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D3.2: Report on methodologies for parent education

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INTRODUCTION

The review of research on family engagement conducted for the FEAST deliverable 3.1 identified a series of recommendations for the design and development of activities aimed at facilitating adult engagement alongside their children in topics of science and technology within a museum or science centre setting.

In this deliverable, key methodological aspects of some of these studies are discussed in greater detail in order to highlight relevant implications of this work for the development of a Common Methodology for FEAST workshops (discussed in detail in D5.1).

The key papers are discussed in turn drawing attention the methodological insights they afford in terms of data collection techniques, conceptualisations of engagement levels, or advice on design of programmes. The implications arising for FEAST partners are then highlighted.

1. Analysing parent actions and beliefs

Downey, S., Krantz. A & Skidmore, E. (2010). The parental role in children's museums. *Museum & Social Issues*. 5:1, 15 – 34.

The study by Downey *et al.* (2010) offers FEAST partners and others a methodological framework for examining parental roles and perceptions, either before or after their participation in the FEAST programme. In particular, it focuses on gauging parents' understanding of the role of play as a way of enhancing children's (and their own) engagement with science content.

The study, conducted at the Please Touch Museum, Philadelphia employed three methods of data collection:

- Questionnaire (to 409 adults leaving the museum)
- In-depth interviews (with 73 adults leaving the museum)
- Timing and tracking observations of 168 children aged 3–10 as they engaged with exhibits.

This volume of data provided the researchers with a large, and potentially representative sample of their visiting public. FEAST partners and other museum practitioners may not be able to collect these volumes of data, but the proces of validating findings in one data source (interviews) with those in another (observations) is relevant to all, even if the number of interviews or observations is relatively small.

The analysis involved the researchers scoring responses to the in-depth interivew on a four-level continuum. Parents who explicitly understood the role of play in learning scored highly. Parent who did not see the connection between play and learning were given a low score. The researchers were looking for instances in which the parents described their views as:

- Play being about fun and enjoyment
- Play being about enrichment
- Play being about skill-building
- Play being about learning

As part of the questionnaire, parents were asked to rank a series of statements. The results are as follows, with the highed ranked statements first:

I most value play at the Please Touch Museum because it…

- Provides opportunities for the children I'm with to have fun
- Enhances the imagination of the children I'm with

- Contributes to the healthy brain development of the children I'm with
- Enhances the abilities of the children I'm with to solve problems creatively
- Contributes to the social and emotional well being of the children I'm with
- Enhances the confidence of the children I'm with
- Provides opportunities for the children I'm with to be active and burn energy
- Contributes to the academic achievement of the children I'm with.

The parents also ranked their role from the following six statements, with the first being the highest ranked.:

My role at Please Touch Museum is to:

- Play and have fund alongside the children I'm with
- Allow the children I'm with to direct / guide activities and play
- Facilitate the play of the children I'm with
- Learn alongside the children I'm with
- Supervise the behaviour of the children I'm with
- Give the children I'm with the freedom to play without adult intervention

Measuing the ranking of such statements provided the researchers with the opportunity to gauge how this relatively large sample of visitors understood learning, the value of play, and the role of accompanying adults.

From their observations at the Please Touch Museum, Downey *et al.* found that most adult-child interactions were 'hands-off' and supervisory, instructional or disciplinary in nature. Only one third of adults played with their children and less than one in ten knelt down to their child's level to play. Significantly, this finding contradicted the responses to the questionnaire findings, and as such highlights the importance for FEAST of both asking visitors about their views/perceptions, but also observing their actions and correlating the two data sets.

Their conclusions from Downey *et al.'s* study are that most parents lack a clear understanding of the learning benefits of play. They may assert that they value play, yet do not engage in or facilitate play with their children. The authors suggest that many parents lack confidence in and knowledge of *how* to play with their children.

Clearly, the findings from this study raise questions about how best to help parents to appreciate and engage in playful activities. Futher they point to whether the physical design of the activity discourages parental involvement or not.

Implications for FEAST workshops design:

- Workshop leaders need to explain the value of play/active engagement on the part of parents for helping children to play, engage and learn.
- Workshop leaders need to model play / active engagement and support parents to do the same
- Workshops need to be physically designed to enable play / active engagement of both adults and children

Implications for FEAST workshop evaluation:

- It is necessary to validate findings from one data soure (eg interviews) with another (eg observation) as parent professed beliefs do not necessarily concur with parent behaviours.

2. Understanding underlying views held by parents

Wood, E. & Wolf, B. (2010). When parents stand back is family learning still possible? *Museums & Social Issues*, 5:1, 35-50

In this discussion paper examining data from a series of evaluations on parent roles in family learning experiences at The Children's Museum, Indianapolis, Wood and Wolf offer valuable insights into why parents may behave as they do. The researchers examined 13 different studies representing 8000 observations of 400 families. In their analysis, they found that parents may not behave in the way that museums would like them to – they stand back rather than interact or collaboratively problem solve. In seeking to explain this behviour, Wood and Wolf suggest that

> 'the parent preference to step back reveals an awareness of the exhibition design and content centred around hands-on learning activities, a percepton of learning in the space, and the opportunitity to "let them[children] figure it out". Children too recogonize the design and content by explaing "this is a place where you can keep trying things until they work."' (page 42)

In examing the data set and parents' responses to various questions, the researchers were able to collate a list of reasons for their standing back:

- Don't want to interrupt their child's experience
- Don't want to take space from another child
- Need a respite from playing with my child
- Somewhat uncomfortable with playing in public
- Like to socialise with another adult

More positively, however, the researchers noted that parents were often proactive in helping their children to avoid frustration, and in providing corrective interventions that led to continued play on the part of the child.

Implications for FEAST workshop design

- It may be necessary to explicity invite parents to join in with an activity and explain that they will not be interfering, or taking the space of another child
- It may be necessary to allow parents to talk together (rather than only in family groups) so that adults can interact at an adult level also.

3. The importance of parents in supporting children's interests

Zimmerman, H.T., Perin, S. & Bell. P. (2010). Parents, Science and Interest. The role of parents in the development of youth interests. *Museum & Social Issues*. 5:1 67-86

This paper highlights the social supports needed to pique and maintain interest for youth around science. Zimmerman *et al*. note that children's interests are facilitated by friends, peers and parents. For young children parents play a particularly significant role in influencing interest. Furthermore, the authors note that parents have a knowledge and understanding of their children's provisional interests and experiences and thus 'parents can act as bridges from youths' prior experiences to their developing STEM expertise' (page 70 – 71).

In order to understand how families experience a museum/science centre visit, and how any interests may be piqued or developed, the researchers studied 15 families, all of whom were regular visitors to the Pacific Science Center. They conducted a pre-visit and postvisit interviews with the families using open-ended questions in a conversational style to guage each family's prior experiences with science and something of their typical routines on a science center visit. They also filmed the family during the course of their visit and then examined their spoken interactions.

From this Zimmerman *et al.* found that

- parents support existing interests through gestures and conversation that connects interests to exhibits
- parents make observations and read museum signage
- familes use storytelling, jokes and analogies to transfer their understanding across different domains of knowledge
- Families readidly use knowledge from pop culture, literature and other everyday experiences to make strategic learning connections.

However, in discussing their data and their findings, Zimmerman et al. note that even parents who had a scientific background sometimes struggled to develop proper explanations and connections for science. Thus they conclude that informal science settings need to provide suggestions to adults about how best to successfully support youth in exhibits.

Implications for FEAST workshop design

- Parents know their children's interests and enact particular social practices that support their children. Such practices need to be recognised, accepted and supported where possible.

- Zimmerman et al promote the funnel metahpor (developed by Schauble and Bartlett, 1997) as a way of facilitating interest development. Thus it is recommended that experiences [workshops / exhibits] should 'narow' from general interest and focus in on increasing oportunities for specialised, detailed learning.
- Explicit guidance is needed for parents on how best to enhance their children's experiences (much in the same way that 'teacher guides' are provided for teachers brings school groups).

4. Parents as facilitators?

Palmquist, S. & Crowley, S. (2007). From teachers to testers: How parents talk to novice and expert children in a natural history museum. *Science Education,* 91: 783-804

This study involved the analysis of family conversations that occurred during a visit to a natural history museum. Findings suggest that parents with children who did not have prior knowledge or prior interest in dinosaurs (termed novice children) were more actively engaged them in learning conversations than parents with children who had considerable knowledge (termed expert children).

In familes with expert children, parents no longer acted as a teacher or coinvestigator, instead they acted as tester or evaluator of knowledge. Palmquist and Crowley aruge that new pedagogical tools are needed to help parents break through the glass ceiling above their child's particular area of expertise in order to continue to support and extend learning.

Implication for FEAST workshop design:

- Workshop designers and leaders need to recognise that participants – both children and adults - may come to the experience with varied backgrounds and levels of knowledge. Care needs to be taken that possessing some knowledge doesn't limit the opportunities for children to engage, or for parents to become effective facilitators of family engagement. Unfortunately, there are, as yet, not answers, about how best to address this issue. Findings from FEAST are thus highly important here.

5. Assessing levels of engagement and examining the potential role of parents

van Schindel, T.J.P., Franse, R.K. & Raijmakers, M.E. (2010). The Exploratory Behaviour Scale: Assessing young visitors' hands-on behaviour in science museums. *Science Education*, 94: 794-809.

This paper presents a tool for asssessing the level of engagement on the part of young visitors to a museum. The researchers developed the Exploratory Behaviour Scale (EBS) – a quantitative measure of preschoolar's hands-on behaviour. The tool considers the child's exploration in the physical environment of the museum against three levels:

- Passive contact
- Active manipulation
- Exploratory behaviour (involves repetition, variation experimenation)

In order to increase the volue of exploratory behaviour, van Schijndel *et al.* developed an instrumental video that aimed to show parents how best to guide their children. They tested the efficacy of this video and found that children whose parents had seen the instructional video showed more high-level exploratory behaviour than those who had not. Intererstingly, however, they found that if an Explainer was present at an exhibit and leading or modelling 'good' exploratory behaviour this tended to limit the level of behaviour on the part of the children. It seems that the presence of the unknown explainer hampered exploratory engagement, whilst the judicial use of pedagogical instruction by a parent supported exploratory engagement.

Implications for FEAST workshop evaluation

- EBS is a useful tool for evaluating exploratory behaviour at exhibits, and could provide a tool for assessing the degree of engagment of the part of young children during FEAST family workshops. Used in conjuction with other recommendations (the need to consider the extent of expertise on the part of children ar adults with regards to a particular topic) , this tool could be useful in evaluating the success of the workshop deisgn for *all* the family. (However, the tool does require the application of interator reliability techniques and an understanding of statistics, and may not be appropriate for those not trained in such approaches)

Implications for FEAST workshop design

- The presence of explainers may not help engagement! It would appear that it may be better for parents to learn necessary facilitation skills instead.

6. Analysing the impact of giving parents specific facilitation expertise

Haden, C.A. and Wilkerson, E. (2010). Enhancing building, conversation and learning through caregiver-child interactions in a children's museum. *Developmental Psychology*, 46:2, 502-515

This study sought to examine the impact of providing caregivers with explicit information and guidance about the value of asking their children 'wh' questions (why, what, where, who) as a mechanism for enhancing their engagement with a building task. The value of providing explicit pre-experience information about a topic (in this case building and structure) was also examined.

Five experimental groups of caregiver and child dyads were examined:
Group 1 – received instruction about the building task and the value and use of 'wh' questions*
Group 2 – received instructions about building task only
Group 3 – received instruction about the value and use of 'wh' questions
Group 4 – a control group that received no advance instruction at all
Group 5 – a group that saw models of building designs and watched video clips of caregiver-child interactions but received no verbal instruction about the use and value of questions or the building task

*The instruction relating to the use of 'wh' questions included examples such as 'Why would a workman wear googles? When have you worn googles? What inside us holds up our bodies? The instruction relating to the building task gave the experimental groups concerned information and insights on the value of bracing buildings to provide strength and so on.

Each group of caregiver-child dyads then took part in activities in an exhibition entitled 'Under Construction'. There were no signs about how or what to build, simply materials for visitors to build as they wished. All interactions between caregiver and child (talk, and collaborative building activities) were observed and recorded. Following their exhibit experience each adult-child pair was asked to comment on various structures presented in a series of photos. Some also took part in an in-home assessment (conducted at a later date) of the child's memory of the event.

The analsyis of the observations and verbal interaction yielded the following findings:

- Caregiver-child dyads in the groups who had received explicit information about the topic (building and structure) built stronger buildings than those who had not received guidance.
- Dyads in the 'wh' question instruction only condition talked more (prompted by parental questions) than the other groups

In their discussion, the authors noted that 'wh-questions may be particularly important for shaping understanding and encoding in that they can call attention to specific aspects of an event that are perhaps particularly salient, interesting, and/or key for understanding, while at the same time helping an adult to determine what a child may or may not know.'(page 513). Furthermore 'when a caregiver's questioning is followed by the child's verbal elaboration, an enriched representation of the experience may be established.' (ibid)

The authors also pointed to the value of explicit content guidance noting that it was the combination of building and question instruction that appeared to be important for the children's abilities to spontaneously report information about their experiences at later points. Finally, the authors noted that it was surprising that the group who had only seen models of building, and video clips of interaction did not perform better than they did. This raises questions about the value of models but again highlights the value of explicit instruction.

Implications for FEAST workshop design

- Providing parents with explicit instruction about key facilitation techniques, such as asking 'wh' questions to prompt greater exploration and discussion, is key in enhancing engagement with content and recall of the experience.
- Providing parents with content information is also important in engendering content/skill acquisition of the part of children which lasts over time.

7. Pedagogical tools to support family engagement

Allen, S. & Gutwill, J.P. (2009). Creating a program to deepen family inquiry at interactive science exhibits. *Curator*, 52, 3: 289-306

Gutwill, J.P. & Allen, S. (2010). Facilitating family group inquiry at science museum exhibits. *Science Education*, 94, 710-742

These papers report on findings from the GIVE (Group Inquiry by Visitors at Exhibits) project at the Exploratorium in the US. The project sought to answer the following questions: Can intergenerational groups of museum visitors such as families be coached by museum staff to learn a set of inquiry skills that they can use on their own? What form of facilitation techniques work best?

Initially, the team hoped to equip families with a set of six skills to support their inquiry at exhibits on the museum floor. These skills (and their manifestation as questions or comments) are as follows:

- Exploration (What does it do?)
- Question-generation (What makes it do that?)
- Generation of mulitple alternative models (Maybe what's going on here is..)
- Choice of exlpanatory model with empirical or theoretical justication (What we think is going on is..)
- Significance (This exhibit 'speaks to me' in terms on…..)
- Metacognitive self-assessment (But what we still don't know is…)

These objectives were based on the team's understanding of good inquiry practice. However, they were also keen that the training would also be appropriate for the museum context. Thus, they stated that the skill training should also be:

- appropriate for groups with a broad range of ages, interests and backgrounds
- accessible enough to be non-intimidating to visitors without strong science backgrounds
- simple enough to be remembered without much effort
- intrinisically enjoyable so they would be used spontaneously, beyond the practice period with a staff educator
- quickly learnable over a 20-30 minute experience to fit easily within the timeframe of a typical museum visit
- applicable across a very broad range of exhibit types and topics, so that visitors would find them useful during the rest of their visit, no matter which exhibits they chose to use.

The team found that it was not possible given the constraints to equip families with all six skills. In particular, metacognitive reflection seemed inappropriate to expect: it may happen later, or it may not be a

focus when there are so many other exhibits to explore. However, the team found that it was possible to support family groups to engage in proposing an inquiry action and to interpret the results of this action. They did this by teaching families to use the juicy questions and to play the hands-off game.

Juicy question game

Family members learn to propose and investigate a juicy question that is explicity defined as one that can be answered at the exhibit and to which nobody knows the answer.
(Initially this requires a facilitiator – eg a museum educator, then a member of the family can take over)

Hands-off game

The hands-off game was in part developed to help ensure the engagement activities were 'fun' as well as educational. At any time, anyone can call out 'hands-off' and which point the others must stop their explorations and listen to the caller. The caller can share either a proposal for something they wish to investigate or a new discovery. Once agreed or noted by the others in the group, the caller may shout 'hands-on'.

Gutwill and Allen in the two papers above note that such games are based on strong pedagogical principles. They:

- Build on learners' prior knowledge
- Teach via modeling, scaffolding and fading
- Identifies skills explicitly / explicitly support skill development
- Support metacognition
- Foster collaboration
- Make the activity intrinsically motivating
- Minimize cognitive load (not too much needs to be remembered)
- Allow family and personal motivations to lead direction of inquiry

To examine the success of the training, the researches examined the interactions beween family groups that had had the training, and those that had not. They found that

- The juicy question activity was effective at improving visitor driven inquiry at interactive exhibits. It had less effect on number of actions proposed, but afforded a substantial impact on the number of interpretations made
- The juicy question condition also fosterd more consecutive interpretations which lead to collaborative explanations and coherent investigations

- Visitors mentioned that the game helped them think, focus and collaborate (although some participants also noted that sometimes the activity was forced and that it was difficult to get everyone to participate and agree on a question ot investigate).
- Significantly, almost half of the families made correct interpretations (so not only inquiry, but also science content knowledge)

Implications for FEAST workshop design

- 'Offering parents a structured, coinvestigative role in exploring phenomena may significantly enhance families' inquiry' (Gutwill and Allen, 2010: 738)
- By prompting the asking of questions to which no-one knows the answers, both parents and children are challenged and motivated. By articulating ideas, the inquiry may become deeper and more coherent.
- By explicitly teaching parents and children the skills of collaborative inquiry, parents are prevented from falling into what may be their usual role of being overly didactic, ie telling children the answers rather than letting children discover answers for themselves.

SUMMARY

The implications for FEAST workshop design from all the papers listed above are summarised as recommendations and clustered below in key themes:

Physical design

- Workshops need to be physically designed to enable play / active engagement of both adults and children
- Workshops need to be designed to encourage conversation between families which in turn will promote collaborative inquiry

Acknowledging parents's backgrounds and skills

- Parents know their children's interests and enact particular social practices that support their children. Such practices need to be recognised, accepted and supported where possible.
- Workshop designers and leaders need to recognise that participants – both children and adults - may come to the experience with varied backgrounds and levels of knowledge and expectations of how to behave. Care needs to be taken that possessing some knowledge doesn't limit the opportunities for children to engage. Similarly a lack of knowledge (on the part of parents) should not preclude their engagement with their children.

Suppoting parents

- Explicitly invite parents to join in with an activity and explain that they will not be interfering, or taking the space of another child, but instead will be helping their children to learn.
- It may be necessary to allow parents to talk together (rather than only in family groups) so that adults can interact at an adult level also.

Workshop leaders

- Workshop leaders need to explain the value of play/active engagement on the part of parents for helping children to play, engage and learn.
- Workshop leaders need to model play / active engagement and support parents to do the same.

Science Content

- Workshops should 'narow' in focus from general interest /content at the beginning to increasing oportunities for specialised, detailed learning.
- Parents need content information to support their children's content/skill acquisition.

Guidance

- Explicit guidance is needed for parents on how best to enhance their children's experiences (much in the same way that 'teacher guides' are provided for teachers brings school groups).
- Providing parents with explicit instruction about key facilitation techniques, such as asking 'wh' questions to prompt greater exploration and discussion, is key in enhancing engagement with content and recall of the experience.
- By prompting the asking of questions to which no-one knows the answers, both parents and children are challenged and motivated.

FINAL WORD

As a final comment, it is worth noting that all the above recommendations are supported by a recent review (June, 2012) of research on family learning commissioned by the UK's National Institute for Adult and Continuing Education (NIACE). The review also highlighted that whilst interventions, such as the FEAST workshops, which are intended to support family learning in science, are often valued for simply providing space for families to spend time together engaged in a joint activity.

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