



Parents talking everyday science with young children

A Cass School of Education and Communities project funded by the 2015 UEL Civic Engagement Fund

Evaluation report to funders November 2015

Eva Lloyd, Casey Edmonds, Celony Downs, Rebecca Crutchley and Fran Paffard, with Grace Amfo and Vikki Silvers

Contents

Acknowledgements	3
Summary	4
1 Introduction	1
2 Aims and added value of the Cass early years project.....	3
3 Matching the project design to UEL"s 2015 Civil Engagement Fund criteria	4
4 The Cass early years project: design and delivery	6
5 The Cass early years project: evaluation design and delivery	10
6 Evaluation: data collection and analysis.....	13
6.1 Impact on parents and carers involved in the project.....	13
6.2 Impact on Children"s Centre practitioners t	20
6.3 Impact on participating ECS students	25
6.4 Project delivery experiences Cass research team members	29
6.5 Children"s project experiences	33
7 Discussion	34
8 Conclusion	39
References	
Annexes	

Acknowledgements

This project emerged from a chance conversation about STEM subject developments at UEL between UEL's Vice Chancellor, Professor John Joughin, and Dr Sue Dale Tunnicliffe from University College London's Institute of Education.

This led the VC to ask Professor Eva Lloyd to explore the possibility of developing a STEM related early years project in Cass and find ways for Cass colleagues to benefit from Dr Tunnicliffe's expertise in the field of emergent science. The establishment of the 2015 Civic Engagement Fund offered an opportunity to realise the aim of developing a STEM related early years project.

The Cass project team are grateful for the UEL funding received. They also profoundly appreciate the unstinting support and guidance received from Dr Tunnicliffe in making a reality of the „Parents talking everyday science with young children“ project.

The leader and staff and parents and children at the East London Children's Centre where the project sessions took place have been immensely enthusiastic facilitators and participants in this project. We hope they enjoyed the sessions as much as all Cass project team members did and that they continue to talk „everyday science“ to young children at home, in early years settings and at school.

Summary

This report is the evaluation of an early years project which was developed by members of the Cass Early Childhood Studies Research Group with funding from the 2015 UEL Civic Engagement Fund. The project aimed to encourage parents' confidence in their own ability to support emergent scientific thinking among their young children. The project was modelled on an early years initiative undertaken a few years ago in rural Bangladesh. The original Bangladeshi project was pioneered by Dr Sue Dale Tunnicliffe, Reader in Science Education at University College London's Institute of Education, and chair of CASTME, the Commonwealth Association of Science, Technology and Mathematics Educator.

The project employed a hands-on approach with parents or carers talking with very young children as they investigated everyday scientific concepts together during four „stay and play“ sessions which were held on consecutive weeks in an East London Children's Centre during the 2014/15 summer term. The programme of activities for these sessions was designed by members of the Cass project team, and delivered by a mix of Cass staff members and Cass Early Childhood Studies undergraduates, who were supported by the early years setting's own practitioners.

The programme design met widely accepted criteria which are applied to supporting emergent science in very young children in an early years environment and also reflected what is known from research about the scientific interests that can be identified among very young children.

Some very positive conclusions can be drawn about this approach to supporting emergent science in very young children. While the impact data do not offer strong evidence that parents' and carers' confidence in talking everyday science to young children increased as a result of the project, the qualitative information collected from Centre staff, participating parents and Cass project team members themselves, provides some useful pointers for early years practice. Working with children as young as under two in this project could certainly be considered innovative and the findings support the conclusion that this is worthwhile.

The project definitely achieved the aims associated with the projects that received funding from the 2015 UEL Civic Engagement Fund. Cass project team members have forged strong contacts with early years settings and local communities in east London over the years, including with the Children's Centre where the project fieldwork took place. The project truly became a joint enterprise with this particular Children's Centre staff and an ethnically and linguistically diverse group of parents and children representative of East London communities. In this way the project reflected the aims of UEL's Community Engagement programme.

Perhaps most importantly, the evaluation findings bear testimony to the enjoyment all participants derived from the science-related activities on offer during those four weeks in the summer of 2015.

1 Introduction

For some time now UEL has been promoting the importance of STEM (Science, Technology, Engineering and Mathematics) subjects and where better to start than in the early years? The project 'Parents talking everyday science with young children' supported by UEL's 2015 Civic Engagement Fund represents a contribution from Cass staff to realising UEL's aims in this area.

This early years project was developed by members of the Cass Early Childhood Studies Research Group to encourage parents' confidence in their own ability to support emergent scientific thinking among their young children. In other words, it was designed to encourage parents to build on the natural curiosity of very young children to explore aspects of the living world around them (Gopnik, 2009) and in the process themselves gain greater confidence in their own ability to do so. Promoting young children's understanding of the world in STEM related areas was a secondary aim. Finally, the project aimed to help parents realise that activities they might undertake with their young children, such as cooking and baking, were in fact „scientific.“

The project was modelled on an early years initiative undertaken a few years ago in rural Bangladesh. The original Bangladeshi project was pioneered by Dr Sue Dale Tunnicliffe, Reader in Science Education at University College London's Institute of Education, and chair of CASTME, the Commonwealth Association of Science, Technology and Mathematics Educator. Her original project was selected to become one of the projects used to mark the 2010 Commonwealth Year of Science and Technology.

Dr Tunnicliffe agreed to become scientific adviser to the Cass project and the team greatly benefitted from her support and guidance as well as from her writing on scientific enquiry in the early years (Tunnicliffe, 2013; 2015) and her experience in Bangladesh.

The project employed a hands-on approach with parents or carers talking with very young children as they investigated everyday scientific concepts together during four „stay and play“ sessions which were held on consecutive weeks in an East London Children's Centre during the 2014/15 summer term. The programme of activities for these sessions was designed by members of the Cass project team,

and delivered by a mix of Cass staff members and Cass Early Childhood Studies undergraduates, who were supported by the early years setting's own practitioners involved in the stay and play sessions. Section four below contains a brief description of the project process.

Underpinning this approach was Dr Tunnicliffe's contention (Tunnicliffe and Ueckert, 2011; Tunnicliffe, 2013) that, in contrast to the current emphasis on science learning in primary and secondary school, the early years are a critical time for acquiring scientific concepts, as children are intuitive scientists (Gopnik, 2009). Parents can support children in this role, through observation and talking, if they themselves are made aware of the extent of their own existing STEM related knowledge by being in turn supported by knowledgeable early years teachers and practitioners.

2 Aims and added value of the Cass early years project

The Cass early years project team hoped that if this „pilot“ project were successfully completed and had some demonstrable outcomes for parents and staff, it could serve as a „demonstration project“ to inform science teaching in the early years across England and beyond. Emergent science can be interpreted as a form of „Understanding the World,“ one of the specific areas that statutory guidance from the Department for Education requires English early childhood teachers and practitioners to implement as part of the Early Years Foundation Stage (DFE, 2014). This framework programme for the early years includes the welfare and learning requirements to be met by all registered early years settings in England and guides Ofsted inspections.

Dr Tunnicliffe’s work makes a unique and important contribution to early science teaching and learning within the context of the Early Years Foundation Stage. In the team’s view it deserves to be widely disseminated among early years teachers and practitioners, as well as among the academics involved in training them.

Additionally, the project’s design aimed to demonstrate the value and practice of engaging parents in a STEM-related early years project and highlight the role they can play in encouraging their children’s natural interest, while building on knowledge and understanding that these parents may not have been aware that they already possessed. A valued outcome of this project would therefore be the participating parents’ heightened awareness and confidence in their own ability to support their young children „taking science.“

Building on the model tested out in a Commonwealth member country would also demonstrate the reciprocal influence of different approaches to learning science in the early years and should establish beyond doubt that this influence is not uni-directional from the West. The team saw this outcome as adding considerable value to the project.

3 Matching the project design to UEL's 2015 Civil Engagement Fund criteria

The criteria project applications had to meet to be successful were set by UEL's Civic Engagement Fund management team. This fund was related to a new strategic direction for UEL set out in its 2015-2020 Corporate Plan. During the 2014/15 academic year, the University of East London set out its ambition to be London's leading university for civic engagement (UEL, 2015a).

One of the Plan's objectives is to better connect students, staff and communities through building partnerships that benefit UEL's students and communities, facilitated and supported by UEL staff. The 2015 UEL Civic Engagement Fund was intended to provide funding for such university-wide projects that will support, promote and reinforce connections between students, staff and communities.

The Cass project team responded to these Civic Engagement Fund criteria for funding by building into the project partnerships with UEL students as well as with the East London Community. They designed an input from a small number of Early Childhood Studies undergraduates at Cass as well as consolidating an existing relationship between one member of the project team and a Children's Centre in a deprived East London community.

The project planned to offer several Cass Early Childhood Studies year two undergraduates the opportunity to help facilitate the four „talking science“ sessions, complementing any experience of practice placements, or other employment or voluntary experience they might already possess. Guided by experienced ECS teaching staff and supported by the setting's practitioners, these students would not only gain valuable experience of an innovative STEM-related approach to early years teaching and learning, but also of working with children and their parents or carers. Moreover, the project would introduce them to research planning and execution, which would benefit their planning for their final year undergraduate research project.

The leader of the Children's Centre and her colleagues tasked with organising the regular „stay and play“ sessions at this centre would also be introduced to this approach, underpinned by growing evidence of its effectiveness, while forming a deeper relationship with UEL. The East London Children's Centre staff team were

keen to participate in this project as a means to improve their own methods of working with children and parents, while also seeing the gender related benefits of an explicit focus on science.

The Cass research team intended to remain in contact with the early years setting this project was going to partner with to deliver the four „parents talking everyday science“ sessions. It was hoped that, following on from an evaluation process and feedback report, the setting’s help could be enlisted in disseminating the findings from this pilot more widely, and build on the pilot experience in any future replications of this project in the same setting or elsewhere.

4 The Cass early years project: design and delivery

When the Cass proposal for the „Parents talking everyday science with young children“ project received a funding commitment from UEL“s 2015 Civic Engagement Fund in late March 2015, the team set about refining the project design. The team leader/PI and other team members agreed different and complementary roles for all in making a reality of the project. Actions were required in five separate areas: acquiring UEL ethical approval and evaluation design; liaison with setting staff and parents; Cass student participant recruitment and briefing, and project programme preparation.

Team leader Eva Lloyd finalised the process of putting in an application to the UEL Ethics Committee for ethical approval to carry out research with children and families and evaluate the project, supported by Cass research fellow Casey Edmonds. The conditions attached to the funding required a simple „before and after“ impact evaluation. With Casey“s help Eva designed the evaluation and its tools, which are described in section 5 below.

Rebecca Crutchley took the lead in the process of recruiting and briefing any Cass ECS undergraduates who were interested in participating in the project. She designed the required materials and saw through the recruitment and briefing process, helped by Celony Downs. Given the nature of the project, students having gained previous work or voluntary experience in an early years setting and having up-to-date enhanced DBS checks became pre-conditions for participation. Two mature year two ECS students were available to participate in all project sessions and met all conditions attached to participation. The Cass ECS undergraduates were expected to participate fully in the four sessions forming part of the project.

Initial contact with the East London Children“s Centre was made by Fran Paffard, a member of the Cass research team who had close links with this setting. Fran Paffard retained a lead in liaising with the Children“s Centre head and other staff about session dates and format. In addition, Celony Downs and Rebecca Crutchley visited the setting to explore the indoor and outdoor spaces being used for the regular „stay and play“ sessions and held discussions with the Centre head and staff about the contents of the programme for each session, ways to encourage

parent and child duos to participate in the activities and the project evaluation process.

Eva Lloyd gave a presentation on the project plan to the Centre's trustees at one of their meetings and confirmed with the Centre leader all agreements in writing. Throughout the process Centre staff agreement was sought on the planned programme contents, ways of communicating with parents and evaluation tools and processes. Annex A is the publicity flyer designed to attract the attention of parents attending the „stay and play“ sessions to the planned project sessions.

The Children's Centre runs twice weekly „stay and play“ sessions for children aged one to three to and their parents and/or carers, such as childminders or grandparents. These are relaxed and informal play sessions, free of costs, which are usually run several times a week in children's centres. Children and parents can attend as often as they wish, though parents are required to register at each visit.

The early years science programme sessions were scheduled to form part of the activities on offer on four consecutive Tuesday morning „stay and play“ sessions during three weeks in June and the first week of July 2015. The Centre is located in an East London community where well-to-do City workers live in expensive flats and houses in close proximity to ethnically and linguistically diverse communities with many young families living on low incomes in extensive public housing estates.

Cass ECS staff member Celony Downs, with help from Fran Paffard and Rebecca Crutchley - all experienced early years practitioners - planned the programme for the four „science“ sessions to be delivered at the East London Children's Centre and the material resources required. For each 1.5 hour session, table top activities were planned around a scientific theme, which parents and children, or carers like childminders and children, could take part in if they wished. Such activities simultaneously took place inside the room allocated to the „stay and play“ sessions and in the outdoor area reserved for these sessions. Annex B shows the outline programme and summary of activities, including planned relevant vocabulary, questions and observations geared to different age groups – children aged one to three and three to five, as well as some songs.

The programme for the first three of the four project sessions used the themes of „Forces“, „Materials and their Properties“ and „The Living World“ to design work with parents and practitioners and identify the emergent scientific thinking reflected in children’s everyday play. Activities related to these themes were to be laid out on two tables, one inside the room set aside for „stay and „play“ and one outdoors in the Centre’s garden.

The fourth and final session was designed to allow participating parents or carers and their children or charges to review their experiences and complete the „project books“ they had been equipped with at the first session. These were meant for parents and children to use for notes on and pictures of science related activities undertaken at home in between the four sessions, a record of scientific „observations“ made by the children or any thoughts children and parents had had on the subject between sessions. After the first three sessions children were given some „science materials“ to take home, like seeds and bulbs to plant, bubble liquid and recipes for making play dough.

Finally, Centre staff made sure that all parents who had participated in any of the project sessions were given a „thank you“ – a £20 M&S voucher - on behalf of the Cass research team at the end of the project period. The Centre itself also received generous equipment vouchers as a „thank you“ for their participation in the project.

In the course of these four „stay and play“ sessions parents, children, the Cass team members and Centre staff together explored how „scaffolding“ –using the concept developed by Vygotsky (1978) – of the children’s scientific thinking can be achieved through sensitive intervention and „sustained shared thinking,“ a process first theorised and promoted by Jerome Bruner (Bruner, 1977).The Cass team had reflected beforehand on any scientific terms to be used and explained during the sessions and had prepared specific prompts and questions suited to the youngest children, aged one, two and three, and to the older ones, aged three to five.Cass project team members met together at UEL after each session to discuss the experience and learning from each session and to adjust the planning for the following session where necessary.

As part of these preparations the team benefitted greatly from direct input from the project’s scientific adviser, Dr Sue Dale Tunnicliffe at UEL’s Institute of

Education and from one of her books dealing with emergent science in the early years (Tunncliffe, 2013). This helped the team to replicate as far as possible the principles and practice underlying the Bangladeshi project on which the Cass one was modelled and to design activities informed by Dr Tunncliffe's scientific work. Dr Tunncliffe also observed three sessions of the project and provided feedback to the Cass research team on her observations.

5 The Cass early years project: evaluation design and data collection

The 2015 UEL Civic Engagement Fund's project agreement conditions stipulated that each successful project bid have in place "A suitable framework to assess the impact of the project is in place (e.g. a pre- and post-project survey of all participants), to determine the success of the project in achieving its targets" (UEL,2015b).As in the original Bangladeshi project, a small three-part pre- and post-intervention evaluation was therefore planned as part of the project.

Casey Edmonds took charge of data management, following procedures stipulated by UEL's Ethics Committee. A password protected database was created for the purposes of writing-up the evaluation report. All forms of data collected were entered into this database. Audio recordings, interview data and field notes were delivered and uploaded in electronic format. A freelance transcription expert was engaged to transcribe the audio recordings taken during each of the four „stay and play" sessions; she also transcribed the one Centre staff interview that was recorded electronically.

This evaluation aimed to explore the impact of the experience on four separate groups: participating parents and carers; Children's Centre staff directly involved with the project; the Cass ECS students participating as part of the project team; and the Cass staff members on the project team directly involved in delivering the project sessions.

Collecting pre- and post-evaluation developmental data on the participating children was not considered feasible as part of such a small project evaluation. Nevertheless, increased parental and staff confidence had been theorised as having an impact on children's emergent scientific thinking. The research team were all the same very interested in capturing young children's responses to the programme. Therefore Intermittent audio recordings were taken by Cass project team members using iPads during each programme session of children's reactions to what was going on and their interactions with parents, staff, the research team and each other. These recordings were subsequently transcribed.

Information from all adults involved was to be gathered before the start of the project sessions as well as at the end. Cass research team members, including the

two students, produced field notes after each project session. For this evaluation the team therefore articulated one main research question and three supplementary ones:

1. What was the impact of the project experience on parents' confidence in talking everyday science to young children?
2. Did participating in the project make a difference to the setting's practitioners' confidence in this area?
3. What was the impact on participating Cass students?
4. What was the impact on Cass research team members?

The „stay and play“ session on the Tuesday preceding the first of the four science-related programme sessions, was designated as a familiarisation session for the Cass project team minus the two students. This additional session also offered the opportunity for the team to carry out „before“ evaluation tasks. These included handing out information and consent forms to staff and to parents about the project and parental questionnaires and conducting semi-structured staff interviews.

Parents participating in the fourth and final „stay and play“ session were again offered a questionnaire to complete and repeat staff interviews were conducted by Cass staff members on the team. Notes were taken for the initial three staff interviews, while one of the final four interviews was electronically recorded. The two students completed an electronic questionnaire before and after they had attended the full series of project sessions. The evaluation methods and number of participants who completed each research tool are detailed in Table A below.

A number of the research tools employed can be found as annexes to this report. These are:

Annex C Parent briefing and consent form

Annex D Parent pre-project questionnaire

Annex E Parent post-project questionnaire

Annex F Children's Centre practitioner pre-project interview topic guide

Annex G Children's Centre practitioner post-project interview topic guide

Table A 'parents talking everyday science' evaluation methods

Participants	Before project sessions	During four project sessions	At end of each project session	At end of series of four project sessions
children	nil	Intermittent audio recordings	nil	nil
parents	Paper questionnaire (n= 8)	Intermittent audio recordings	nil	Paper questionnaire (n=5)
Regular 'stay and play' practitioners	Interview (n=4)	Intermittent audio recordings	nil	Interview (n=4)
Cass project team ECS students	Electronic questionnaire (n=2)		4 x field notes (n=2)	Electronic questionnaire (n=2)
Cass project team staff		Intermittent audio recordings	4 x field notes (n=2)	

.Note that Table A does not list briefings and consent forms provided to parents and Centre practitioners in advance of their participation, only the actual evaluation tools.

6 Evaluation: data analysis

Extensive evaluation data were collected from the five categories of people involved in the project via the instruments listed in Table A in section 5 above. This analysis section does not set out to do justice to all this information; it only provides a broad overview of findings and notes some of the limitations of the data resulting from the evaluation design. In any future academic publications, however, the Cass research team hopes to do justice to these rich materials.

6.1 Impact on parents and carers involved in the project

Information collected from parents and carers via both pre- and post-project questionnaires was key to beginning to formulate an answer to the main research question: what was the impact of the project experience on parents' confidence in talking everyday science to young children? Via the initial questionnaires, data about the sample of parents and carers was collected as well as about their views on science and their confidence in talking about scientific subjects to the children. As Centre staff had a register of all adults and children attending, it was possible to work out the pattern of attendance for parents/carers and for children over the period of four weeks that the project lasted. This is illustrated in Figure 1 below.

Figure 1: Parents'/carers' and children's registered attendance

Number of sessions attended	Parents/carers	children
one	6	8
two	7	7
three	3	5
four	3	6

A total of 19 parents or carers attended at least one programme session and they brought a total of 26 children along. But only six parents/carers participated in three or four sessions. As data were collected anonymously, we are unable to work out whether the parents/carers who completed the initial and final questionnaire were among those who attended the most sessions. Parents had been asked to mark their pre-questionnaire with a „pseudonym“ to be used again for a questionnaire at the end of the four sessions, but this strategy did not prove successful.

The number of parents/carers registered was more than twice as large as the number of those who completed questionnaires. There were eight parents/carers who not only took part in the project but also filled in the parental questionnaire at the initial familiarisation session. Questionnaires were distributed by members of the Cass team supported by members of the Centre’s „stay and play“ staff team. In some cases the latter were able to help with language issues.

The breakdown between parents and non-parental carers such as grandparents or childminders can be seen in figure 2 below. Between them they brought along 11 children (see figure 3 below) and the ages of these children ranged from one year and two months to three years old.

Figure 2: Breakdown between parents and carers completing initial questionnaire

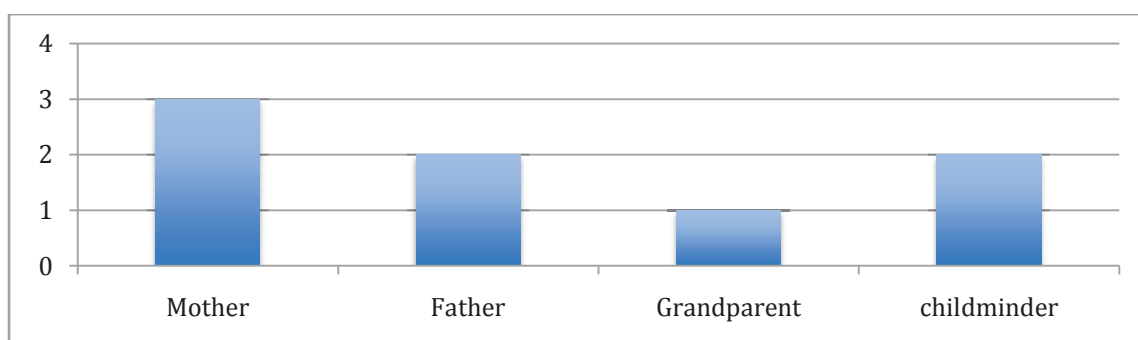
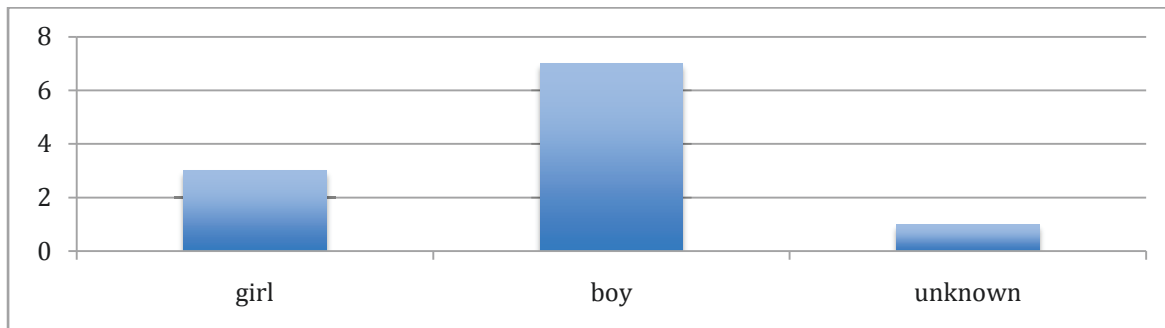


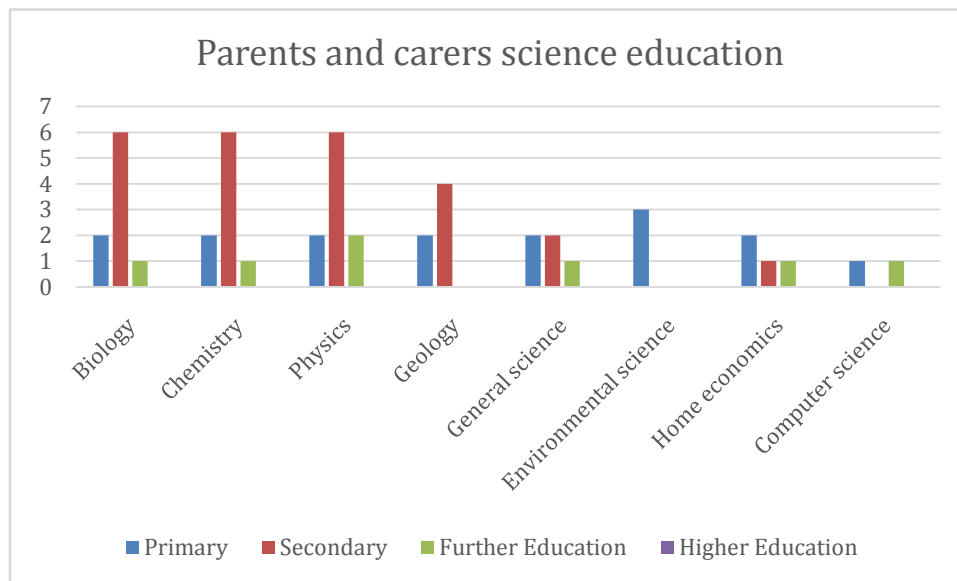
Figure 3 only notes gender details for the 11 children whose involvement was noted on returned initial questionnaires, not about the other 15 children listed on the Centre’s register for the four „stay and play“ sessions.

Figure 3: Gender of children whose parents/carers completed initial questionnaire

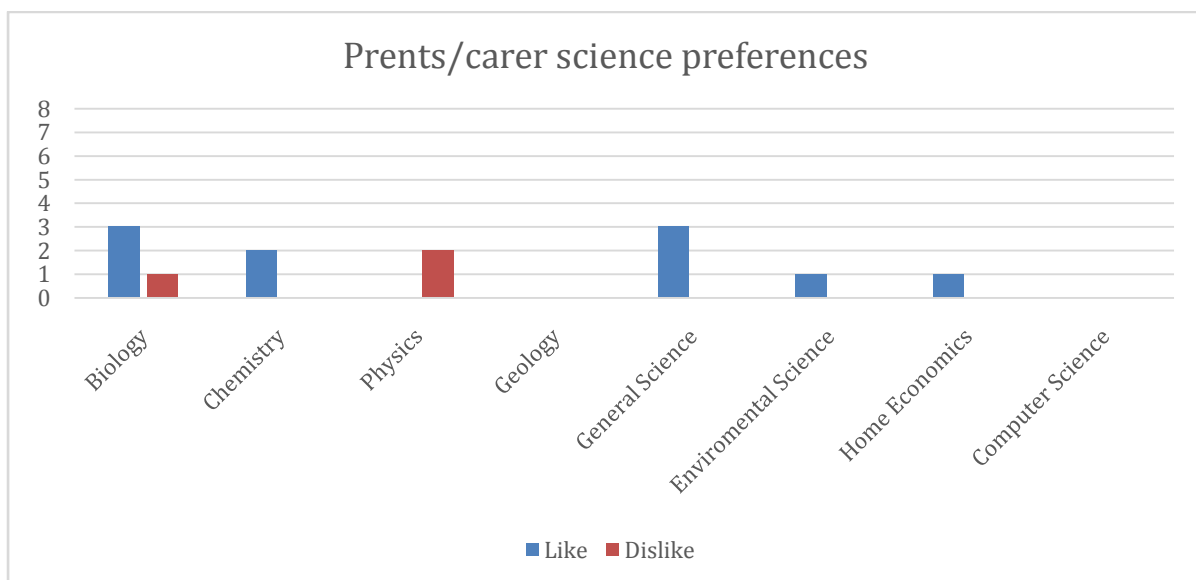


Information about parents' familiarity with science subjects through their education had been gathered in the Bangladeshi project on which the Cass project was modelled, on the basis that this might affect the manner in which parents talk to their young children about scientific subjects.

In answer to a question about their previous science education (see figure 4 below), only two parents/carers indicated that they had studied science at primary school, one parent/carer indicated they weren't sure and all others left this blank. However, most parents/carers (six out of the eight) indicated that they had learned the three core science subjects at secondary school with two of these also indicating that they had learned general science at secondary school as well. Only one parent/carer indicated that they'd had no science education at secondary school. In addition, three parent/carers had studied some science at Further Education level, while no parents/carers studied science at university.

Figure 4: Parent/carer science education

Another questionnaire item explored science subject preferences. These are illustrated in figure 5 below. Only two subjects, physics and biology, generated dislike among this small group.

Figure 5: Parent/carer's science subject preferences

Parents/carers were also asked, both before and after the project, to write down what the word „science“ meant to them. The answers given can be seen in figure 6 below. Since it is hard to determine whether some of the same parents who

completed the initial questionnaire also completed the post-project questionnaire, it is difficult to draw any conclusions from this information about any impact of attendance at project sessions.

Figure 6: parent/carer responses pre and post project about what the word 'science' meant to them

<u>BEFORE PROJECT</u>	<u>AFTER PROJECT</u>
Chemicals	Properties changing
Exploring	Science is the act of using the mind to imagine things and doing it or acting it
Water, floating	Science is world through observation and experiment
Biology, chemistry, physics	Definitely discovery, testing things out, experimenting. I like the idea of it being more explicit. Nice to have a focus for a play session.
Looking for explanations	It means exploring, experimenting. It is about finding out how things work e.g. how the sponge soaks in water or how the stone sink in water.
How things work. Technology. Humans.	
Discovery, learning new skills or exploring 'around us'.	
Is physical and natural world through observation and experiment	

Unfortunately it is impossible to state whether for the five parents who at the end reported change in what science meant to them may have developed through participating in this project. While the changes in their responses might have been an indication that attendance rendered them more confident about talking about

science, this cannot be reliably established in the absence of reliable data. Nevertheless, these parental observations are interesting.

Before participating in the project parent/carer's were asked if they had noticed their child exploring and investigating what could be called science and six of the eight parent/carers reported that they had noticed their children exploring and investigating in this way. They gave examples such as sand play, water and liquid play, shape sorting, trying to work things out, problem solving and colour mixing.

Additionally before participating in the project most parent/carer's reported feeling confident in helping their children to explore and investigate in this way with only one writing that they were not sure. During the fourth and final project session, only five post-project questionnaires were completed. However, all parent/carers who did so reported having enjoyed the session or sessions they attended. In response to the question what they liked the most, they commented:

- "All of it, interaction, the way children got involved."
- "The area of working with my son when he sees things I feel it is new and trying to find out if he understands."
- "I really like all of them. That gave me some ideas to plan activities with the children."
- "I like how things change each time. The grubs, the food tasting, cutting up fruit – really good questioning, really good for [*my child*], just trying things."
- "I like fruits and vegetables the most because I found out that some of the fruits you eat the skin while some you eat the seed inside."

Only one of these five parents/carers reported liking anything the least and this was:

- "messy play – hair conditioner – I was worried about him eating it – so disappointed he couldn't try it – edible alternatives."

Another question explored what parents/carers had learned during these sessions and all reported having learned something. Their comments are listed below:

- "Different activities. Log rolling and marking with chalk; mealworms. Fruit tasting and looking inside for pop."

- “My son learning new things like plants, animals and creative things with water colours.”
- “How the sponge can be in the water and the stone. How children can explore the fruit and vegetable.”
- “A little bit to think about the box – especially the maggots – and to vary things with him and maybe spend more time on things. When he was trying the cherry he took a long time. Try not to rush.”
- “I learn about more fruits that I never heard of before. I learn that science is everywhere and in everything children do”.

All parents who completed the post project questionnaire reported feeling more confident about helping their child explore and investigate the types of activities that they took part in during the project session(s). In response to the questionnaire’s item exploring whether they had any new ideas about how to use their garden, all parents/carers responded, even though initially only one parent had reported having access to a garden at home. For example:

- “I help him plant his seed in a pot which was put at balcony”
- “I don’t have a garden but I can do inside most things.”
- “Doing gardening with him, exploring about insects and worms when the ground is wet.”
- “Water play, doing different weights, looking under stones for creepy crawlies, log rolling, chalk.”
- “Making the links between different community groups. Session on language development.”

The responses showed that despite not having a garden and irrespective of the number of project sessions they had attended, all parents/carers reported having developed new ideas about exploring and investigating science with their children and could think creatively about outdoor spaces they could use or how else they could pursue their new ideas.

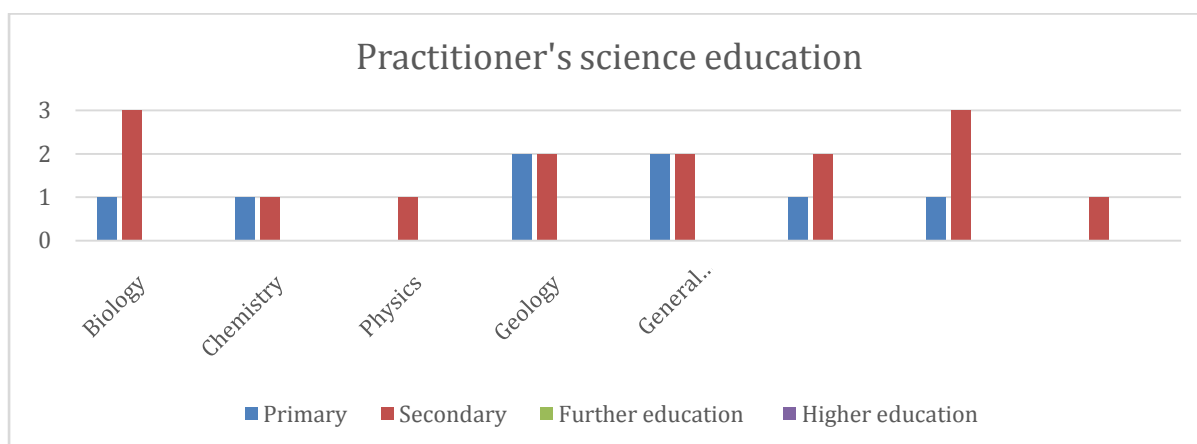
6.2 Impact on Children's Centre practitioners

Three „stay and play“ session practitioners at the Centre were interviewed before the beginning of the project. They all reported as having worked as an early years practitioner for many years and each had different qualifications; one had worked as an early years practitioner for 6 years and had a BA in child psychology; another had worked as an early years practitioner for nine years and had a diploma in childcare and a NVQ level 3 in adult and child psychology; and the third had worked as an early years practitioner for 30 years and had an NNEB qualification.

All of the practitioners indicated that they had noticed children exploring and investigating science by for example using magnifiers, using sand, both wet and dry, water play, playing with cars, planting and bugs. They all felt confident about helping children in their setting explore and investigate in this way and all felt confident in talking to parents about early science, with one saying that: “it’s important to have that discussion”.

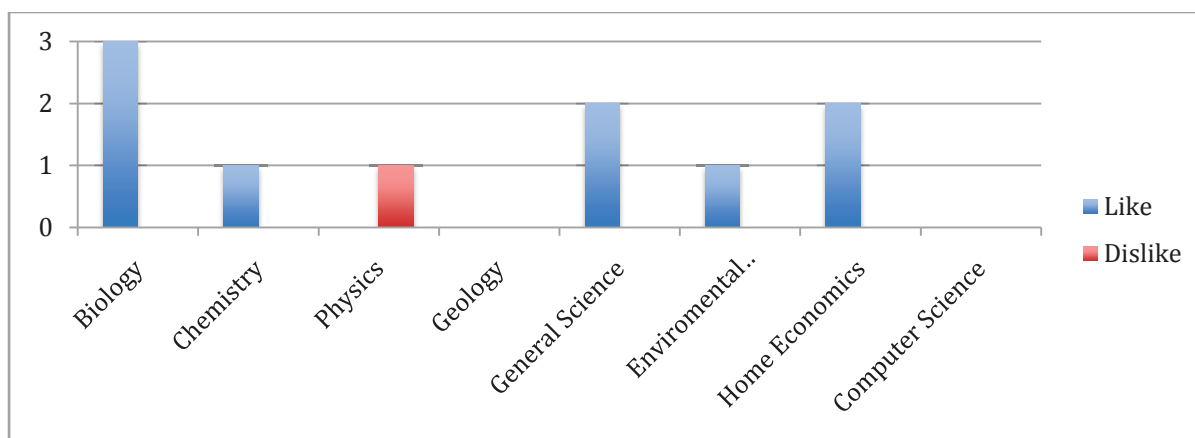
None of these practitioners had studied any science subject in further education (FE) or higher education (HE), but they had studied various science subjects in primary and secondary school as listed in figure 7 below.

Figure 7: Practitioner's science education



Just as the parents and carers had been, the practitioners were also asked which topics of science they liked and disliked and these are shown in figure 8 below. Just as in the case of the parents/carers, physics was the least liked subject out of a range of eight science subjects encountered in primary and secondary education.

Figure 8: Practitioner science subject preferences



When asked before the project began what the term „science“ means to them the practitioners answered:

“Things going on around you, everything around you, science, water, experimentation.”

“Find out how things work, getting the answers.”

“Exploration, investigation, discovery, imagination. Making links, fun & curiosity.”

The same three practitioners were interviewed again after the project had finished and asked again what the term „science“ means to them (Annex G). This time a fourth practitioner was also interviewed and this interview was recorded. As with the parents, their responses were more detailed and evident of a change in either confidence talking about science and/or knowledge as illustrated in the following two responses:

“Science. To me it’s about exploring. Investigating. Discovering. And making sense of the world around us and why things do, why things happen the way things happen really. That whole curious approach.”

“To me it means exploring, learning new things about science. Yeah just really overall exploring.”

The practitioners all reported having enjoyed the sessions and having found them fascinating. They also identified different elements that they particularly liked and would be putting into their planning for children's activities. Some of their explanations have been reproduced here as rather long quotes. This is because they illustrate how the experience of participation in the project had prompted these practitioners to think more about the programme of activities:

"I found it all fascinating. Every child and parent was interested. I thought the planting was really good. When they did the little planting the seeds and was able to take them home. Also the ice. The ice cubes with the food dye. That was really popular."

"Yeah. Really enjoyed it. The biggest part for me was about the approach to the activities including the language that was used. I think one of the challenges that practitioners have is being able to feel confident in the language that they use to help children make sense of what they're experiencing or what they're seeing. And within that, sometimes I see that if you're not confident that you can shut children down by becoming perhaps apprehensive or nervous that it's gone a little bit off script. So being able to have those open ended questions that get children to think about what they've seen or what they've experienced or to try moving an object in a different way to test what it is that they just did or saw I think is what I really took from it."

"One of the things that dawned on me a couple of weeks ago was ... in the home area. That we've got these soft kind of cushiony fruits and vegetables and I was saying well actually, do we need those? Could we not replace those with real fruit? Real vegetables. Even if it's not all the time but for a period of time. To allow children to feel what those things are like. Chop them up. Have pieces. You know, structured aspects. So it's just made me think differently I guess about activities and how we present things to children and families."

The practitioners all liked the way the four sessions had been organised and run. One suggested that at first they thought it seemed quite rigid but that in practice this was not the case and in fact it helped the planning, giving confidence but at the same time allowed flexibility all of which they appreciated:

“I think the initially the planning side of it looked really rigid. However, what I thought was great was that there was this confidence that if a child wanted to take an activity in a certain direction that that was allowed and encouraged really. And the vocabulary went along with that.”

“....almost the rigidity goes into the planning, which I think helps the thought process and the structure of the session. But actually when it takes place that then gives you the confidence to allow it to kind of go in whatever direction the child wants to take it in. And the other strength of the planning was that there was the vocabulary box as well. So it gave you those hints and tips that, you know, you could bring vocabulary into it that may be not, may be not your confidence level, but it was there so you could name some of the things that were happening to help support the child.”

“It was well planned. The timing was perfect. And the members of staff also helped us as well.”

The practitioners also spoke of the way in which it felt to them like team work, which also included the involvement with the parents and the children. As a result of the project the practitioners report feeling more confident about helping the children in their setting to explore and investigate science in this way, but also mentioned the wider benefits of them exploring further. For instance, in response to the question:

“So do you think that it’s helped you to feel more confident about helping children in your setting to explore and to investigate?”

One practitioner replied:

“Definitely. Even myself. Yeah I’ve found myself looking online at stuff.”

It was also felt that the project helped practitioners to make links to other areas within early science. One mentioned them having already developed new areas as a result:

“So we’ve added in recently messy play but also basic cooking. But within that there’s a number of scientific approaches and strategies that we can help them understand by thinking about those sessions in a different way.”

According to their feedback, the project experience had also helped the practitioners to feel more confident when talking to parents about science and helping them to make the same links. The practitioners also reported learning from the project overall and would recommend this way of working to other early years practitioners. They mentioned that this would be of interest to older children too:

“Definitely, yes. Especially the nursery. I think the older children because they’ve shown so much ... basically all the pictures that we’ve got up that we’ve set up, the children they’ve shown so much sort of ... involvement and they’re asking questions about it. Oh can we do that here? And they’re asking, oh when did the younger children do that?”

One practitioner explicitly identified the positive impact the project had had on the „stay and play“ session colleagues:

“I’ve been really pleased in their approach to it. What I’ve seen them do is go off and research areas themselves. So looking for different activities. What’s been great is seeing them motivated and thinking differently about activities and science that they can incorporate that comes from them, which I think is really good as well.”

It is important to note that these observations were made right at the end of the project and only a longer-term follow-up would be able to confirm whether plans became a reality and impact persisted over time.

6.3 Impact on participating ECS students

The two Cass ECS students who made such an important contribution to the delivery of the project also submitted evaluation data in the form of an electronically completed pre- and post-project questionnaire and produced field notes after each project session they attended. One student participated in all four project sessions, and one managed three, missing one due to family commitments.

Before participating in the project the students reported having some understanding of how young children develop their scientific thinking through reading, discussing, exploring and observing. Their previous experience of supporting the development of scientific thinking in young children was largely within their own families, and in social and playgroup settings. They identified opportunities such as gardening and visiting farms, parks and gardens as giving them the chance to discuss various aspects of everyday science such as:

“Discuss special flowers or the importance of bees in spring and even the impact of litter on our environment”.

Their thoughts on activities and resources that would support scientific thinking before their participation in the project involved plenty of outdoors experience, walks and discussions as well as many indoor activities such as cooking, water play, and experimenting with different materials;

“Nature walks and plenty of outdoor experiences that allow children to ask questions and explore using their senses.....in a setting perhaps creating a pond where children can watch frogspawn develop and a garden to grow fruit and vegetables”

“Flour...cooking...baking...dissolving sugar...collage making using stones, leaves, rice, beans cotton wool (to learn about matter/textures).”

These students, identified before taking part in the project, whose theories of child development could be applied to the development of scientific thinking in young children. They suggested that Piaget’s theory that children acquire knowledge through reasoning was relevant, along with Vygotsky’s ideals that significant adults

providing support were a major factor in influencing children's social development. Additionally, they suggested that Kohlberg's theory of moral development, Bruner's social constructivist theory and Friedrich Froebel's assertion that the value of play was central to a child's development could also all be applied.

In advance of their participation in the project, the students identified possible challenges of supporting young children's scientific thinking such as limited access to outdoor environments, limited time, curriculum expectations, policies on health and safety and permission seeking, lack of resources & funds and perception of parents and teachers. They identified ways in which parents could engage their children in the home to support scientific thinking as well as the potential benefits of practitioners working alongside parents to support this thinking.

Students indicated that their understanding of the development of scientific thinking in young children had been affected by their participation in this project:

"My understanding to the way young children develop their scientific thinking has been affected. This is because being part of this project has shown me that learning about science could be inexpensive, materials within the home environment could be used in different ways to enhance children's communication and participation."

"My involvement in the project has broadened my outlook on engaging all ages of children with our scientific world. I was weary of using scientific language but realised simple everyday terms such as force, weight solid and liquid were all easily accessible to young children and could be introduced in a home or nursery environment."

Even though both were already experienced early years practitioners, working alongside the parents/carers who participated in the project had also offered these students new insights:

"The parents taking part on the project were already naturally encouraging their children to explore the different activities on offer.....the carers too supported each child's interest but my impression was the project demonstrated to all of the carers how a simple activity of rolling objects down a ramp could lay the foundations of science to a child's future. It was

developing this awareness in all of the adults, which I believe will leave a lasting impact on the people involved.”

“It has shown me that parents take active part within the community when they have a very strong sense of belonging.....young children can build on their confidence and knowledge through the support of their parents and other adults.”

Both students indicated that their approach to supporting children’s scientific thinking had changed as a result of their involvement in this project and that this had already had an impact on their interactions with young children they worked with, as well as with their own young children and was likely to continue to do so.

Their final few comments are reported here at length, because of the insight they provide into the students’ thinking about the change wrought by the project:

“Yes, most definitely. It already has with my own children and the children I work with in KS1. I’ve stopped directly answering children’s questions. Instead I hand the question back to them and ask them why they think for example; the days are longer in summer. I want to encourage children not to just question but provide opportunities for a child to develop their own ideas and line of thought.”

“I have realised that in helping children to develop their thinking scientifically, materials within their immediate environment could be used to help them measure, observe, predict and make their own conclusion without incurring much cost.”

“I have learnt that young children can use and learn some scientific words based on any activity when given the right environment”

It appeared that the experience had helped them to identify ways in which they could support other practitioners in their settings with their understanding of children’s scientific thinking, showing the impact of this project can and may extend beyond those involved:

“The project has given me confidence to contribute and support interests in every science. Simply modelling behaviour in a setting. Encouraging the

use of scientific terms throughout specific activities. Encouraging parental involvement and providing monthly themed literature and activities that can be extended in the home.”

“To give children the free will to play without the practitioners teaching them.....to involve the parents in the children’s activities.....to try and make good use of materials (recyclable) around us without spending a lot of money.”

It also developed students’ thinking about what resources and activities can be used to support scientific thinking in young children:

“From what I understand now, you do not need any new material. Simple objects in the home, nursery and in our natural world provide most of the resources required to get engaged in everyday science.”

“RESOURCES: parents, funds, community, school, home. ACTIVITIES: baking and cooking, using the microwave to warm food or defrost food, planting seeds and harvesting, using some of the things learnt in songs and poems, using different colours of squash(drinks) to make ice cubes so that children can explore colours and mixture of colours.”

The students also indicated what they thought parents/carers gained from being involved in the project. They suggested that parents had learned about different activities that could extend children’s thinking and communication and had developed both their knowledge and their confidence:

“One parent was telling me how she was finding out and comparing the theories of Vygotsky, Piaget, Bruner and Tina Bruce....”

“I think the project has given some parents and carers confidence to discuss science with their children. Science can create fear with some people drawing on their own past experiences or images of laboratories and white coats. These memories or ideals become barriers to those who don’t believe they have scientific knowledge to support their children. I believe this project demonstrated that simple discussions and everyday pursuits can support a child’s future interest to engage with adults in everyday science.”

Just as in the case of the Centre’s practitioners, however, it must be noted that longer-term follow-up only would be able to confirm whether these were lasting impacts. Even more so in the case of the practitioners, the students’ expectations would have influenced their reporting of the perceived impact of the project.

6.4 Project delivery experiences Cass research team members

The use of field notes had been built into the evaluation design to allow all members of the Cass research team participating in the delivery of the „parents talking everyday science to young children” project sessions to reflect on their experiences. Being involved in programme delivery precluded them taking observational notes, so the field notes were the next best thing.

Two Cass staff members and the two students completed such field notes after each session thus providing a rich database on their own learning from the project. The scientific adviser attended three sessions and reported back to the staff on her observations and one member of the Cass team attended the preliminary and one other session and interviewed Centre staff before and after the programme, but did not complete field notes. The project leader did not attend any programme sessions, as she lacked an up-to-date DBS certificate, a condition stipulated by UEL’s Ethics Committee.



Table arrangement session 2 „Living and growing”

The following observations are taken from the body of staff field notes. In many cases it appeared that the children initiated the activities around the activity tables and led the adults to support them. Adults were then observed to actively ask the children questions and support and help them identify things, for example during the float and sink activity in session one they were observed actively asking the children questions and helping the children to identify items that would float or sink even though most of the children were not yet speaking.

It appeared that this activity engaged the children and it was also noted that parent/carer's supported their children with their language development, some particularly by making them aware of some scientific words. However it was also noted that there were times when neither the child nor the parent noticed when a member of the research team attempted to introduce scientific language to the play. It appears during the first session particularly that the parents/carers may not identify certain things their child does as being exploring or investigating science. This is well illustrated in the observations form one of the research team below:

„M (male aged 14 months) is waving his hands in the water, splashing and making waves. He smiling and has a concentrated look on his face. I comment on how he is using his hands to make the splash and the waves, and show him that I can do this too. His mum comments that he loves to splash and does this in the bath and at the swimming baths. I comment on how so many children of this age love to see the impact of their actions, through cause and effect, and mum comments that he likes to do the same thing over and over again. I comment that this is like a scientist testing a theory, and mum laughs. Several minutes later when she is completing the questionnaire, she is unsure if he engages in scientific play but that he does like to explore.“



Table arrangement session 1 „Forces“

Parents/carers were also observed extending their children's learning; one example was a father offering more information on the peas that the child was looking at and explaining how „mummy“ uses different varieties for different types of food.

From all the interactions observed and reported on by the research team it became evident that the children, although young and often pre-verbal, enjoyed the activities and explored them actively. It is noted that the children showed interest in the different experiences and showed an awareness of certain scientific concepts,

for example showing an awareness of the different force that is necessary to push objects up an inclined ramp or gutter as well as the gravitational force when rolling objects down the ramp or gutter. This is evident by the observations of the children at times rolling the object with their fingers and at other times allowing it to roll free noting the different speeds and lengths it travels. During other activities the children's engagement and interest was evident from them picking up the object, for example the fruit, and showing their parent/carer *„as if asking [or] seeking information from them“*.

Children were also observed trying to engage other children with the activities, for example one boy tried to get a girl to smell a flower, actively pursuing her and modelling the behaviour of smelling the flower again trying to get her to smell the flower. This is something the child's parent/carer had been trying to get her to do.

Parents engaged not only with their children but also with the activities themselves, with some noting that they hadn't heard of some of the fruits and



vegetables for example from one of the activities.

This allowed a conversation to take place between the parent/carer and the researcher regarding the different fruit/vegetables and the parent/carer writing a list so they could buy the fruit/vegetable themselves. It was noted repeatedly in the field notes that parents/carers generally seemed curious about the activities and resources.

It was observed that although the Centre staff interacted with the children in an encouraging and supportive way, for example "well done, what's that you've got?", the Cass team members failed to collect much evidence of staff trying to tune into the possible thinking processes of the children or to model the process of exploring, for example by asking questions such as: "I wonder what will happen if....". It was noted that parent/carers did do this at times though. Cass team members noted that commenting on a child's play can be more effective than asking lots of questions, which can feel intrusive and can switch the focus of the play from the child to the adult.

The research team encouraged parents/carers to continue engaging their children in „talking science“ after the sessions by giving them related items to take home to continue the exploration and investigation, such as bubble liquid, seeds and bulbs to plant and play dough recipes for use at home. As noted in section 5 above, at the first session each parent/carer was given a scrapbook to collate and document everyday science activities within the home setting.

The Children’s Centre practitioners in charge of running the „stay and play“ sessions made a major contribution to consolidating each session’s experience by displaying the content of the previous week’s session on a white board and clearly labelling the focus of that week as well as putting up photos labelled with key terms. Some of them commented that they hoped that the project activity sessions would encourage staff to do a „science day“ during the summer holiday scheme. Some of the activities were also left in place for the children to explore independently on their next visit.

6.5 Children's project experiences

In total just over an hour of activity involving children was recorded in the course of the four sessions. It is not surprising that these audio recordings on their own give only a very incomplete description of how these very young children responded to the programme of activities on offer during the sessions. Several factors were responsible for this complexity.

In many cases the conversations involved more than adult, for instance a parent/carer, a Cass research team member and one child or a couple of children, most of whom as yet had limited productive language. Predictably, the recordings also picked up remarks by Centre staff not directly related to the scientific activities.

Nevertheless, the recordings do definitely suggest that most of the children attending the „stay and play“ sessions became actively involved in the activities alongside their parents/carers, Centre staff and members of the Cass team and appeared to find them fun and interesting. These impressions are strengthened by the material collected via field notes by Cass ECS students and staff, which was discussed in section 6.4 above.

Taken together, these data constitute a useful source of information on the children's responses to the programme. They deserve exploring further as part of preparing academic journal articles, although for the purposes of this report we will not examine them in greater depth here.

7 Discussion

Looking back on the experience of this small early years science project and its evaluation as reported in the preceding sections, we can draw some positive conclusions about the potential usefulness of this approach. Although a few parents/carers mentioned a positive impact on their confidence in the post-project questionnaire, overall the impact data do not offer strong evidence that this approach is a helpful way of encouraging parents' and carers' confidence in talking science to young children. On the other hand, the qualitative information collected from Children's Centre staff, participating parents and Cass research team members, including the ECS students, themselves, does provide some useful pointers for early years practice.

Even if the evaluation evidence collected did not allow us to conclude that these parents' or carers' confidence in talking everyday science to young children increased as a result of attending one or more project sessions, there was some useful evidence about changing perceptions among the Centre's practitioners and the participating Cass students. Cass staff members on the project team also made some interesting discoveries.

The evaluation definitely provides useful information for researchers to build on in exploring optimal ways of promoting emergent science in very young children. Perhaps most importantly, the findings bear testimony to the enjoyment all participants derived from the science-related activities on offer during those four weeks in the summer of 2015.

Unavoidable limitations on the research design, resulting from the small scale of this project, are the main reason for the absence of clearer findings among parents and staff as explained below. Ultimately, this was a very simple evaluation of a very small project involving very small numbers of participants.

Working with children as young as two in this way has not yet been widely reported in the relevant literature, leading us to assume that promoting emergent science in the youngest age group has not yet been studied extensively. To date the focus of most studies about emergent science in the early years appears to be on

children upwards of three years old in educational settings such as nursery classes and schools. This even applies to the majority of articles in the *Journal of Emergent Science*, launched in 2011, although its editorial policy explicitly applies this term to aspects of the development of children aged nought to eight. Indeed, the Bangladeshi project on which the present project was modelled, involved children with a much wider age range and none as young as two. In this respect this small Cass project could certainly be considered innovative.

Moreover, all participants, apart from the children themselves, were broadly aware of the purpose of the special science-related programme offer and thus of the expected effects. These „demand characteristics“ of the evaluation research situation, so well explained and demonstrated in the work of Orme (1969), would have predicted positive responses in the Centre staff interviewees and among the parents and carers, as far as impact was concerned.

The fluctuating nature of attendance at the „stay and play“ sessions meant that engaging the same parents in a „before and after“ evaluation was challenging. We cannot be sure that the few parents who reported change at the end of the four programme sessions were the same parents who completed the initial evaluation questionnaire. This is not to denigrate the value of their self-reports, but just to acknowledge again the possibility that they might have wanted to meet the research team’s expectations, consciously or unconsciously. Particularly if the experience of attending all or some the science project sessions had been an enjoyable one.

For the same reasons it is not possible to make any links between these individuals previous experience of science learning at school and beyond and their project experiences. The qualitative data tentatively suggest that they gained new perspectives on what constitutes science in the project context.

Not only did only three parents/carers attend all four sessions, but the overall number of parents who completed the evaluation tools was also very small. This is not surprising within the Centre’s „stay and play“ session context, where any participation is voluntary and unpressurised. There is limited information in the research literature on the length of attendance associated with short-term or longer-term impact on children’s emergent science, although even attendance at a couple

of sessions may generate enthusiasm and interest in science related activities among parent/carers and the children brought along.

Children's Centre staff had invested time and effort in facilitating the science programme and were likely to wish for it to have some sort of discernible positive impact on parent, children and on themselves. In particular as Centre staff, not just „stay and play“ staff, aimed to explore new ways of working with parents across the Centre's activities. Having welcomed the involvement with Cass staff in this small project, they would have been less likely to report nil impact on themselves or on the other participants. Nevertheless they made some very interesting observations as evidenced in section 6. 2 above.

Again, the small sample precludes linking the information gathered on their previous formal experience of learning science to the observations these practitioners expressed on the science experiences offered as part of the project. The views expressed, though, strongly suggest that the project experience opened up new perspectives on how very young children can be introduced to science-based activities within the „stay and play“ setting context. This can be considered a valued outcome of the project

The Cass staff members involved in the delivery of the programme were also tasked with collecting the evaluation data, another – unavoidable - weakness of the design stemming from the fact that this was very much „real world research“ (Robson, 2002). Their retrospective field notes were not equivalent to real time tracking observations, although extremely valuable in themselves. Would videotapes have been more helpful than the intermittent audio recordings that were obtained? Undoubtedly; but it was decided early on, that as Cass staff were delivering the programme, supported by „stay and play“ staff, they could not also be expected to videotape the sessions. Moreover, the project did not have the resources to engage in the frame-by-frame analysis such recordings would have required.

Another important question that the evaluation needed to address was to what extent this science programme was faithful to the intentions and design of the original Bangladeshi programme. As already noted, the age group this programme was aimed at different from the original one. Although Dr Sue Tunnicliffe did write about the Bangladeshi project in a variety of publications (references needed), this

literature was not sufficiently detailed to ensure full programme fidelity. However, the team did have her direct input as a scientific advisor to guide them in planning the programme format.

Arguably, though, the programme design did meet the wider criteria applied to supporting emergent science in very young children in an early years environment as articulated in an editorial to a recent issue of the *Journal of Emergent Science*:

Emergent science encourages young children to communicate and share their ideas with others... It does not limit children and neither does it advocate didactic teacher-led approaches; rather, it recognises that the best learning strategies often involve the practitioner „standing back“ and allowing children time and space for exploration...

(Johnston and Tunnicliffe, 2014, p 3)

The Cass project carried out at the Children’s Centre also closely reflected the further definition of an optimal approach provided in the same editorial:

Hands-on activities are essential for the learning of science in the early years. The science explanation does not need to be given, but the practical experience of the phenomenon is essential to further learning.

(Johnston and Tunnicliffe, 2014, p 3)

Yet the hands-on experience does not assume that these young children will learn by „discovery“ the correct explanation of the forces they observe at work for instance in water play. The project blueprint clearly adheres to the notion that instruction is more influential than discovery, but it is the nature of the educational approach that is crucial in generating and maintaining very young children’s interest.

In studies on emergent science and technology in the early years, Siraj-Blatchford (2001; Siraj-Blatchford and McLoad-Bruendell, 1999) argued that for types of play like water play:

...to be educational in terms of science some form of instruction (e.g. demonstration, modelling etc.) is usually needed, and clear objectives need to be defined. From the simplistic notions of individual cognitive elaboration

through „discovery“ we have therefore increasingly come to see child development in socio-cultural terms as a „construction zone“ involving the educator and not just the child

(Siraj-Blatchford, 2001, p.4)

The present project design conforms to these principles. The original project design and this attempted replication also reflected what is known from research about the scientific interests that can be identified among really young children (DeLoach et al, 2007; Leibham et al, 2013).

The attitudes towards science of early years teachers were identified as crucial to encouraging young children’s interest in and excitement about scientific concepts and activities, according to research by Spektor-Levy et al (2011), cited by Tunnicliffe (2013, p5). Of course in this project’s four sessions, the practitioners’ interest and enthusiasm, both that of Cass team members and that of the Centre practitioners themselves, needed to be communicated to children directly as well as via the medium of their parents and carers. Parents are and remain the child’s primary educators and this is particularly pertinent in the early years.

The body of studies on the influence of parental strategies and interests on the emergence of young children’s interests, including scientific interests, is considerable (e.g. Leibham et al, 2005; Tenenbaum and Callanan, 2008). In a recent doctoral thesis, Pattison (2014) reported on undertaking empirical research with seven parents and their four year old daughters in order to explore the emergence of scientific interest in the early years. The girls and their parents were offered access to four scientific activities both in the home and in out-of-home settings. Pattison also examined pre-existing parental scientific interest and found a relationship between this and the girls’ „broad sustained interest“ (Pattison, 2014, p. 115) after the programme of activities had been concluded.

Our data do not allow us to trace such effects in our own sample of parents, but in future projects of this kind, this subject should definitely be studied in greater detail. It may be well be that the practitioners stimulated the greatest interest in the scientific activities on offer in those children whose parents’ or carers’ own interest enabled them to build more effectively on the ideas generated in the project sessions.

8 Conclusion

The project definitely achieved the aims associated with the projects that received funding from the 2015 UEL Civic Engagement Fund. Cass project team members have forged strong contacts with early years settings and local communities in east London over the years, including with the Children's Centre where the project fieldwork took place. The project truly became a joint enterprise with this particular Children's Centre practitioner team and an ethnically and linguistically diverse group of parents and children representative of East London communities. In this way the project reflected the aims of UEL's Community Engagement programme.

The Cass ECS undergraduate students on the project team, who were themselves experienced early years practitioners familiar with East London settings, played a full part in the project, alongside Cass staff. They had the opportunity to deepen their understanding of civic engagement and build on it.

This small STEM project may generate a some lasting and wide-ranging impact on the promotion of emergent science among very young children, if it gets translated into materials to be shared more widely with early years practitioners. In the first place it may inspire early years practitioners, and they may influence parents as they in turn become inspired by those practitioners.

Hopefully this evaluation report, and any academic and practitioner publications yet to emanate from this project, could achieve for this small project the status of a „demonstration project“ to inform science teaching in the very early years across England and beyond. The project therefore may also turn out to offer a possibility of being translated into commercial work, e.g. through a publication or consultancy activities, in line with the aims of UEL's Civic Engagement Fund.

The ultimate aim of the project has been throughout to improve young children's understanding and enjoyment of the living world. This remains the Cass project team's aim for any further activities that may follow from it.

References

- Bruner, J. (1977) *The process of education*, Cambridge, Mass.: Harvard University Press. Second edition.
- DeLoache, J. S., Simcock, G. and Macari, S. (2007) „Planes, trains, automobiles-and tea sets: Extremely intense interests in very young children.“ *Developmental Psychology*, 43(6), 1579–1586.
- DFE (2014) *Statutory framework for the early years foundation stage – Setting the standards for learning, development and care for children from birth to age five*. London: Department for Education
- Gopnik, A. (2009) *The philosophical baby – What children’s minds tell us about truth, love and the meaning of life*. New York: Farrar, Straus and Giroux.
- Johnston, J. and Tunnicliffe, S. (2014) „Editorial.“ *Journal of Emergent Science Vol 8*, 3.
- Leibham, M. E., Alexander, J. M., Johnson, K. E., Neitzel, C. L. and Reis-Henrie, F. P. (2005) „Parenting behaviors associated with the maintenance of preschoolers’ interests: A prospective longitudinal study.“ *Journal of Applied Developmental Psychology*, 26(4), 397–414.
- Leibham, M. E., Alexander, J. M. and Johnson, K. E. (2013) „Science interests in preschool boys and girls: Relations to later self-concept and science achievement.“ *Science Education*, 97(4), 574–593. <http://doi.org/10.1002/sce.21066>
- Orme, M. (1969) „Demand characteristics and the concept of quasi-controls,“ in R. Rosenthal and R. Rosnow (Eds) *Artifact in behavioral research*. New York: Academic Press, 143-179.
- Pattison, S. A. (2014). *Exploring the foundations of science interest development in early childhood*. Oregon State University, Corvallis, unpublished PhD thesis. Retrieved from <http://hdl.handle.net/1957/54783>
- Robson, C. (2002) *Real world research*. Oxford: Blackwell Publishing. Second edition.
- Siraj-Blatchford, J. (2001) „Emergent science and technology in the early years,“ paper presented at the XXIII World Conference of OMEP, Santiago, Chile. Available from: <http://www.327matters.org/Docs/omepabs.pdf>
- Siraj-Blatchford, J. and MacLeod-Brudenell, I. (1999) *Supporting science, design and technology in the early years*. Buckingham: Open University Press.

Tenenbaum, H. R., & Callanan, M. A. (2008). „Parents“ science talk to their children in Mexican-descent families residing in the USA.“ *International Journal of Behavioral Development*, 32(1), 1–12.

Tunnicliffe, S. D and Ueckert, C. (2011) „*Early biology: the critical years for learning.*“ *Journal of Biological Education*, 45 (4) 173-175.

Tunnicliffe, S. D. (2013) *Talking and doing science in the early years – A practical guide for ages 2-7*. Abingdon: Routledge

Tunnicliffe, S. D. (2015) *Starting Inquiry-based Science in the Early Years: Look, talk, think and do*. Abingdon: Routledge

University of East London (2015a) *Civic Engagement*.
<http://www.uel.ac.uk/about/civicengagement/>

UEL (2015b) *UEL Civic Engagement Fund 2015 – Project agreement and conditions of funding*.

Vygotsky, L. S. (1978) *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press

Annexes

Annex A Parent flyer about Cass science project

Annex B Programme outline 4 project sessions

Annex C Parent briefing and consent form

Annex D Parent pre-project questionnaire

Annex E Parent post-project questionnaire

Annex F Children's Centre practitioner pre-project interview topic guide

Annex G Children's Centre practitioner post-project interview topic guide

Talking Everyday Science

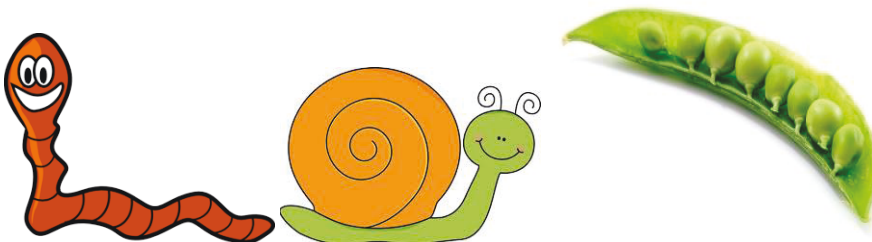
This is an exciting opportunity to find out how your child uses scientific thinking in their everyday play and what you are doing at home to support them!

For 4 Tuesday mornings in June, staff and students from University of East London will be attending the Stay and Play session to speak to parents about your children's scientific thinking and demonstrating how the everyday activities you do at home with your child involve more science than you might think!



Each week a different scientific theme will be explored and on the 4th week, you will have the opportunity to create a photo book of your child's engagement in the activities.

If you are interested in being a part of the project, please speak to Gareth or one of the Stay and Play staff



During these 4 sessions photographs and audio recordings of the children may be taken. If you do not wish your child to have their photo taken or to be recorded, please let know.

*'Parents talking everyday science to young children'**Programme outline 4 project sessions***Week 1: Forces****Introduction to the talking everyday science sessions****Outdoor activity:** Floating and sinking

An introduction to the concepts of floating and sinking, with targeted questions for the children and parents.

Children will have access to a range of water activities, water play with bubbles, funnels, bottles.

A range of everyday items to be tested to see if they float or sink variations to this will be if some objects take time to sink for example sponges.

Possible prompts:

2-3 year olds:

"What will happen when we put this object in the water?"

"Is the object floating or sinking?"

3-5 year olds:

"What objects do you think will sink?"

"What objects do you think will float?"

"If we press the object will it sink faster?"

Outdoor:: Cars, Balls and Ramps

Children to have free access to a range of balls, cars, and non-rolling items (wooden blocks?). Ramps to be created using wooden blocks and guttering. Children to investigate/consider the properties of items which roll, and to „test“ how quickly/far different items will roll. Opportunities for repetitive play and adaptation of items/ramps to adjust the length and speed that the items travel. Activity differentiated by children's choice of resources and adult prompts. Children to observe the play of their peers and adapt their own play accordingly. Parents and students to observe the choices of the children, the repetitive play, their observation of their peers and how the adapt activities according to the prompts or to their observations of their peers.

Possible prompts:

2-3 year olds:

"Ready, steady, roll, ooh all the way to the bottom....!"

“ Ready, steady, roll. Uh Oh, it got stuck in the middle!”

“ How can it go faster?”

“ How can it get to the bottom of the ramp!”

3-5 year olds.

“ This car rolls right to the bottom of the ramp, I wonder why it does this?”

“ Oh dear, this wooden block gets stuck/falls to the bottom. I wonder why it doesn’t roll like the car does?”

“ I can’t make my car roll up the hill, it only wants to roll down! Can anyone help me?”

Discussion of possible activities that could be replicated at home.

- Rolling cars and balls in the garden or down the stairs
- Pushing floating items in the bath (blowing with straws?)

Vocabulary: Roll, top, bottom, ramp, pull, push, move, stop, predict, smooth, glide, quickly, slowly, round, pointed, edges, light, heavy, weight, float, sink, splash, big, small, soak, water, still, ripple, on the water, under the water, wood, metal, plastic, fabric, change, down, up, texture.

Week 2: Living things

Indoor : Exploration activity

Children to explore a range of different seeds and bulbs from plants, flowers and vegetables. Children to be encouraged to describe the colours, patterns and textures of the bulbs and seeds. Facilitator to explore what the children already know about how plants and flowers grow from seeds and bulbs. Drawing materials to be made available for children to draw /talk about their ideas. Facilitator to open the veg and fruit (e.g. peas, carrots with roots on, plants and flowers with roots attached). Parents and students to observe how the children explore the materials, and to record the comments that the children make in response to the questions/prompts.

Possible Prompts:

2-3 year olds:

“What do these feel like? What do they smell like? (facilitator to model feeling and smelling)

“ Have you seen these before?”

“ What’s inside here? (peas-hold up to the light)”

3-5 year olds

“ Where do you think I got these plants from? How did I get them? Have you seen these plants in your garden or in the park? What are these bits (roots)? I wonder what they are for?” This stem feels very strong, I wonder why it needs to be so strong?

“I want to have more flowers in my garden. What should I do with these (bulbs)?”

Outdoor : Exploration activity

Builder’s tray with mealworms, leaves, real and artificial flowers, a variety of vegetables. Children to be encouraged to find the worms and explore their

features. Facilitator, parents and students to be on hand to ensure that the children are handling the creatures appropriately. Children to explore the features of the worms, observe how they move and consider what they might eat. Children to be encouraged to compare the characteristics of the worms with human characteristics.

Possible prompts:

2-3 year olds:

“ I wonder what this is? Can you see it moving? Where is it going?”

“ I wonder what this is (mealworm?) Is it moving? I wonder which one is quicker?”

3-5 year olds:

As above + “ Can you see any legs on the worm? I wonder how it moves then?”

“ What do you think they like to eat? What about the worm? How do they find their food? Why do they need to eat? What does it feel like?”

Discussion of possible activities that could be replicated at home.

- Planting seeds and bulbs
- Opening peas
- Exploring the inside of fruit and veg
- Looking at fruit and veg in the supermarket
- Looking at plants, flowers, mealworms in the garden/park and in the setting

Vocabulary

Roots, seeds, bulbs, stem, leaves, petal, grow, water, soil, sun, names of different flowers and vegetables, pod, worm, snail, wriggle, crawl, slime, parts of the body, backbone/vertebrae?

Week 3: Materials

Indoor activity: Making play dough

Outdoor activity: Sand and corn flour play

Sand play

Children to have access to dry sand and water, buckets, spades and watering cans. Children to explore mixing the sand and water together to fill and empty the buckets. Also to explore the movement of sand and water through the sand wheels and the water wheels. Children to be given opportunities to discuss the changing texture of the sand and water and how this has an effect on how the materials move and can be manipulated (e.g. „catching water“ *sprinkling* dry/wet sand/. Also to explore how adding water to sand effects the weight and strength of the sand (for making castles), and to consider what happens when the wet sand is left to dry out. Differentiated according to age of children by the nature and type of interaction/questioning. Parents and students to observe the repetitive play, adaptation of activities and record the responses to the prompts/questions.

Cornflour play

The aim of the activity to observe the changes to materials when water, washing up liquid and food colouring is added to them.

Possible Prompts:

2-3 year olds:

“ Shall we pour the sand in here. Whee, look at the little wheel go round and

round. I wonder why? (Repeat with water, over and again)

“ Who can fill this bucket all the way to the top?” Ready, steady.....!”

“ What happens when we add some water to the sand.... Here goes!”

3-5 year olds

“ I’m going to fill my bucket with all of this dry sand and make a sand castle. Oh no! It’s all collapsed” I wonder why it won’t stand up”

“ I wonder what will happen if I add water to my sand. Who thinks my sand castle will stand up this time? Why do you think this?”

“ Wow, my bucket is really heavy now (after mixing with water!). I wonder why. Which of these buckets is the heaviest?

“ Ugh, this wet sand is all messy and gooey! Who knows where all the water has gone?! (when mixed with the sand)

“ I wish my sand was dry again. How can I make it go back to being dry?”

Discussion of possible activities that could be replicated at home.

- Sand and water play
- Mud kitchen
- Baking and cooking
- Watching food in the microwave (scrambled eggs)
- Melting and freezing

Vocabulary:

Mix, water, sand, messy, gooey, combine, dissolve, evaporate, separate, heavy light, full, empty, strong, weak, collapse, unstable, stable, wet, dry

Week 4: Discussion with parents/carers about photobooks

Indoor activity: Discussion with parents on the content of photobooks. RC and CD to complete end of project evaluation with parents. Students to collate observations, photographs and to complete their own evaluations of the research.

Parents' briefing

Parents talking everyday science with young children

Dear parent/carer,

Staff and students from the Cass School of Education at the University of East London will be joining 4 ...Children's Centre „stay and play“ sessions this summer, on 9, 16, 23 and 30 June. We will be working alongside the ... Children's Centre staff, spending time with parents and children talking and playing science together using everyday experiences. This is a small project exploring how parents and early years practitioners can together build on children's curiosity and early interest in investigating and experimenting with science.

This project has been funded by the University of East London's 2015 Civic Engagement Fund and it has been approved by the Ethics Committee of the University of East London. The purpose of this letter is to provide you with the information that you need to consider in deciding whether to participate in this project „*Parents talking everyday science with young children*“ and in its evaluation.

All activities planned will be perfectly safe for young children and their parents or carers. All UEL researchers and students taking part in this project have passed the appropriate Disclosure and Barring Service checks allowing them to work with children. If you are happy to take part we would be asking you to fill in a short questionnaire before and after the project, and to attend all 4 „stay and play“ sessions and take part in the activities put on by UEL and ... Children's Centre staff. With your permission we will audio record the sessions to help us understand better how children, parents and staff respond to the activities.

All the information we collect in this ways will be kept safe and confidential in password protected files on UEL computers which can only be accessed by members of the UEL project team and in accordance with the University's Data protection Policy. We will use this information for a small report telling you and ... nursery staff about our findings and for academic journal articles. Neither the name of the nursery, nor your name or that of your child will be mentioned in any of these materials. All this information will be destroyed after we have used it to learn from the project and write about it.

Your own and your child's/children's involvement, or that of the children you care for, in this project is entirely voluntary and you are welcome to withdraw from the special activities during these 4 special stay and play sessions at any time.

If you would like to know more about the project, please talk to G... or M...Or if you have any queries regarding the way we are conducting this project in which you are being asked to participate, please contact: Catherine Fieulleateau, Research Integrity and Ethics Manager, Graduate School, EB 1.43, University of East London, Docklands Campus, London E16 2RD (Telephone: 020 8223 6683, Email: researchethics@uel.ac.uk).

Of course you are still very welcome to attend the ... nursery „stay and play“ sessions as usual, even if you and your child/children prefer not to take part in the activities put on by ... nursery and UEL staff. There will be other activities on offer as usual. There is no need to give a reason for not wanting to take part in the special activities. Equally, if you would like to take part in the activities put on, but prefer not to complete the questionnaires before and after these 4 sessions, that is fine, too.

Kind regards and many thanks,



Dr Eva Lloyd, Principal Investigator
Cass School of Education and Communities University of East London
Stratford Campus, Water Lane, London E15 4LZ
Tel 0208 223 6367 (07957 292674 out of hours)
Email: e.lloyd@uel.ac.uk

Parent/carer consent form

Parents talking everyday science with young children

I have read the information about the above project in which I and have been asked to participate and have been given a copy to keep. The nature and purposes of this project have been explained to me, and I have had the opportunity to discuss the details and ask questions about this information. I understand what it being proposed and the nature of my involvement and that of my child/children or the children I care for has been explained to me.

I understand that my involvement in this project, and the information gathered from questionnaires and from the programme of activities, will remain strictly confidential. Only the UEL research team involved in this project will have access to that information. It has been explained to me what will happen once the programme has been completed.

I hereby freely and fully consent to participate in the project which has been fully explained to me and for the information obtained to be used in relevant research publications.

Having given this consent I understand that I have the right to withdraw from the project at any time without disadvantage to myself and without being obliged to give any reason.

Parent/carer's name (BLOCK CAPITALS)
.....

Parent/carer's signature
.....

UEL Research team member's name (BLOCK CAPITALS)
.....

UEL Research team member's signature
.....

Date:

Parent questionnaire

Parents talking everyday science with young children

Dear parent/carer,

We do hope that you and your child(ren) enjoyed participating in the 4 „stay and play“ sessions at ... nursery where researchers from the University of East London explored with you and ... nursery practitioners how young children learn about everyday science with help from their parents. The research team is again really interested in your replies to the questions below.

Your replies will remain anonymous, but it is very useful if you use the „code“ name on your form, which you used when we asked you questions before the sessions took place.

You should feel free to answer as many or as few questions as you like. If you complete this questionnaire we will assume that you are happy for us to use the information in our research. All the information we collect in these ways will be kept safe and confidential in accordance with the University's Data protection Policy. We will use it for a small report telling you and ... nursery staff about our findings and for academic journal articles

Now that the 4 „stay and play sessions“ are finished, we plan to report back to you quite soon on what we have learned from this small project. Please hand the form back to the „stay and play“ staff when you have answered the questions.

If you have any concerns about the conduct of members of the researcher team or any other concerns about this project, you are welcome to contact researchethics@uel.ac.uk

Many thanks for your help with this small research project!

Dr Eva Lloyd (e.lloyd@uel.ac.uk)
on behalf of the UEL project team
Cass School of Education and Communities

1. Please can you provide the same „code“ name for yourself which you used when we asked you questions before?

2. What does the word „science“ mean to you right now?

3. Did you enjoy the „talking everyday science with your children“ sessions?

Yes No A little

4. What did you like the most?

5. What did you like the least?

6. What did you learn during the sessions?

7. Do you feel more confident about helping your child explore and investigate the types of activities we did in the sessions?

Yes	No	A little
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Have you got a garden at home?

Yes No

9. Have you got any new ideas about how to use your garden at home?

Yes No

If yes, what are they?

... nursery staff will be able to answer any questions you may have. Many thanks for your help!

Parent questionnaire

Parents talking everyday science with young children

Dear parent/carer,

We do hope that you and your child(ren) enjoyed participating in the 4 „stay and play“ sessions at ... nursery where researchers from the University of East London explored with you and ... nursery practitioners how young children learn about everyday science with help from their parents. The research team is again really interested in your replies to the questions below.

Your replies will remain anonymous, but it is very useful if you use the „code“ name on your form, which you used when we asked you questions before the sessions took place.

You should feel free to answer as many or as few questions as you like. If you complete this questionnaire we will assume that you are happy for us to use the information in our research. All the information we collect in these ways will be kept safe and confidential in accordance with the University's Data protection Policy. We will use it for a small report telling you and ... nursery staff about our findings and for academic journal articles

Now that the 4 „stay and play sessions“ are finished, we plan to report back to you quite soon on what we have learned from this small project. Please hand the form back to the „stay and play“ staff when you have answered the questions.

If you have any concerns about the conduct of members of the researcher team or any other concerns about this project, you are welcome to contact researchethics@uel.ac.uk

Many thanks for your help with this small research project!

Dr Eva Lloyd (e.lloyd@uel.ac.uk)
on behalf of the UEL project team
Cass School of Education and Communities

-
1. Please can you provide the same „code“ name for yourself which you used when we asked you questions before?

-
2. What does the word „science“ mean to you right now?

3. Did you enjoy the „talking everyday science with your children“ sessions?

Yes	No	A little
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. What did you like the most?

5. What did you like the least?

6. What did you learn during the sessions?

7. Do you feel more confident about helping your child explore and investigate the types of activities we did in the sessions?

Yes	No	A little
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Have you got a garden at home?

Yes No

9. Have you got any new ideas about how to use your garden at home?

Yes No

If yes, what are they?

... Children's Centre staff will be able to answer any questions you may have. Many thanks for your help!

Topic guide

Pre-project semi-structured interview...Children's Centre practitioners

Parents talking everyday science with young children

1. What does the term „science“ mean to you?

2. Did you learn any of the following subjects at school?

Subject	Yes or No	At primary school	At secondary school	In further education	In higher education
Biology					
Chemistry					
Physics					
Geology					
General Science					
Environmental science					
Home economics					
Computer science					

3. Did you like any of these science subjects? Yes – which ones? No – which ones

Yes	Which ones?
No	Which ones?

4. Have you noticed children exploring and investigating what could be called science? Can you give examples?

5. Do you feel confident about helping children in your setting exploring and investigating in this way?

6. Do you feel confident talking to parents about early science?

7. How long have you worked as an early years practitioner?

8. What is the highest qualification you have got?

Many thanks for your help!

Topic guide

Post-project semi-structured interview...Children's Centre practitioners

Parents talking everyday science with young children

1. What does the term „science“ mean to you?
2. Did you enjoy the „talking everyday science with your children“ sessions? What did you enjoy the most? What did you enjoy the least?
3. Is there anything you would like to change about the format of the sessions?
4. Do you feel more confident about helping children in your setting exploring and investigating science in this way, building on their natural curiosity?
5. Do you feel more confident about talking to parents about early science?
6. Did the project give you any new ideas for working with children? If so, can you give examples?
7. Did the project give you any new ideas about working with children and parents together in this way? If so, can you give examples?
8. Did you feel you learned from the project overall?
9. Would you recommend working in this way to practitioners in other early years settings?

Many thanks for your help!