Using a behaviour change framework to develop an Early Years literacy and science project to support parental engagement

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Abstract

Parental engagement in children's education is an important aim for many schools. This paper presents the development and evaluation of a literacy and science project for families with children aged 3 to 5 in nursery and reception classes at a school in North East England where parental engagement was a focus for development. The project was developed using a Theory of Change and incorporating a behaviour change framework. In total, 87 families took part in the project, which spanned the COVID-19 pandemic. Due to lockdowns, project delivery shifted to an online model and we describe how the behaviour change framework was used to support this change. There was strong and regular engagement in the project by the families, with reasons for non-participation related to work requirements. Families reported that the books were read repeatedly at home after the sessions, but that there was less repeat use of the science activities. Finally, we outline some implications for schools and external organisations when planning similar projects.

Introduction to the project

Me, You and Science Too (MYST) was a science and literacy engagement project co-created by the research team and a primary school in the North East of England, which ran between 2019 and 2021. The school was sited in an area of deprivation, with 50% of pupils receiving free school meals. All 88 families with children in nursery and reception classes were invited to take part in the project, with specific attention given to how to engage families previously considered, by the school, as 'hard-to-reach'. In total, 87 children aged between 3 and 5 and their parents and carers were active participants in the project.

The project had a number of aims: to support parents/carers with skills and confidence to talk about science with their children; to strengthen relationships between home and school; and to improve children's outcomes in reading and science.

Ten storytime and science activity sessions were planned to take place between October 2019 and October 2021. Commercially-published picture books were selected by the research team on the basis of their science or STEM-related content[1]. Simple STEM activities linked to the science in the book were then devised; e.g. for the story *Hey, Water!* (Portis, 2020), families made their own water filters and cleaned some muddy water.

Each session included a member of the research team with teaching experience reading the story aloud and modelling good practice (such as varying pace and intonation whilst reading, taking time to pause and discuss the story as it progressed, asking questions about what happened in the story), parent and child reading the story together, and a simple science activity linked to the theme of the story. After each session, the storybooks were given to the families to keep, along with physical and online materials to extend the reading and science exploration. Families who were not able to attend the sessions were also given a copy of the book and activity by the teacher.

The project received ethical approval from Northumbria University, and all adult participants gave informed consent to take part in the research aspects of the project. Declining to take part in the research did not prevent the family from attending the storytime sessions.

[1] The full selection of books, and accompanying activities, can be viewed at https://nustem.uk/myst/

The project was affected by the Covid-19 pandemic in March 2020, which meant that of the 10 planned sessions, only 8 were delivered: 3 in school, and 5 online following lockdown restrictions.

Parental engagement in literacy and science

Parental involvement with children's education is positively associated with children's academic development and achievement at all socio-economic levels (Axford *et al,* 2019). For young children, there are benefits to both parents and children of developing shared reading activities, including higher parental self-efficacy in helping their children become better readers, and a better relationship (Education Endowment Foundation, 2018; Lam *et al,* 2013). The Book Trust (2023) found that over 60% of parents and carers read regularly with their pre-school children, but 28% did not find reading with their child easy.

Parental attitudes to science can be coloured by parents' own experiences of school (Kaya & Lundeen, 2010) and they may hold stereotypical views about science (Tenenbaum & Leaper, 2003). Parents may also be less confident talking about science with their children than they are talking about literacy and mathematics (Silander *et al,* 2018) and may not recognise 'science' in the informal activities that they do with their children (Hightower *et al,* 2021). Several studies have looked at how stories or picture books can be used to support science learning. This includes teaching of science process skills such as observing, classifying and predicting (Monhardt & Monhardt, 2006) and as a basis for developing science enquiries (Salehjee, 2019).

Although parental involvement is seen as beneficial, there are barriers to this involvement. Hornby and Blackwell (2018) identified barriers to parental engagement, including parents' own negative experience or outdated views of school, limited school opening hours and work-related time restraints for parents, and parents' confidence in their knowledge and ability to engage with their child's learning.

This paper explores a school-based project aimed at maximising family involvement at parental reading and activity sessions.

Theoretical underpinnings

A Theory of Change (ToC) can provide a framework to understand, test and refine the impacts of a particular project (HM Treasury, 2011) and enables articulation of underlying assumptions and how the project is expected to achieve its aims (Reinholz & Andrews, 2020). Typically, it includes a goal, and lays out the intermediate outcomes that are needed to achieve that goal. It is also possible to incorporate programme theory and action models to provide more detail on activities and their implementation (Coryn *et al,* 2011). ToCs often utilise an iterative action research approach to evaluation (Vogel, 2012), which typically involves plan–act–observe–reflect stages in a number of cycles (McAteer, 2013). This allows dynamic changes in an intervention to be responded to.

Many initiatives that use a Theory of Change aim to produce a behaviour change (Breuer *et al,* 2015). Creating and sustaining behavioural change is challenging, but can be achieved (Michie *et al,* 2018). The Behavioural Insights Team[2] developed a simple 'EAST' framework to summarise the literature on behavioural change for policymakers, which can be summarised as 'Make it **E**asy, **A**ttractive, **S**ocial, **T**imely' (Service *et al,* 2014). In the current project, the targeted behavioural change was to increase the amount of reading and science activities that families did together at home.

[2] The Behavioural Insights Team is a commercial organisation set up to (initially) advise UK government. The EAST framework relates to achieving behavioural change and more broadly to https://www.bi.team/

Methodology

A Theory of Change (ToC) model was developed for the project (Figure 1), incorporating a change model that described the mechanisms by which the desired outcomes are achieved, and an action model that described the activity to be delivered, and incorporated the EAST framework principles that underpin these (shaded highlight).

To develop the ToC approach, the research team worked backwards from the project aim of 'Parents and children more confident to talk about STEM'. This aim was chosen as being within the ceiling of accountability of the research team, i.e. an aim that was directly achievable in the duration of the project (De Silva *et al,* 2014). Plausible causal pathways to achieve this aim were identified and developed into a coherent model. Integration of the EAST framework allowed the exploration of the mechanisms to support ongoing engagement. Feedback loops in the ToC that could be explored using an action research approach were identified, allowing for ongoing adjustment of delivery and a depth of understanding about how different aspects of the project worked together.

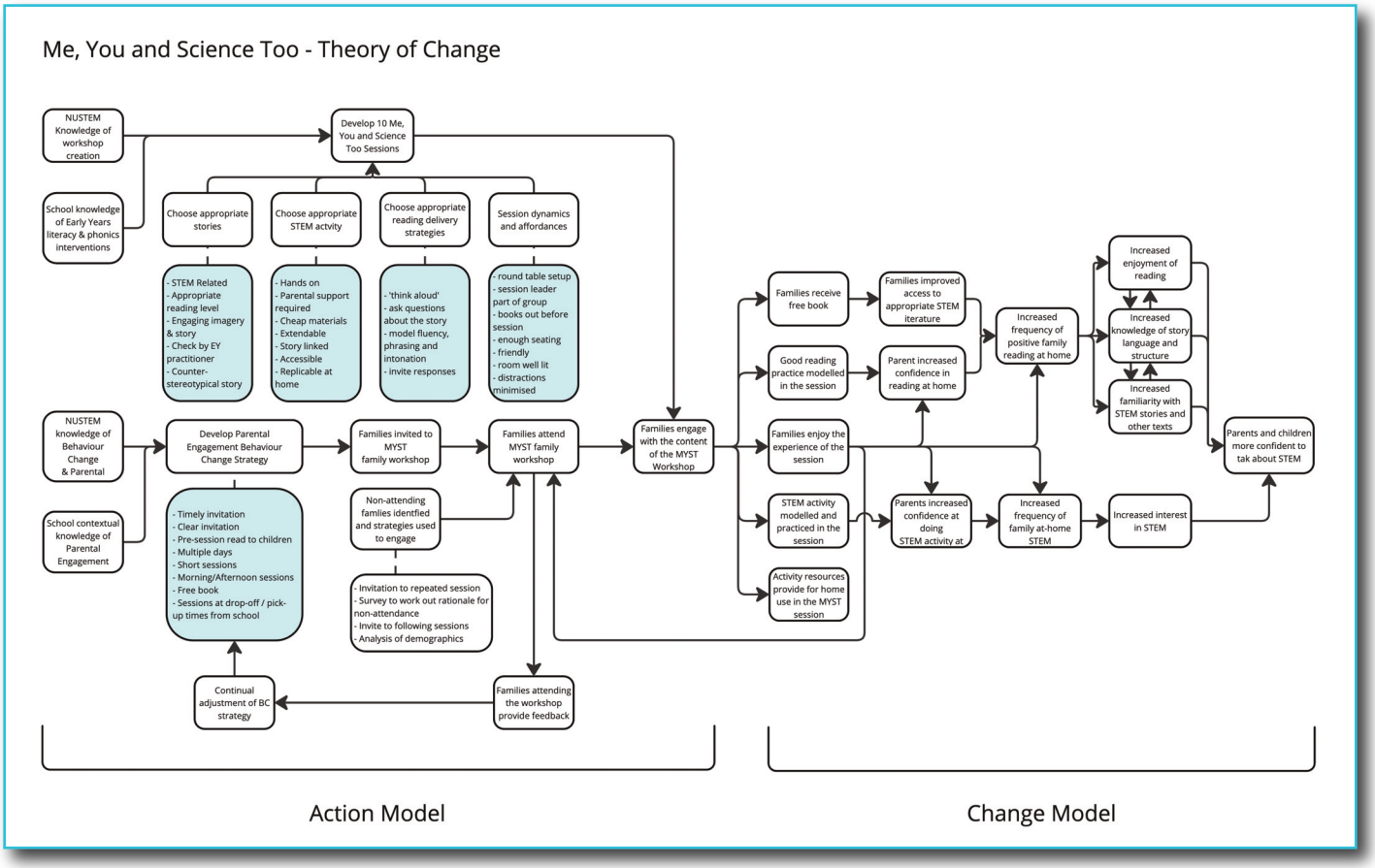


Figure 1. Theory of Change model for Me, You and Science Too (MYST). (Shaded boxes are linked to the EAST framework of behaviour change (Service *et al*, 2014).)

The EAST framework provided the structure to develop successful family engagements. In making engagement easy for parents, multiple different timeslots for the same book session were offered to accommodate parents' schedules. The sessions were marketed attractively, including party invitations that assumed attendance, and the classroom teacher encouraged participation through timely reminders about sessions at school drop-off and pick-up. Multiple entry points allowed participation to grow at later sessions through word of mouth within parents' networks. Table 1 below outlines how each aspect of the EAST framework was used to develop the activity. Using an action research approach, after each book session, the planning and resources were reviewed and amended as appropriate.

Table 1. The use of an EAST framework to support engagement with book reading sessions.

East framework	Planning
Easy	Invitations sent home in school bags. Invitations assume parents' attendance, and stated 'only reply if you can't make the session'. Language in invitations was carefully chosen to make sure that the purpose of the session and the times were clear and obvious.
Attractive	Invitations to children aimed directly at them: 'You are invited to…'. Invitations invited children to a storytime rather than overtly to a science session. High quality, visually appealing books chosen. A free copy of the book was given to each family attending a session.
Social	Delivery team read the book during assembly to introduce children to the idea. Repeated invitations and repeated interactions. Classroom teachers encouraged parents to come along at school drop-off and collection times. Activity area set up in a social way around a table, with no obvious lead or expert. The school's communication app was used to advertise and share pictures from the activities.
Timely	Range of time slots available for families to attend (e.g. before and after school on multiple days). Survey to attending and non-attending parents to ascertain the best delivery times. Reminders sent out via the school's communication app before the sessions. Clarity of expectations embedded into the advertising materials.

COVID adaptations

In March 2020, schools in England closed to most children. It was necessary to adjust the project to meet its aims through a different medium of delivery. The ToC was adapted to an online delivery model. Strategies originally used for in-person delivery were supplemented and, in some cases changed, to support online delivery (Figure 2).

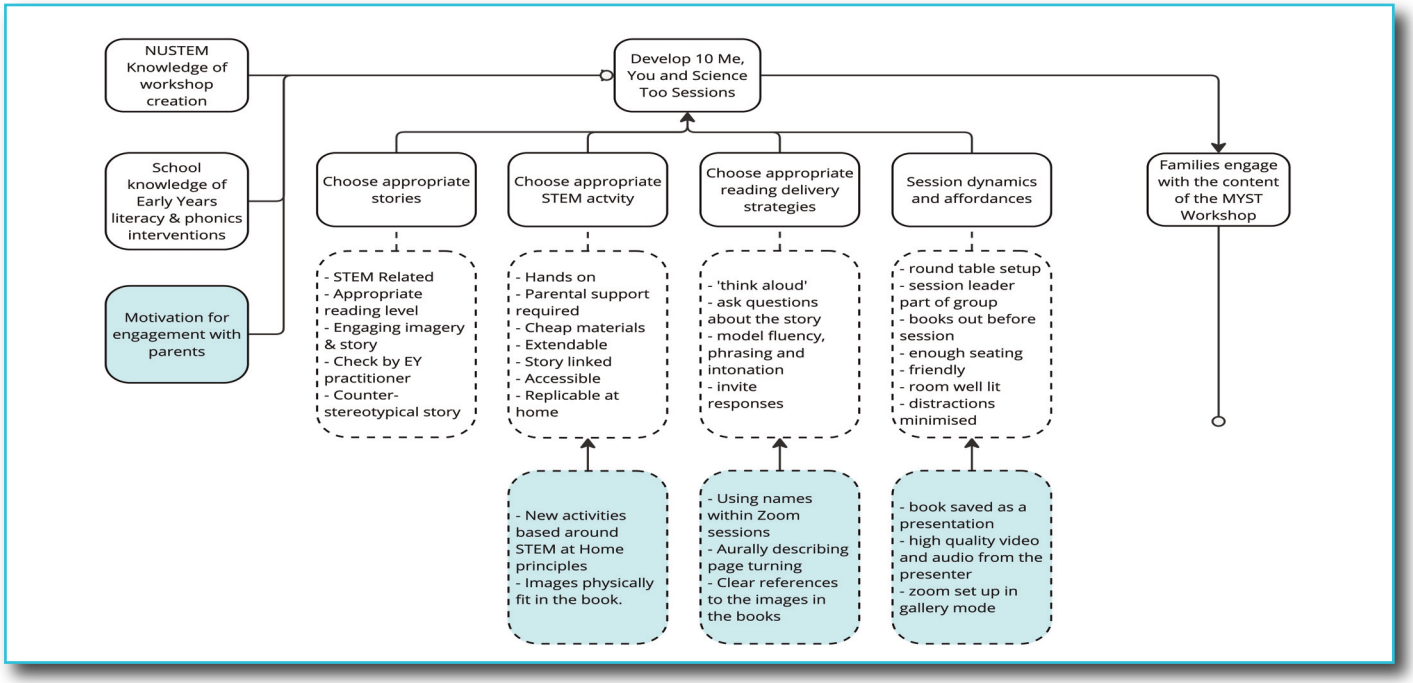


Figure 2. COVID-19 adaptations to the action model section of the Theory of Change. (Shaded boxes indicate how the strategies were changed to facilitate online delivery.)

The behaviour change and engagement aspects were also reviewed using the EAST framework. To keep participation 'Easy', links were sent out in advance through the school's existing home-school communication app, and guidance was shared with families on how to access Zoom. Parents could just 'turn up' and didn't have to book onto sessions in advance. To maintain the 'Social' element of the guidance, families attending the online sessions were encouraged to turn their cameras on so that they could see and interact with other families taking part, and the school's app was used to advertise and share pictures from the activities, as well as provide repeated invitations. Sessions continued to be offered on a number of different timeslots and days to ensure that they were 'timely' for families who might have been working from home or home-schooling a number of children. The school's app was also used to send out reminders just before each session was due to start.

Research tools and data

The evaluation was designed to grow with the project through action research cycles: in the first year evaluating short-term outcomes via light-touch methods, and in the second year evaluating longer-term outcomes using longitudinal data. Data collection was planned through project-monitoring information, feedback postcards, responsive surveys during sessions, posts on school social media, tracked pre- and post-project surveys and post-project interviews with stakeholders. However, the proposed pre- and post-project tracking of participants did not prove adaptable to the move to online delivery methods and could not be completed. The central outcome, 'parents and children more confident to talk about science', which required the longitudinal data, is therefore not included in this paper. Instead, the project used three of the short-term outcomes drawn from the ToC, and reported the extent to which:

- families attended the MYST workshops;
- families engaged with the content of the workshop; and
- families engaged with the content beyond the workshop.

Findings

Due to programme adaptations in response to the COVID-19 pandemic, findings are split into in-person and online delivery.

Outcome 1: Families attend the MYST Workshop

The first book session was offered 10 times and attended by 60 families (68%) (see Table 2).

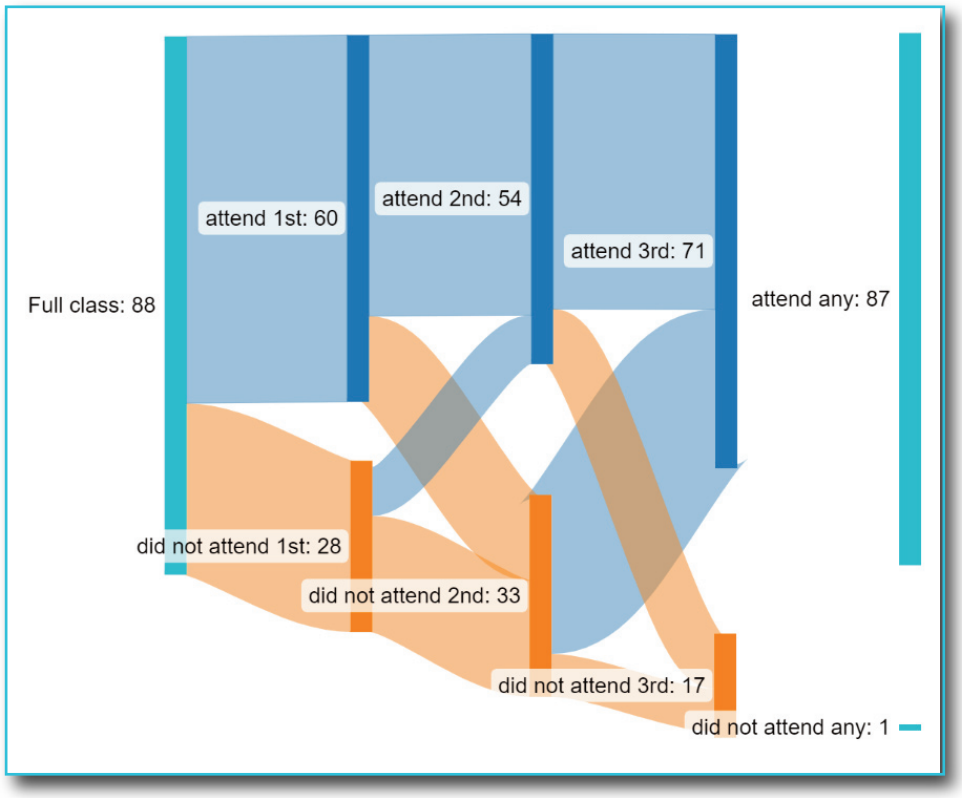
Dates and times offered	Number of families	Cumulative total
Monday 8:30am	6	6
Monday 9:10am	8	14
Monday 3:15pm	10	24
Tuesday 8:30am	4	28
Tuesday 9:10am	10	38
Tuesday 3:15pm	2	40
Wednesday 8:30am	5	45
Wednesday 9:10am	6	51
Wednesday 3:30pm	3	54
Catch-up session	6	60

Table 2. Times offered for Book Session 1.

Figure 3 visualises the engagement of families across the sessions and highlights how repeated invitations to join or re-engage in the project achieved high levels of involvement with the project overall. At each session, the number of families attending and not attending is presented. Out of a possible 88 children and their families, by the end of the project, 87 were able to engage with the project at some point.

Figure 3. Sankey diagram showing engagement flows across the first three book sessions. Each solid vertical line represents attendance (blue) or non-attendance (orange) at the first three sessions.

The flows between lines represent how many people attended each subsequent session. The turquoise lines represent the full cohort.



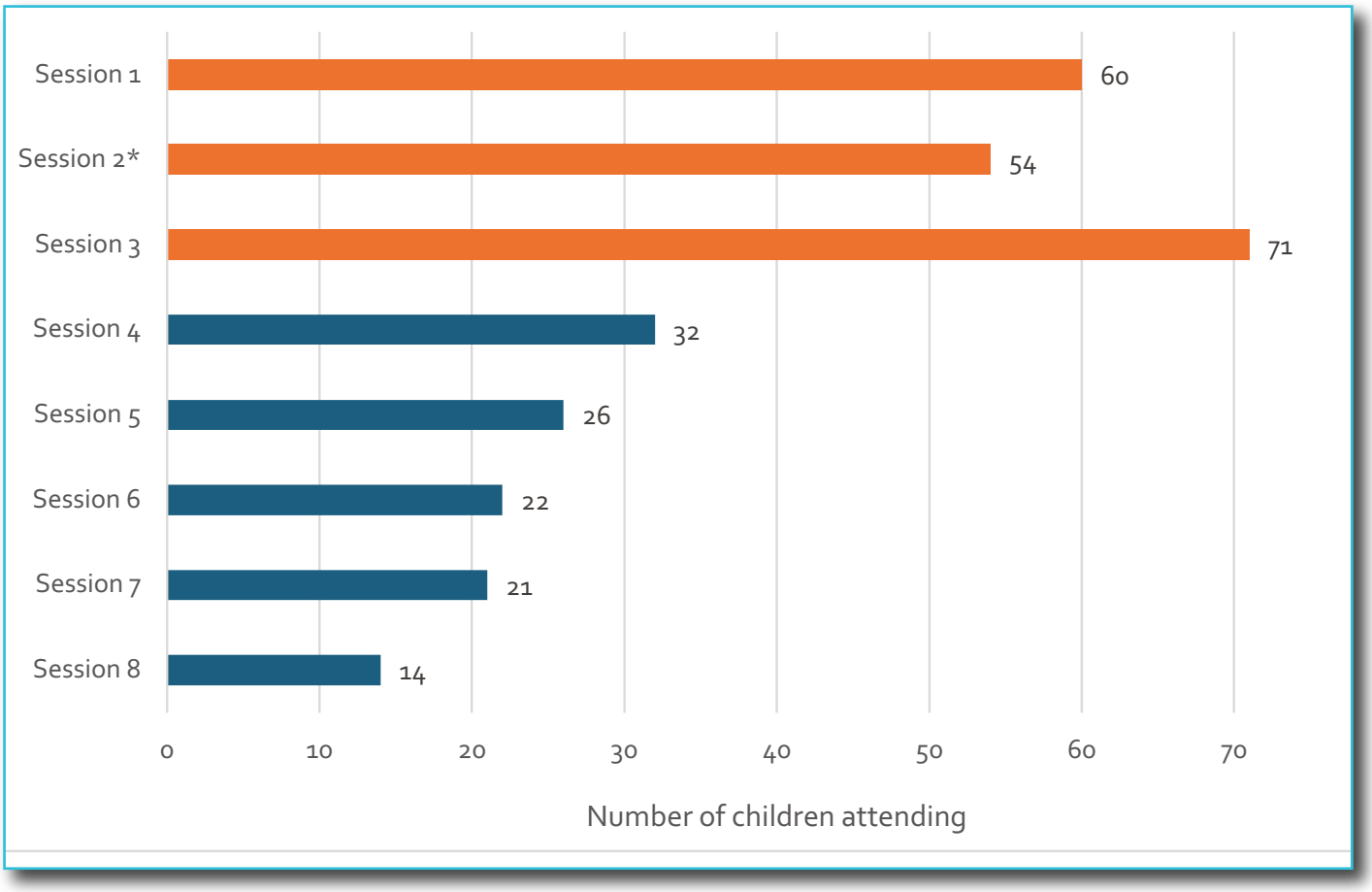
Tracking of individual families across the sessions shows that 67% (40/60) who attended the first book session attended the next two, and 88% (53/60) attended one of the sessions following.

Surveying was used to build understanding of how to support the delivery models. The pre-survey for the first book session (n=52) showed a strong commitment among carers to support their child and their learning. Common motivations for engagement were: 'To do something together' (30%), 'to find out how to help child at school' (15%).

Families not attending the first session were also surveyed (n=5). Despite the small sample size, this indicated that work was a significant barrier. Analysis of project-monitoring information revealed positive strategies used to allow children to attend, with different family members attending different sessions, drawing on wider family networks (parents, grandparents, aunts, etc.) in 13 of the families attending.

The move to online sessions saw a drop in engagement (Figure 4). On average, 26% (23/88) families in nursery and reception attended the online sessions. Session feedback from attending families showed that some were new to the Zoom platform and were experiencing technical difficulties. In a post-project interview, one parent explained the challenges to her participation online: '*There was a couple of chats I did one-handed while juggling the baby, and I'm trying to sort the screen for her to get the multiscreen on and I couldn't remember how to do it. The person was trying to read the book, I'm trying to do it one-handed, the baby is screaming and I'm like you're just going to have to watch it like that for now*.'

Figure 4. Engagement numbers at each book session.
(*Session 2 affected by Norovirus outbreak in the school. Sessions 4 – 8 (blue) were online.)



Monitoring repeat engagements of families at online sessions was more challenging, but available data are indicative of high repeat engagement among at least a small cohort of families. In the feedback survey for the 6th book session, we asked how many previous sessions participants had attended and, of the 8 responses, 4 participants said that they had attended all previous sessions offered, 5 had attended previous sessions in-person, while 3 began attending sessions in the second year.

Outcome 2: Families engage with workshop content

Children were asked to rate how many stars they would give the books in each in-person session. The majority of children enjoyed the books and, overall, 21% gave 4 stars and 75% gave 5 stars. Later feedback from parents in surveys indicated the value in the story-based approach for learning:
'*The story itself and the illustrations to go with it are great conversation starters.'*
'My daughter spent time talking about each page.'

A small proportion of families did not return after the first in-person session (11%). One parent highlighted their child's developmental age to engage as a reason: '*Thought it was good and fun for children but my child was too young to really engage*'. Observations from project and school staff also indicated that some carers were becoming annoyed when their child was not listening, or running around. These families did not attend future sessions.

Workshop feedback surveys from the online sessions showed that 82% of parents (14/17) reported that they had enjoyed the sessions, with 65% of parents (11/17) reporting to have enjoyed it a lot. Post-project interviews with parents again reveal enthusiasm for the session model: '*She was always dead happy when she got the book, but once she had done the Zoom meeting all she wanted to do was log back on and do the next one. She wanted to do it again and again. It was hard for her to wait for the next one*.'

Session feedback also indicated that parents felt the presenters had done well to maintain engagement in an online setting and how interactive the sessions were: '*... the story reader involves every child that is on Zoom at that time*' and '*The reader was engaging and had time for each child who was participating*'. Conversations with parents indicated a preference for face-to-face over online models but that, when this was not possible, delivery over Zoom had worked well.

Data collected and analysed against Outcome 2 present evidence that the MYST project was rated highly by those who attended. The project was still found to be enjoyable by those attending the online sessions after COVID-19.

Outcome 3: Families engage in workshop content beyond session

93% of participants who returned feedback postcards for sessions 1 (n = 45) and 2 (n = 34) reported that they had re-read the book again after the session. Feedback from the Headteacher indicated that parents had been keen to share their engagement with the session content at home on the school's digital app. An interview with a parent post-project highlighted the value of engaging with the same content across home and school environments: '*When the "Look Up" story was the bedtime story on CBeebies [BBC], [my child] ran to the screen and said "that's my book"*'.

The science activities used as part of the sessions were also repeated, with 78% (60/77) of participants who returned feedback for sessions 1 and 2 reporting that they had done the activities again. Some activities, such as the constellation tubes (NUSTEM, n.d.), were popular as they could be added into the bedtime routine: '*Me and [child] read "Look Up" at home at bedtime and he loved using his telescope with the torch*'. However, not all families were able to repeat activities: '*I said I was going to probably try and do that again when I had just him and a bit more time, but we haven't*.'

Evaluation of the online post-COVID sessions showed that children were reading the books repeatedly, with 70% of parents re-reading the book '*many times*', and 30% re-reading the book '*once or twice*'.

'"*Somebody Swallowed Stanley", she loved that one. She told everyone about it and then we went to the beach and things and suddenly she's "you've got to take your rubbish home because it ends up in the sea". She really notices what the book says.*'

Discussion and implications for practice

The MYST project intended to support families to strengthen shared reading and science activities in an informal out-of-school setting. The Theory of Change developed for the project identified a number of short- and medium-term outcomes. As with many outreach or research projects running between 2019 and 2021, MYST was impacted by the COVID-19 pandemic, leading to an adaptation of the delivery method and evaluation plan over the course of the project.

This paper presents findings against three outcomes. The first outcome was 'Families attend MYST sessions' and the data present strong evidence of the involvement of parents and families in the workshops over time and in the face-to-face sessions. The project was also able to retain 25% of families during the challenges of the COVID-19 pandemic. The second outcome was 'Families engage with the content of the workshop' and the data provide evidence that the MYST sessions were rated highly by those who attended. The project was still found to be enjoyable by those attending the online sessions after the pandemic. Finally, the third outcome was 'Families engage with the content beyond the workshop' and the data show that participating families read the storybooks regularly at home after the sessions, but repeated the science activities less frequently.

The Theory of Change also posits a number of longer-term outcomes, including increased parent/carer confidence in talking about STEM, which were not possible to investigate in the current project, but which would be a valuable avenue for future research.

The use of the EAST framework to design the planned delivery provided focus on the needs and requirements of the families. This resulted in high levels of engagement, even with families previously considered by the school as 'hard to reach'. The use of the framework also facilitated the change from in-person to online delivery as a consequence of the COVID-19 pandemic. While families indicated that they would prefer a face-to-face delivery model, remote delivery was still valued by the participants, and could be useful under circumstances where in-person delivery is challenging, e.g. where a project is working across a wider geographical area instead of a single school.

It is important to note, however, that the high levels of engagement required concomitant time and ongoing effort from the research team and school staff. The families were not necessarily 'hard to reach' but 'expensive to reach', both financially and time-wise, because the decision to provide up to 10 separate sessions for each book required much more staff time for delivery than would have been the case if only one session had been offered. For high engagement with families, projects should include funding for school staff involvement. We would also suggest that funders should recognise that projects that are aiming for high levels of engagement from a particular cohort may appear more expensive than other, lighter-touch, projects.

In terms of building stronger relationships between home and school, and promoting family engagement with the project, the use of the school's communication app was very helpful in providing two-way communication. This allowed reminders to be sent out, images from sessions to be shared, and enabled families to feed back on what they had done after the sessions.

Developing a Theory of Change that consisted of an action model and a change model provided a helpful theoretical basis for the planning, development and delivery of the project. Incorporating the EAST framework facilitated a clear focus on the needs of the participants in the project, and also supported the research team to adapt the project in response to the pandemic. Use of such frameworks when planning projects is recommended by the research team as a way to improve the quality of delivery and impact of projects.

Overall, despite the challenging circumstance, the outcomes of the MYST project were achieved and families were facilitated to engage more directly with the school and teachers, and children and their carers re-read the books after the sessions.

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