supporting parents with children's learning) to carry out a research study of their Exploring Together Programme (ETP) and how this can support the development of children's science, technology, engineering, and maths (STEM) skills.
- The Programme has been developed and piloted by Peeple with Sheringham Nursery School in Newham, to support parents to identify and make the most of STEM learning opportunities at home by talking, listening, and playing with their children.
- Your child's Early Year's setting/nursery agreed to take part in the ETP to:
    - Support your child's early STEM learning as part of everyday activities and routines in their setting.
    - Support you to participate in the online Exploring Together Programme.
    - Support and encourage you to make the most of STEM learning opportunities at home with your child.
- We understand that as part of your participation in the ETP, you have taken part in online training and completed activities with your child at home, between October and November 2023.

What is the purpose of the research?

- The aim of this research is to find out whether the ETP will support parents and guardians to become more aware of and confident in making the most of everyday opportunities for exploring STEM with their child.
- We will also be seeing how the ETP in this format might be evaluated in the future. This will support its development to improve it further.

What happens if I decide to take part in the research?

IES will be selecting some early years settings/nurseries taking part in the Programme to be case studies. If your child's setting is selected, staff from IES may Contact you to arrange a telephone interview to capture your views of the Programme and its perceived impact on you and your child. If you agree to participate in a telephone interview, we will

arrange a private conversation by telephone call between you and one of our research team. It will take 30 minutes in total and will be arranged for a time convenient for you.

A follow-up online questionnaire will also be sent to all parents to complete and return electronically to the University of Oxford. The questionnaire will take approximately 15 minutes to complete online (printed copies available if needed). It will include questions on the home learning environment, particularly relating to maths and science. All parents who return a completed questionnaire at the end of the Programme will receive a £5 Amazon gift voucher, which will be sent using the email address supplied when they signed up for the study.

What kind of information do we collect?

The research will involve collecting data via:

- Questionnaires being sent to all parents by the University of Oxford.
- Interviews with key staff (e.g., settings managers and practitioners) in case study early years settings/nurseries.
- Interviews with parents/carers in case study settings, who have consented to take part.
- Review of the training and materials provided online by Peeple.
- Analysis of management information data from the delivery team.

What happens to the information I share, or 'my data'?

- If you choose to take part in a research interview, with your permission, we'll record our telephone conversation (audio) and take notes on your views and opinions of the Exploring Together Programme.
- We only store one file with your name and other identifying information (like your email address) so we can reach you. This is held securely on our server and not shared with anyone outside the research team. Anything else you share is labelled anonymously (for example, as 'Participant 1').
- If you choose to take part in an interview or fill in the questionnaire, the data you give will be used for research purposes only. In reporting, **no child, parent and/or setting** will be named, nor will any information be included that could reveal you or your child's identity, except with your explicit permission:
    - IES will produce a report that summarises the main findings from these research activities. The University of Oxford will prepare data for submission to a peer reviewed academic journal. The Research Team may decide to publish the report and disseminate more widely.
- To protect your data, we delete the audio recording of our conversation, the file with your name and other identifying details as well as the other information you provide 6 months after the project is completed (this is currently estimated to be September 2024). Further information on how your data will be used is available in our privacy notice.

Who do I contact to ask questions?

If you have questions about the evaluation, or would like to remove the information you have provided, please email ETPSTEM@employment-studies.co.uk or call the Research Manager, Jade Talbot on 01273 763409.

Practitioner Research Information Sheet

Evaluation of the Exploring Together Programme - S*upporting the foundations of Science, Technology, Engineering & Maths (STEM)*

What is this project about?

- The Institute for Employment studies and the University of Oxford have been commissioned by Peeple (Peeple – charity supporting parents with children's learning) to carry out a research study of their Exploring Together Programme (ETP) and how this can support the development of children's science, technology, engineering, and maths (STEM) skills.
- The Programme has been developed and piloted by Peeple with Sheringham Nursery School in Newham, to support parents to identify and make the most of STEM learning opportunities at home by talking, listening, and playing with their children.
- Your setting has agreed to take part in the ETP to:
    - Support children's early STEM learning as part of everyday activities and routines in their setting.
    - Support parents to participate in the online Exploring Together Programme.
    - Work with parents to encourage them to support early STEM learning at home.
- As part of your Early Years setting's participation, practitioner(s) from your setting participated in the training and delivery support (the live sessions and online modules) ahead of parents and guardians delivering the ETP to their children at home, between October and November 2023.

What is the purpose of the research?

- The aim of this research is to find out whether the ETP will support parents and guardians to become more aware of and confident in making the most of everyday opportunities for exploring STEM with their child.
- We will also be seeing how the ETP in this format might be evaluated in the future. This will support its development to improve it further.

How will my setting be involved in the research?

IES will be selecting some settings taking part in the Programme to be case studies. If your Early Years setting is selected, staff from IES will:

- Contact you to arrange a suitable time to interview practitioners to collect their feedback on the training and perceptions of the impact of the Exploring Together Programme on parents and their children. These interviews will be carried out by Teams/Zoom/telephone at a time that suits your staff.
- Contact one or two parents to arrange a telephone interview to capture their views of the Programme and its perceived impact on them and their children.
- A follow-up online questionnaire will be sent to all parents to complete and return electronically to the University of Oxford. The questionnaire will take approximately 15 minutes to complete. As before, these will be online (printed copies available if needed) and include questions on the home learning environment, particularly relating to maths and science.

What kind of information do we collect?

The research will involve collecting data via:

- Questionnaires being sent to all parents by the University of Oxford.
- Interviews with key staff (e.g., settings managers and practitioners) in case study settings.
- Interviews with parents/carers in case study settings, who have consented to take part.
- Review of training Programme and materials provided online by Peeple.
- Analysis of management information data from the delivery team.

What happens to the information I share, or 'my data'?

- If you choose to take part in a research interview, with your permission, we'll record our telephone conversation (audio) and take notes on your views and opinions of the Exploring Together Programme.
- We only store one file with your name and other identifying information (like your email address) so we can reach you. This is held securely on our server and not shared with anyone outside the research team. Anything else you share is labelled anonymously (for example, as 'Participant 1').
- If you choose to take part in an interview, survey, assessment or case study for this project, the data you give will be used for research purposes only. In reporting**, no individuals or settings** will be named, nor will any information be included that could reveal your identity, except with your explicit permission:

- IES will produce a report that summarises the main findings from these research activities. The University of Oxford will prepare data for submission to a peer reviewed academic journal. The Research Team may decide to publish the report and disseminate more widely.

- To protect your data, we delete the audio recording of our conversation, the file with your name and other identifying details as well as the other information you provide 6 months after the project is completed (this is currently estimated to be September 2024). Further information on how your data will be used is available in our privacy notice.

Who do I contact to ask questions?

If you have questions about the independent evaluation, or would like to remove the information you have provided, please email ETPSTEM@employment-studies.co.uk or call the Research Manager, Jade Talbot on 01273 763409.