THE PERCEPTIONS AND BEHAVIOUR OF CHILDREN AND THEIR FAMILIES IN CHILD-ORIENTATED MUSEUM EXHIBITIONS

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Abstract

This study explores the part that *child-orientated exhibitions* play in the child and family museum experience. Such exhibitions are characterised by their distinctive approaches to learning, interpretation, and design, being especially devised for children. The research was carried out in children's galleries from three types of museum (a maritime museum, a science museum, and a children's museum) in order to compare and contrast similarities and differences between them. Since most of the research in this area has been carried out in science centres or science museums, there is a need to explore the situation in child-orientated exhibitions and compare it to studies carried out in other informal learning settings. Understanding the qualities of their experience in a child-orientated exhibition which children and families value and why and how design and interpretation decisions may affect family behaviour, perceptions, and learning, will enable educators, museum designers and other museum professionals to plan more responsive and meaningful child-centred exhibitions.

Children from seven to eleven years old and their accompanying adults were considered in this study. The research involves both qualitative and quantitative approaches and the use of different methods of investigation, such as face-to-face interviews with children and an adult relative; unobtrusive observation of family group interactions at three exhibits in each gallery; and collection of children's drawings about their favourite exhibit in the galleries. The sample sizes for each investigation varied: 150 families, totaling 300 individuals, were interviewed (150 adults and 150 children); 450 different family groups were observed at the galleries (150 in each gallery); and 120 children's drawings were collected. The guiding principle was to adopt an holistic approach to the situation under investigation, taking into consideration Falk & Dierking's interactive museum experience model (Falk & Dierking, 1992), which considers the personal, social, and physical contexts of a museum visit.

Findings from the **observations** indicated gender effects in adult splitting behaviour from the family group at exhibits according to family members joint-activity compositions, and that differences in exhibit design/tasks affected adult manipulation of hands-on exhibits and the level of proximity between family members. Nine attributes from attractive child-orientated exhibits were drawn from the observed exhibits: element of fun, challenging situation, element of surprise, child-sized exhibit design, imaginative design, opportunity for experiencing things, opportunity for role play, interactive machine/game, and teamwork. The analysis of the **children's drawings** revealed that drawings can be a valuable source of information about children's interactions with hands-on exhibits and can be used to assess children's understanding of exhibits through the depiction of the exhibit outcomes.

The **interview** data was analysed qualitatively (inductive content analysis) and statistically (chi-squared tests). The analysis of the open-ended interview questions indicated that adult relatives were enthusiastic about the opportunity for the children to interact with exhibits and perceived the hands-on gallery approach as motivating to the child with regard to learning. Children perceived the exhibitions as exciting places and reported positive feelings. A few children mentioned negative feelings, which were related to problematic exhibit design. The majority of children said that they prefer to visit museums in a family context rather than in a school context. The statistical analysis of the closed questions indicated twenty-two significant associations between the adults' and children's interview variables, related to adults' and/or children's age, gender, education, perceptions, behaviour, preferences, visiting habits, and type of museum, supporting the notion that personal, social, and museum aspects affect the child's and adult's museum experience, perceptions and learning. Children's perceptions of their learning in the galleries were found to be affected by the time spent in the gallery, the type of museum, the accompanying relative, and the child's preference for the social context of the museum visit.

This investigation provided new insights into the study of galleries designed for children, and has demonstrated that child-orientated exhibitions have features which positively affect the child and family museum experience, that children do perceive that they are learning in this environment, and that it is a effective catalyst for family social activity. Therefore, child-orientated exhibitions are a valuable museum provision for the child and family audiences.

To the *dreamers* and *makers*
inside each one of us.

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Introduction

'Children are the living messages we send to the future.'
after Neil Postman

Framework for the study

During the twentieth century, developments in the concept and objectives of museums gave rise to new types of museum and communication approaches. Traditionally oriented primarily to their collections, an important shift in museums has been the adoption of a more *visitor oriented approach*. This trend had two main driving forces: first, a desire to popularise museums and develop new audiences and, second, a growing awareness of the educational and social roles that museums can play within the community. Today, it would be considered very limited to justify the existence of a museum solely on the basis of the conservation of particular collections without considering the museum commitment to society with regard to the physical and intellectual access to its collections and the museum's responsibility to represent and address itself to a variety of audiences.

There was also a shift from the object seen in 'isolation' to the object seen 'in context' (social and historical context). One of the outcomes of this approach has been the widespread use of thematic exhibitions. The 'thematic exhibition' proposition that museums can exhibit 'ideas' as well as objects has developed together with a growing understanding of the educational potential of museums as informal learning environments. New forms of museological institutions were born, for example children's museums at the turn of the twentieth century and science centres in the second half, which have introduced innovative approaches to museum exhibitions, encouraging the visitor's direct participation. A criticism commonly raised by people from the museum sector regarding children's museums and science centres is that they cannot be considered truly 'museums', because some of them do not have 'real' museum objects. However, such institutions have public and educational concerns comparable to museums, and they can play an active role in enhancing the visitor's awareness of subjects and the visitor experience.

The communication approach that a museum adopts in its exhibitions and other public services reflects its position towards education. Museums have been seen as repositories of 'knowledge', and this idea sometimes implies that information is transmitted from above (museum/curators) to below (visitors). In educational terms, this position could be compared with the traditional education view which assigns a passive position to the learner. On the other hand, when a museum approaches visitors in its exhibitions in an 'equal' or 'conversational' tone, and when it offers some freedom of choice and the possibility for visitors to exercise self-motivation and to learn through a variety of approaches, the museum is taking a more liberal and unconstrained position towards education, and is empowering the visitor.

In this context of development of the concept, functions, approaches, and responsibilities of museums, their educational role has also expanded considerably. Nowadays, the museum community agrees that the term 'museum education' should be seen in a broad context, with interfaces to many areas of the museum, specially with those related to museum communication (Anderson, 1997). In relation to exhibitions, their educational goals should aim at contributing to the enrichment of the visitor experience by providing opportunities for exploration, observation, study, critical thinking, and dialogue.

With the purpose of improving the visitor museum experience and providing the visitor with a more meaningful encounter, museum professionals responsible for education and interpretive activities have begun to investigate theories of learning and the psychology of cognition that could have an application to the museum context (Hein, 1998). If museums want to provide meaningful and educational experiences for their visitors, they need to understand how human beings learn, how museums can stimulate learning situations, how they can motivate people to use their observational and inquiring skills, how materials should be presented according to the needs of different age groups and learning styles, and other educational and psychological issues. As a result of this movement, some museum professionals have been trying to develop a deeper understanding of the nature of learning in informal settings (Hein, 1998; Falk & Dierking, 1992, 1995; Borun et al., 1997; McManus, 1987).

The development of visitors studies in museums during recent decades has provided new understandings about the museum visitor experience and about the visitors' expectations, interests and preferences. These studies are helping museum professionals to plan and design more meaningful exhibitions and activities aiming at different sections of museum audience. Falk and Dierking stressed that the museum experience is an inter-relation of three basic contexts: the *physical context* (the museum environment, the exhibits), the *personal context* (the individual's interests, prior experiences, educational background, age, gender), and the *social context* (the group composition in which the person visits the museum: alone, with friends, with family, in a school group) (Falk & Dierking, 1992). This notion of the dimensions affecting the 'museum experience' offers a valuable framework for museum professionals to think about and plan museum environments and related programmes for the public.

In 1995, a conference organised in the United States, with the theme '*Public Institutions for Personal Learning*', aimed at defining learning in museums and establishing a research agenda in order to determine how museums meaningfully affect people's life. In the conference proceedings, it was stressed that the "political climate of public accountability is requiring that museums demonstrate their educational value to society and justify their very existence". In response to this trend, "understanding learning in museums has become a high priority within the museum community" (Falk & Dierking, 1995).

In Britain, the Museums Association, in its national strategy for museums regarding *education* and *access*, recently recommended that "the Department of National Heritage should encourage research into the process of informal learning in museums". The Museums Association also stressed the importance of museums being encouraged "to examine their existing and potential audiences and adjust their activities accordingly" (Museums Association, 1996: 4). In a report commissioned by the Department of National Heritage, '*A Common Wealth - Museums and Learning in the United Kingdom*' (Anderson, 1997), museums were acknowledged as centres of learning and a strategy with recommendations for their future development in this direction was presented. Museum education has a central role to play in museum public policies. Among its recommendations, the report stresses that education should

be included in the museum mission statement and that "research and evaluation of public learning needs to become an integral part of museum practice" (Anderson, 1997:viii). The report identified examples of a possible agenda for museum learning research. Some of the research topics include: the nature of visitors' learning experience in museum galleries; how children, families, adults and other informal learners use museums; how the role of parents in children's learning can be supported; qualitative studies on the nature of the visitors' gallery experience; the specific learning needs of key museum audiences; and the benefits of informal learning (Anderson, 1997:37). The present study addresses these research topics.

Children and families as a target audience for museums

In the endeavour to provide more adequate services to different target audiences, museums have started to pay more attention to the provision of special programmes, exhibitions, and activities that could attract diverse social groups and meet a variety of abilities. Families have become an important target group, because they can have a positive influence in the building of new audiences and because parents have a fundamental role in the education of their children. For these reasons, some museum professionals (Wolins, 1989) point out the need for museums to reflect more carefully about the role they can play in the educational and socialisation processes involving families.

The attempt to provide suitable museum services for children is an issue that has been concerning museum educators for a long time. Inspired by various conceptions of the nature of learning in childhood, museum educators have begun experimenting with diverse educational approaches to exhibitions and the interpretation of collections. The concern with the museum *family experience* is, however, relatively recent. Families have been recognised as an important audience, not only because they are frequent museum visitors who tend to repeat their visits, but also because parents can contribute to stimulating in their children a positive attitude towards museum visiting and support children in their learning processes while in the museum (McManus, 1994). Some museums are adopting a clear policy towards family groups. For example, one of the objectives of the Boston Children's Museum, in the US, is

to "foster the family's experience together, so that their knowledge and personal experience can be woven into the experiences taking place in the museum" (Smith, 1993: 27).

The growing concern regarding the learning potential of museum exhibitions prompted museum professionals involved with education and communication to pay more attention to the interpretive approaches they were employing in the creation of child-orientated exhibitions. Many exhibitions for children and families have explicit learning goals.

The growth of exhibitions planned for children and family groups in Britain

In Britain, the 1980s and 1990s witnessed the growth of exhibitions planned for children and family groups. During this recent period there has been great pressure on museums to develop new audiences due to continuous reductions in government funding. Museums and galleries in Britain are considered to be part not only of the cultural sector but also of the leisure sector, since they provide a range of services to society and attract around 100 million visits each year, competing with other leisure attractions (Morrison, 1994, 35; Museums Association, 1996).

Recently, a major project called '*Centres for Curiosity and Imagination*' has been launched with the support of the Department of Education and Employment, Museums & Galleries Commission, and the Calouste Gulbenkian Foundation with the aim of stimulating and supporting the development of community-based discovery centres in the UK.

Exhibitions and museums aimed at families have been very popular in Britain. As a consequence, some museums have been making considerable effort to attract and retain this audience. Some of them have been criticised for promoting themselves as 'entertaining' locations, focusing on the 'fun' that can be experienced during the museum visit to the detriment of their educational goals. Although this criticism of some museums cannot be generalised to all museums, it is important to stress that museums should strive to find a balance between education and entertainment, through the use of a clear education and communication policy. Rather than 'entertain', it is important that museums should attempt to offer an 'enjoyable' experience (Csikszentmihaly, 1975,

1995). Many museum professionals involved with education and communication have stressed that learning in museums should not be confounded with formal learning situations such as those in schools. Thus, if museums can motivate visitors through an experience which they can enjoy and find educational at the same time, the museum has a positive chance of succeeding in its educational and communication task.

The growing interest in the nature of the *family experience* in museums encouraged visitor studies researchers to focus on the interactions and perceptions of children and family groups at different museum exhibitions. The aim of these studies is to understand the nature of family social interactions and learning in a museum environment in order to indicate how museums could improve and increase sociable learning situations directed at family groups. Museum visitor research is still in the process of implementation in many museums so this field of study is still looking for 'descriptions' of the visitors' experience in museum exhibitions.

Purpose of the research

A major motivation for this study was to explore the value of a children's gallery in a museum and how it may affect and contribute to the museum experience of its target audience: children and their families. Research by others in this area has been carried out mainly in science centres or science museums (Borun & Dritsas,1997; Brown, 1995; Carlisle, 1995; Salmi, 1993; Tuckey, 1992; Kremer, 1992; Blud, 1990; Diamond, 1986), so there is a need to explore the situation in *child-orientated exhibitions* and compare it to studies carried out in other informal learning settings. Recent studies developed in Britain about 'hands-on exhibitions' focused on the managing aspects of them (Caulton, 1998) and family agenda (Mossouri, 1997), while the present study takes into account the *child-orientated environment* of a children's gallery in its entirety, and how different variables may affect the child and family experience in such spaces.

Children's galleries are occasionally dismissed by some museum professionals who see such exhibitions as being spaces where children 'run around' as they please and where little learning may take place. These

professionals may feel suspicious about the likelihood of learning outcomes in such galleries and may find it difficult to recognise these spaces as 'integrated' into a museum exhibition policy, tending to see them as a 'separate area'. The present study aims to address some of these unsupported beliefs. Few people realise the number of specialists required in an exhibition team in the conception of a children's gallery and the amount of creative and professional work involved. Also, such galleries can play an important role in museum audience development policy.

This study aims to investigate the perceptions of children aged 7 to 11 and their relatives in child-orientated museum exhibitions in order to understand which aspects of their experience in these galleries they value and why, as well as to examine the complex issues surrounding the design of such exhibits and how it may affect children's and adults' behaviour and learning. The study takes insights from Falk & Dierking's interactive experience model, which takes into account the personal, social, and physical contexts of the museum experience (Falk & Dierking, 1992). This investigation seeks to explore whether children and their adult relatives perceive themselves to be in a learning situation or whether their perceptions are more oriented towards having a 'fun' experience in a child-orientated gallery. The study examines the informal learning environment of child-orientated exhibitions in a family situation and how this social context affects the children's visit experience. School groups are not investigated in this study since the main purpose of it is to explore the natural learning interactions between families.

Understanding the qualities and dynamics of children's and adults' experiences in a children's gallery and the successful elements of child-orientated museum exhibits, will enable educators, museum designers and other museum professionals to plan more responsive and meaningful exhibitions for this audience and enhance the quality of their museum experience.

Why the present study is important and singular

- This research is important because environments prepared for children have not previously been closely examined from both the children's and their adult relatives' points of view.

- The study adopts a holistic perspective of the museum experience (which takes into account the personal, social, and physical contexts of the visit) in order to investigate the family members' experience in child-orientated galleries.

- This study gives further insights into the study of museum communication, exhibit design, and museum audiences.

Structure of the thesis

The thesis is divided into two parts and structured in eight chapters.

Part One, which includes Chapters 1 and 2, offers a background in which to situate the research topic. It provides a historical overview of the growth of children's museums and participatory exhibitions in the twentieth century and summarise the main theories of cognition and learning which have been influential to the development of such museums and exhibitions. It covers topics related to the history of interactive and child-orientated exhibitions in museums and an overview of learning theories related to active learning and cognitive developmental psychology. The research questions are presented in the Methodology Chapter (Chapter 3, page 113) and derive from the visitor studies literature discussed in sections 2.2 and 2.3 (Chapter 2), which includes visitor studies about children and family behaviour and perceptions in museums, a discussion of museum learning, informal education, and learning approaches used in exhibitions; and research on the characteristics of stimulating environments and museum experiences.

Part Two encompasses chapters presenting the methodology and procedures used in the study (Chapter 3), analyses of the data collected and their interpretation (Chapters 4,5,6,7), and a final discussion (Chapter 8).

Chapter 1:

An Overview of the Development of Participatory Exhibits and Child-Orientated Museum Exhibitions

INTRODUCTION

This chapter presents a historical overview of the development of participatory and child-orientated exhibits in museums in America and in Europe, emphasising revolutionary approaches introduced in museum exhibitions aiming at enhancing the visitor experience and learning.

The chapter is divided in three sections. Section 1.1 introduces educational ideas from Pestalozzi and Froebel which were influential in the 19th century and gave birth to the child-centred education movement. These educational approaches offer a framework for understanding the creation of the first museums for children at the turn of the century. The first American children's museums are described, due to their influence in the field, as well as the introduction of innovative approaches in European museums in the first three decades of the 20th century.

Section 1.2 gives a general view of the growth of participatory exhibits in museums in the second half of the century, such as interactive exhibits and discovery rooms, with examples from the Boston Children's Museum (US), the Royal Ontario Museum (Canada), the Exploratorium (US), and La Cité des Sciences et de l'Industrie (France).

Section 1.3 describes the science-centre developments in the United Kingdom in the last two decades, as well as the growth of museum provision for children.

1.1. THE BIRTH OF MUSEUM ENVIRONMENTS FOR CHILDREN AND PARTICIPATORY EXHIBITIONS IN AMERICA AND EUROPE

Introduction

In order to comprehend the birth of museum environments for children at the end of the nineteenth century, it is necessary to understand the educational movements which were going on at that time, particularly regarding the nature of children's learning. The ideas of Pestalozzi and Froebel, which can be situated in the line of succession of Rousseau's thought, were influential during the nineteenth century. The Pestalozzian method encouraged educators to provide different experiences for pupils, incorporating the performance of a range of activities to strengthen the pupil's own abilities. Froebel emphasised not only the importance of play, practical work and handling of materials, but also the need to create an educational environment for children. He stressed the importance of involving children in practical work and the handling of materials in an educational environment. For him, sensory experiences, provided through play, were the foundations of child intellectual development. This notion was crucial to the development of new learning opportunities for children in educational settings.

The birth of children's museums at the turn of the century can be seen as an attempt to provide - inspired by the educational methods of Froebel and Pestallozzi - a learning environment specifically directed to children's needs. The ideas of Dewey and Montessori in the first decade of the 20th century were also revolutionary. Montessori, with her emphasis on a pedagogic method based on the development of motor and sensory experiences, created diverse activities with which to engage children in constructive learning. Dewey, with his emphasis on experience, has stressed the role of social interactions and personal experience in a child's life. Their ideas and influence will be further discussed in Chapter 2.

The child-centred movement promoted the concept that children are at a different stage of intellectual development from adults and consequently that they need a different approach to learning. The implication of this movement for

museums in methodological terms lies in the museological emphasis on the role of sensory experiences in an environment designed for educational purposes along with the recognition of the importance of social interactions with peers and family to the learning process. This educational approach has provided the philosophical and methodological basis for the birth of museums and exhibitions especially designed for children which also cater for a family audience.

Between 1899 and 1930, around fifty children's museums were established in the United States. Also, children's rooms/galleries were designed in traditional museum settings. These institutions had a defined goal, which was to provide an appropriate environment for children and to experiment with the current educational theories (Cleaver, 1988: 6).

Children's museums contributed to the general museum communication field due to the new philosophy they introduced to museum interpretive and educational work. These institutions, from their beginning, affirmed the idea that museums should direct their activities according their audience's interests and needs, considering people as their prime aim, and working in consultation with the community. Most children's museums were created not from the starting point of collections, but from the idea of serving as an educational and leisure resource to their communities. Children's museum mission statements continue to emphasise this aspect.

The main consequences of this approach to the general museum communication strategy were: the design of exhibits according to target ages; preference for thematic exhibitions rather than object-out-of-context ones; the importance of the creation of an informal environment for people to express themselves and to encourage self-activity; and the promotion of a continuous dialogue between museum staff and visitors.

It is interesting to notice that the first children's museums were initiated by people involved in art or science education, such as the Brooklyn, the Boston, and the Detroit Children's Museums, United States. This is probably not a coincidence. Art and science are both subjects deeply involving perception and experimentation, intuition and reasoning, inductive and deductive thinking. Frank Oppenheimer, the founder of the most influential

hands-on science centre in the 1960s - the *Exploratorium*, San Francisco - regarding the relationship between art and science, stressed:

> "There are many common bonds between art and science. They both begin with noticing patterns - spatial patterns, patterns of time, patterns of process and behavior. They both elaborate, reformulate and ultimately link together patterns, in nature and meaning, which initially appeared unrelated... Both art and science are involved with order-disorder transitions and the creation and relief of tension. Both endeavors are deeply rooted in culture and heritage; both expand our awareness and sensitivity to what is happening in nature and ourselves."
>
> (*Oppenheimer* in Duensing, 1993:74)

1.1.1. CHILD-CENTRED EDUCATION AND ITS INFLUENCE ON THE BIRTH OF MUSEUM ENVIRONMENTS FOR CHILDREN

Child-centred education antecedents: Jean-Jacques Rousseau and the child's nature

Rousseau's (1712-1778) guiding principle, expressed throughout his book *Emile*, written in 1762, was that the *child's nature is essentially different from the adult's*, and that the *child develops through stages* (Darling, 1994:6-8). Each stage in child development is different from the other and an educational technique used successfully in one stage would not necessarily be appropriate to another. Rousseau's opinions had important implications for the development of child-centred education since they pointed out the need to observe the child as an individual, to note his/her expressions and behaviour and emphasised the *individual needs* of each pupil.

Rousseau's principal concerns were related to the vital part that sensory experiences play in each stage of child development. However, he did not discuss the part played by the child's involvement in an ongoing social life, although he stressed the importance of a controlled environment as well as manifesting admiration for simple, rural societies. His thought was chiefly influenced by the classical empirical concept that 'everything that comes into the human mind enters through the gates of sense', resulting in Rousseau's

assertion that "anything outside children's experience is meaningless to them" (Darling, 1994: 6-8). The pedagogic principle of *learning from experience* arises from this position.

Pestalozzi and the concept of experiential learning

The Swiss educational reformer Johann Pestalozzi (1746-1827) was markedly influenced by Rousseau's writings, particularly *Emile*, which was published when Pestalozzi was sixteen. In his opinion, Rousseau's work was "the turning point between the old world and the new in educational matters" (*Pestalozzi* in Darling, 1994: 17). He believed, like Rousseau, in the concept of education as development of the child's innate faculties, and in the endeavour to base education on the *nature of the child*. His pedagogical ideas stressed that instruction should proceed from the familiar to the new, from observation to comprehension, and his curriculum included activities such as drawing, singing, physical exercise, model making, and field trips. Pestalozzi also stressed the importance of the role of the mother in early education, of security in the home environment, and of moral education.

The experiential learning methodology adopted in Pestalozzi's famous school in Yverdon county, which he directed between 1805 and 1825, incorporated activities such as nature walks, games and songs. His school received many visitors, such as the German educator Friedrich Froebel, who visited it twice, the first time spending a fortnight and the second time, in 1808, staying for two years (Darling, 1994: 20).

Froebel and the notion of child self-activity

Friedrick Froebel's (1782-1852) influence throughout the second half of the nineteenth century was substantial. Lectures based on his philosophy were given in London in 1854; the Froebel Society was formed in the 1870s; and the Pestalozzi-Froebel centre was founded in Berlin in 1881 (Darling, 1994:24). In his book *The Education of Man*, written in 1826, Froebel stressed the

importance of the *child's self-activity* as the essential method in education. In order to fully understand his ideas, it is necessary to consider the religious aspect of his philosophy. His theory was based on theism, on the notion of the *unity* of all living things as well as on the conception of the divine nature of human beings which rests on their ability to be productive and creative (Darling, 1994:21). In this context, Froebel emphasised the nature and value of play, the role of parents in the arousal of the child's physical and mental powers, and the responsibility of schools for child development through the use of methods which can lead the child to observe and think (Froebel, 1887, 333-39).

Froebel was the founder of the first 'Kindergarten' ('garden of children'), which was first established in 1837. Here, he applied his educational methods, which were influential in the development of early educational settings. His 'Gifts' and 'Occupations' were activities aimed at stimulating the children sensory experiences through *play* as well as helping them to understand the basic universal principles and laws of nature. The 'Gifts' included a series of toys and apparatus such as "balls, building blocks, coloured tablets for design, coloured paper to cut and fold, clay and sand, pencils and paint, arranged in a series" (Woodham-Smith et al., 1952, 23). The 'Occupations' consisted of "paper folding, perforated paper designs for pricking, drawing on squared paper, intertwining, weaving, folding, cutting, paperwork, cardboard and clay modelling". Music was also an important part of the curriculum (Woodham-Smith et al., 1952: 23). These learning apparatuses were aimed at stimulating preschool children through well-directed play accompanied by songs and music. His methods were based on the premise that the child is active and creative and not merely receptive. One of Froebel's major contributions to child-centred education is that he initiated a movement which made educators familiar with the idea that there is a role for play activities in school settings (Darling, 1994: 24). According to Froebel, sensory experiences, provided through play, are the foundation of intellectual development. But he advocated that play should be guided by the teacher in order to achieve educational results. He stressed:

> "Play [...] must not be left by chance. Just because a child learns through play he learns willingly and learns much. So play, like learning and activity, has its own period of time and it must not be left out of the elementary curriculum. The educator must not only guide the play, since it is so very important, but he must also often teach this sort of play in the first instance."
>
> (*Froebel* in Darling, 1994:23)

Froebel recommended that parents and teachers encourage children to think for themselves, however he did not seem to advocate *free-play* in the sense that it is understood today.

Museum education activities for children in the nineteenth century

During the nineteenth century, the educational activities offered to children by museums were basically 'object-teaching' and 'school visits' (Hooper-Greenhill, 1991: 25-27).

Object-teaching as a museum activity was developed with school children and was based on the observation of museum objects, such as the 'nature tables', and sometimes also the handling of them. This direct study of the object was aimed to develop pupils' perceptions of it and, as a result, to improve their existing knowledge.

Another educational activity provided by museums at that time was *school visits to museums*, which could provide students with an experience which was different from the school one. However, schooling was not widespread in the nineteenth century, so few children could have access to these experiences. Object teaching and school visits are still practised in museums but now incorporate new approaches to learning.

In this context of nineteenth century revolutionary educational views regarding child development and learning, the birth of the first children's museums at the turn of the century and first decades of the twentieth century can be seen as an effort to provide more appropriate museum experiences for children, as described in the next section.

1.1.2. CHILDREN'S MUSEUM DEVELOPMENTS IN THE UNITED STATES DURING THE INITIAL THREE DECADES OF THE 20th CENTURY

The Brooklyn Children's Museum: the first example

The very first children's museum was founded in Brooklyn, United States, in 1899. The idea of the creation of the Brooklyn Children's Museum was developed by a fine arts curator at the Brooklyn Institute of Arts and Science, Prof. William Henry Goodyear, who supported the idea of having a separate institution devoted specially to children (Paine, 1992:86; Smith, 1993:11).

The Children's Museum was created in the house where the Brooklyn Institute of Arts and Science was previously installed and received some objects from its collection when the Institute moved to other quarters (Cleaver, 1988:7). Prof. Goodyear suggested that the Brooklyn Children's Museum adopt some of the ideas used by Deyrolle in his 'Musée Scolaire', such as natural history cartoons with attached specimens and comparative anatomy models. Two of these models, a giant honeybee and a 5-foot-long silkworm, were purchased by Prof. Goodyear and displayed at the Museum (Paine, 1992:88) .

The central idea of the Brooklyn Children's Museum has always been to function as an educational resource, providing assistance to schools as well as being an attractive place for children and their families to spend their leisure time. The Museum mission, as stated in 1899, was "to form an attractive resort for children with influences tending to refine their tastes and elevate their interests, to create an attractive educational centre for daily assistance to pupils and teachers in connection with school work and to offer new subjects of thought for pursuit in leisure hours" (Feber, 1987:64).

Anna Gallup, a nature teacher and Brooklyn Children's Museum's first curator, gave the young institution its profile: to stimulate and satisfy children's natural curiosity (Cleaver, 1988:7). The exhibitions were expressly planned for children to use, and museum objects were available to be handled and explored. The Brooklyn Children's Museum directed its activities at all children, whether attending school or not, and showed also a concern regarding recent Brooklyn immigrants. It was the first museum entirely devoted to children.

The Smithsonian Children's Room

The first Children's Room inside a museum was opened in 1901 at the South Tower of the Smithsonian Castle, Washington D.C.. This space was conceived by Samuel Pierpont Langley, who was the Smithsonian's Secretary at the time. Langley was concerned in providing children with an environment directed to their interests and which could arouse their curiosity. He was responsible for the design and the content of the exhibition.

The Children's Room was based on a 'showcase display' design conception. "There was a fish tank, a stuffed beaver, a case of insects, a case with the remains of invertebrates, and a case with an assortment of minerals; but the vast majority of exhibits were devoted to birds. There were seven cases of birds" (McCutcheon, 1992:14). Regarding the use of labels, Langley believed that latin taxonomic names should be absent or in very small print, and that labels should describe habits and cite well-known poetic and literary references (McCutcheon, 1992:9). Having in mind that the exhibition was aimed at children aged eight and nine, this approach to labels and the showcase-based presentation does not seem to be the most appropriate for a youth audience.

The Smithsonian Children's Room illustrates that the first children's exhibition approach taken by a traditional museum was markedly different from the approach taken by children's museums, such as the Brooklyn.

However, Langley introduced some important features to the Children's Room, which are still relevant today: child eye-level showcases and the use of colours to stimulate the senses. An inscription at the Room entrance showed his intention with regards to the exhibition: 'Knowledge begins in Wonder'. He also planned a large fish tank, with half salt water and half fresh, and a giant kaleidoscope, but both failed to work when constructed (McCutcheon, 1992).

Since there are few photographs of this exhibition and no evaluation studies, it is difficult to know how successful it was with children. The Smithsonian Children's Room remained little changed until 1939, when it was

replaced by a *Visitor Centre*. It is an example of a first attempt to introduce in a museum institution a gallery aimed at a child audience.

Other Influential Children's Museums in America

During the first decades of the 20th century, three influential children's museums were established in the U.S., in Boston, Detroit and Indianapolis. They were created because of the interest of representatives of their community in providing more educational resources for city children.

The **Boston Children's Museum** was opened in 1913, by a group of science teachers. The motivation came from the Boston Science Teacher's Bureau which maintained that formal education could be supplemented and further enhanced in a museum setting (Smith, 1993:15). The museum changed location twice and moved to its current home on Museum Wharf, in 1979. The Boston Children's Museum has implemented many programmes and services, such as publications, educational kits, field trips and travelling exhibitions, serving the surrounding schools and communities. It has also become a meeting place for local kids' clubs (Cleaver, 1988:6; Smith, 1993:15-17).

The third youth museum to be created in the U.S. was the **Detroit Children's Museum**, which opened in 1917 (Feber, 1987). It began as a joint venture by the Art Institute of Detroit and the Detroit Board of Education. It became the first children's museum to be owned and operated by a school system when, eight years after its opening, the Board of Education assumed responsibility for running it (Pitman-Gelles, 1981: 8).

In 1925, another children's museum was founded in Indianapolis by a core group representing several sectors of the community, including a school principal, a city librarian and an art instructor (Pitman-Gelles, 1981:8). The **Indianapolis Children's Museum** adopted similar pedagogic approaches to the previous American children's museums. In fact, the Brooklyn, the Boston, and the Indianapolis Children's Museums have inspired many other institutions in the US and abroad.

In 1937, as a result to the increasing number of children's museums being established in the US (between 1921 and 1936, around fifty children's museums were opened), the American Association of Museums decided to create a *youth division,* in order to accommodate all the children's (or youth) museums in a special division (Smith, 1993:11). This division was transformed later into the Association of Youth Museums, still active today.

1.1.3. MUSEUM EDUCATION FOR CHILDREN IN BRITAIN IN THE FIRST THREE DECADES OF THIS CENTURY

Overview

In the United Kingdom, the discussions regarding museum education and ways of improving it was under attention. In 1931, the Board of Education published a memorandum called '*Museums and Schools: Memorandum on the possibility of increased co-operation between public museums and public educational institutions*' with guidelines describing diverse examples of collaboration between museum and schools, such as loans of exhibits, provision of information for teachers, school visits, etc.. The document pointed out that "there was no children's museum in Britain like the Brooklyn Children's Museum", and stated that the most similar example in Britain was the Horsfall Museum at Ancoats Hall (Hooper-Greenhill, 1991: 40-41). The Memorandum also cited many examples of good practice in museum education abroad as well as in the UK: the Deutsches Museum in Munich, the Brooklyn Children's Museum in the US, and the Science Museum and the Bethnal Green Museum, both in London (Hooper-Greenhill, 1991: 40).

The situation regarding children's museums in Britain was different from the United States. *Museums of childhood*, which typically contain mementoes of childhood, have developed educational programmes oriented towards children, but these museums were quite distinct from *children's museums*. First, in a *museum of childhood* "the impetus is often collecting, and it by no means follows that an antiquarian or scholarly interest in the subject of childhood accompanies a love of children themselves" (Feber, 1987, 64).

Second, the pedagogic drive in these two kinds of museums was different. In a *children's museum*, exhibits are to be *explored,* the environment is informal and there are very few glass cases. In contrast, generally in a *museum of childhood* the collections are to be *observed*, and the design of exhibits is characterised by the use of glass cases and formal labels. Nowadays, however, museums of childhood are tending to take a similar approach to children's museums, introducing interactive exhibits and participatory programmes into their activities, such as at the Bethnal Green Museum.

The pioneer Children's Gallery at the Science Museum, London

In 1931, the Science Museum, London, established the first gallery expressly designed for children in Britain (Caulton, 1998:3). This new facility for young visitors was in line with the developments of the American children's museums and the Deustches Museum of Science and Technology in Munich.

The Children's Gallery was located in the basement of the Science Museum and had some thirty groups of varied exhibits "designed to be interesting and comprehensible to children" (Brooks and Vernon, 1956: 175). The aim of the Gallery was to provide an introduction to the theme of science in daily life and to create an environment that could attract and entertain young Museum visitors. The Science Museum received thousands of children annually, and most of them were expected by the Museum to visit the Children's Gallery.

This pioneering effort was not to be further developed until the early 1980's, when the movement towards museum exhibitions planned for children and families became much stronger in Britain.

1.1.4. PARTICIPATORY APPROACHES IN EUROPEAN MUSEUMS IN THE FIRST HALF OF THE 20th CENTURY

The 'Museum for Education' in The Hague: A Pioneer of Educational Museum Work in the Netherlands

In Europe, the *Museum for Education* (Museum Voor Het Onderwijs), in The Hague, Holland, was created in 1904, and it is considered to be the first European museum particularly aimed at a child audience (Feber, 1987:64).

Initially, the purpose of the Museum was to be a museum for the benefit of schooling - a schoolmuseum, providing opportunities for children to have direct experiences of objects from the Museum collection. Today, with the growth of its collection, the Museum assume its position beside other Netherlands museums as well as serving a wider audience.

The Museum was created by a small group of private individuals including the internationally renowned educationalist Jan Ligthardt. The institution, then called *Museum for Education*, aimed "to assemble and maintain a collection of teaching materials, more especially for primary education, serving both as aids in the tuition of pupils and as a guide for schools and instructors" (Kievit, 1989).

The *Museum for Education* was a pioneer of educational museum work in the Netherlands. It had an active role within its community, working with schoolchildren and family groups.

Due to the growth of its varied collection, which is divided in the scientific fields of biology, geology, history, ethnology and natural sciences, in the late 1970's it was decided that the museum would move to a new building, specially constructed to meet the requirements of the Museum audience, educational activities, exhibition areas, and management of its collection. In 1986, the *Museum for Education* was opened with another name - *Museon* - in a large and modern building in The Hague.

The exhibitions of the *Museon*, like other museums aimed particularly at a child audience, have displays designed at child eye-level. Other characteristics are the use of working models, replicas, charts, photos and audio-visual presentations. During weekdays it is possible, due to the museum

flexible internal design, to temporarily close one gallery for a school group in order to conduct educational activities inside the room with its collection.

The *Museon* acquisition policy emphasises the didactic importance of the collection. Objects are acquired only if they have an educational value, in terms of being able to illustrate process and develop themes (Kievit, 1989). Its present aim is to inform and entertain visitors - schoolchildren, families, teachers and individuals in general - in an enlightening way.

The Deutsches Museum, Munich: a Revolutionary Interpretive Approach to Exhibitions

The Deutsches Museum was founded in Munich in 1903 by Oskar von Miller, a German engineer, and was transferred to a new building occupying three floors totaling fifty-six rooms in 1913 (Alexander, 1983: 350; Quin, 1997). The purpose of the Deutsches Museum at its creation was to be a science and technology museum which would give a vivid history of the influence of science, technology inventions and mechanical progress, upon human society.

Unlike the two leading science and technology museums at that time, the Patent Museum at South Kensington in London (today the Science Museum) and the Conservatoire National des Art et Métiers in Paris, the Deutsches Museum aimed to make science and technology *understandable* to a wide public, including its younger segment, through the introduction of new interpretive approaches, such as participatory exhibits, visitor-activated experiments and staff-conducted demonstrations.

Oskar von Miller made full use of experimental demonstrations, sectioned working models and other interpretive techniques such as diagrams, charts, cartoons, period interiors, mural paintings, and any other device that would enhance visitor comprehension of the exhibits. Labels did not contain the scholarly jargon of scientists and curators. Miller also "avoided glass cases as much as possible, and his attendants were chiefly demonstrators and interpreters, rather than guards" (Alexander, 1983: 353-4). In 1929, Oskar von Miller wrote a paper on 'Technological Museums as Centres of Education', where he outlined the importance for museums to provide models which could be touched by the public as well as trained interpreters to explain the exhibits (Alexander, 1983: 352).

This idea of a 'dynamic' museum, which promotes visitor participation and involvement through hands-on activities and trained interpreters, in addition to being very popular with the public, was influential to the development of new science and technology museums, as well as to the reorganisation of old ones.

H.W.Dickinson, keeper at the Science Museum of London in the 1930's, wrote that:

> "Miller introduced so much that was novel in museum technique that he may be said to have changed fundamentally the attitude of the general public towards museums from looking at them as institutions remote, incomprehensible, even comatose, to regarding them as places that are living, stimulating and close to 'men's business and bosoms'."
>
> (Alexander, 1989: 356)

The Deutsches Museum was a pioneer of participatory exhibits and new interpretive techniques in museum exhibitions. An important contribution was the approach introduced to the institution by Oskar von Miller, creating the idea of museums as places for enjoyment, active involvement and spellbound.

The Palais de La Découverte, Paris

The Paris International Exhibition of 1937 called 'The Application of Arts and Techniques to Moderne Life', gave birth to six new French museums: the *Musée de l'Homme, Musée d'Art Moderne, Musée des Monuments, Musée des Arts et Traditions Populaire, Musée de la Marine*, and the *Palais de la Découverte* (Maury, 1995).

The *Palais de la Découverte* was created as part of the University of Paris with the purpose of being a vehicle for the popularisation of science, as well as an institution of high scientific learning and research open to all people. The idea was to "familiarise the masses of people with the great scientific discoveries of the past and keep them informed of those of recent date" (Leveillé, 1948: 116). It was probably the first French museum to adopt an approach to its exhibitions characterised by the use of demonstrations, experiments and oral presentations, similar to the approach used at the

Deustches Museum. Due to its emphasis on experimentation, the *Palais de la Découverte* was a kind of open laboratory for the public. Occupying around 20.000 sq. m. and more than fifty rooms, it had demonstrators who carried out "four hundred experiments under the visitors' eyes" and explained the exhibits to the general public and to students.

André Léveillé, who directed the institution from 1938 to 1950, stressed that:

> "museums should no longer be mere repositories of objects. They must become living, active and dynamic institutions [...]"
>
> (Léveillé, 1948: 117)

This trend of museums to be seen as active learning institutions continued to grow during the second half of the 20th century. Many museums, specially science and natural history ones, embraced these ideas and influenced the birth of new museum environments.

1.2. THE GROWTH OF PARTICIPATORY EXHIBITS BETWEEN THE 1960s AND 1980s

Introduction

The approaches adopted by children's museums and science and technology museums contributed to the introduction of new educational practices and interpretive strategies in museums.

In the late 60s, after a period of latency, the establishment of children's museums regained momentum alongside the rise of hands-on centres, such as science centres and discovery centres (Cleaver, 1988: 7). One of the reasons for this new burst of activity can be found in developments in the field of educational psychology which raised new discussions about the cognitive development of children. Another reason can be found in a movement for the popularisation of museums which led new strategies in museum communication approaches.

It is important to recognise that children's museums and hands-on centres have been influential to the development of participatory exhibitions in *traditional* museums (Pitman-Gelles, 1981: 43). In fact, children's/youth museums, science centres, and other institutions which offer provisions for children and families, contributed to the transformation of museums generally into active learning environments.

Cognitive development theories and their influence in informal education

Cognitive development theories had a large audience in the 1960s and 1970s in Western countries. As a result, many Western educational systems started to adopt learner-centred approaches to teaching. In Chapter 2, the impact of these theories on formal and informal education is discussed.

The cognitive development theory of Jean Piaget, emphasising the child's active learning through developmental stages, had a great impact in the educational area in the 1960s. Other psychologists and educators influencing the work of museum professionals responsible for exhibitions and education programmes have been: Dewey and his theory of experience; Jerome Bruner

with his notion of 'spiral curriculum'; Lev Vygotsky, who stressed the role of social interactions and guidance in the learning process; and more recently Howard Gardner and his theory of 'multiple intelligences'.

In this context, children's museums, science and natural history museums, as well as hands-on science centres established during the 1960s and 1970s took advantage of these psychological developments to apply learning theories in their own situations.

Interactive exhibits and their learning potential

Since the 1960s, participatory exhibits in museums have been influenced by the Piagetian conception of learning as an active exchange between the learner and the environment. The application of his theory in museums can be exemplified by the use of exhibits which involve "various senses and motor skills [...] and provide opportunities for hands-on exploration of concrete and abstract concepts" (Black, 1990: 23).

Other pedagogical reasons for the attractiveness of interactive exhibits include: the promotion of active participation, the stimulation of curiosity, intrinsic motivation, play, and exploration as components of the learning process (Rennie and McClafferty, 1996: 60). For instance, intrinsic motivation is considered to be an important learning requirement since it brings satisfaction and enjoyment to the process of learning, which may result in a 'flow experience' (Csiksentmihalyi and Hermanson, 1995: 59).

The main criticism raised about hands-on exhibits is that 'hands-on is not necessarily minds-on':

> "It is false to assume that any physical manipulation of an exhibit provokes intellectual engagement."
>
> (*Lucas* in Rennie and McClafferty, 1996: 58)

Rennie and McClafferty, in their competent review of literature about interactive science exhibits and their approach to learning, drew a distinction between *interactive* and *hands-on* exhibits. *Hands-on* exhibits, according to their review, would clearly require some physical involvement of the visitor with the exhibit, whereas *interactive* exhibits may require other senses or types of participation, not necessarily involving 'touching' (hands-on). They pointed out

in their review that a good interactive exhibit should be able to *personalise* the experience for the visitor (Rennie and McClafferty, 1996:58). Neverthless, many interactive exhibits are hands-on, and the terms can often be used interchangeably.

The Boston Children's Museum in the 1960s: revolutionary approaches

In the 1960s, a revolutionary approach to exhibitions was taken under the direction of Michael Spock at the Boston Children's Museum, United States. Son of Dr. Benjamin Spock, the noted child psychologist specialist in child care, Michael Spock was perhaps more open to psychological theory them other museum professionals. He started experimenting with the application of learning theories in exhibitions through the use of interactive, hands-on exhibits. These exhibitions were guided by Piaget's central assumption that children are active participants in the development of their knowledge. Approaches adopted by the Boston Children's Museum in its exhibitions, such as discovery-based and cross-generation learning, were influential in the development of participatory exhibits elsewhere.

With regard to the *educational purpose* of an interactive exhibit, Spock stressed:

> "If kids are not doing it, it is not working."
>
> (*Spock* in Cleaver, 1988: 8)

Exhibitions such as '*What's in inside*', encouraging children to explore the interior of things, '*What if you couldn't*', simulating difficulties experienced by the physically disabled, and '*Playspace*', a play area for children under five (and their parents), were aimed at encouraging children to make full use of the exhibits (Smith, 1993, 20). 'Playspace' provides an *observational area* with guidance for parents in order to stimulate them to observe the play behaviour of their children. Educational psychology theorists have encouraged parents, as well as teachers, to observe their children at play in order to help them to understand the cognitive development stage in which they are situated and their preferred learning styles.

An example of the cross-generation approach at the Boston Children's Museum is found in exhibitions such as '*Grandmother's Attic*', an environment designed to encourage children to discover the life of their grandparents which, at the same time, also offers opportunities for adults to interact with children in explaining the significance of the objects there.

Discovery Rooms: Hands-on Galleries in Museums

Discovery rooms were first opened in North America during the 1970s and the main idea behind them was to create a hands-on and learning facility for visitors in museums, that is, to design an environment where visitors could handle authentic museum objects in an informal atmosphere conducive to experimentation and learning, by handling, observing and comparing artefacts, and consulting the information provided in cards and panels. The discovery room concept was in line with the developments of participatory exhibitions, pioneered mainly by children's museums and science centres. The educational approach which support the discovery room concept is based on discovery learning, which aims to generate a personal experience with objects and create opportunities for self and guided discovery, facilitating learning through direct sensory stimuli.

The National Museum of Natural History of the Smithsonian Institution, Washington D.C., was the first museum to create a discovery room in 1974, and it was an example for initiatives in this area. After the opening of the Smithsonian's facility, other discovery rooms were opened in American natural history museums such as the Field Museum, Chicago, in 1976, and the American Museum of Natural History, New York, in 1977. Other museums also started to integrate discovery rooms in their exhibition areas: the California Academy of Sciences opened its first Discovery Room in 1978 (Diamond, 1978). In Canada, an experimental Discovery Room was opened at the Royal Ontario Museum in 1977, and, due to its success, it was renewed and reopened in 1983 as a Discovery Gallery (Freeman, 1989).

Discovery rooms/galleries are characterised as being an informal educational environment, with places to sit and tables, organised in areas by

activities, with materials, artefacts and specimens to be handled. Discovery boxes (boxes containing artefacts, photographs and written information) are used with frequency in discovery rooms and provide visitors with the opportunity to have a direct experience of the object at their own pace, to share information and interact with others, to compare artefacts and to make associations between objects and the written material.

At the Royal Ontario Museum Discovery Gallery, a more elaborate approach was taken to the space. The gallery, which represents collections from all the Museum's curatorial departments, is divided into "units" called: *stumpers* (shelves), identification units (drawers), discovery boxes, work stations, discovery trail, touch wall, scientific equipment (eg. microscopes) and other learning resources. The target audience for the use of these units ranges from age 6 to adult (Freeman, 1989).

Each of these units is to be used in different ways. For example, *stumpers* are groups of shelves which display objects from the Museum collection that can be touched and examined by visitors. Each object is accompanied by a card, which contains information and poses questions to the visitor in order to stimulate his or her interest. *Discovery boxes* are self-contained single-theme boxes, composed by a combination of artefacts, illustrations and texts. The *identification units* are custom-built wooden units containing approximately ten drawers. Each drawer presents different examples of objects of the same kind. At the front of each drawer, there is a title label and a colour photograph of a sample object identifying the content of the drawer, so visitors can make their own identifications of objects. Reference books are available, as well as places to sit. The *work stations* consist of a tripartite table with shelves above it, where objects are displayed and are easily accessible, such as the ones dedicated to 'Bones' and 'Birds'. The units are equipped with magnifying lamps, light tables, and information about the objects.

A visitor survey carried out at the Discovery Gallery identified its most popular elements, as *discovery boxes*, *microscope station*, and *work stations*. The least-used components of the gallery included a *static display*, *identification units* and *reference books* (Freeman, 1989: 46).

Discovery rooms/galleries were developed to be used by all visitors, although they are very popular with children and family groups (Freeman,

1989: 50). A similar situation was found by Diamond at the California Academy of Sciences Discovery Room, where 79% of visitors were groups composed of adults with children (Diamond, 1988: 163).

The Exploratorium: the Influential Interactive Science Centre

The Exploratorium, probably one of the most famous and influential hands-on science centres, opened in 1969 in San Francisco, United States. It was conceived by the physicist and teacher Frank Oppenheimer (1912-1985), who subsequently received many prestigious awards, including the *Millikan Award* from the American Association of Science and Teachers and the American Association of Museums' *Award for Distinguished Service to Museums*. The latter award was particular significant since it represented the recognition of hands-on science centres as belonging to the museum field. On the occasion of the receipt of the award from the American Association of Museums, Oppenheimer commented:

> "When I started developing [the Exploratorium] there was no organization whatsoever that thought of science centers as part of the museum world. So it seems that this award is not only to me but to the entire field of science centers."
>
> (Oppenheimer, 1982: 39)

The Exploratorium was created as a research and development laboratory. The guiding principle was to design exhibits which were able to arouse visitor's questions about scientific processes. The environment was planned to be flexible enough to provide visitors with opportunities to become engaged with experimentation and discovery (Duensing, 1993: 77). The Exploratorium's principal goal, expressed since its opening, has been to be a space that "would not glorify science and scientists or praise the fruits of science, but instead would testify to the excitement of the activity of science and teach people to take part in it" (Hein, 1990: 6).

Oppenheimer described influences from the museum field which helped him to shape the Exploratorium. The earliest ones were three European museums: the Deutsches Museum, Munich, with its interactive approach and with its training programme for schoolteachers about the content of museum exhibitions; the Science Museum, London, and its Children's Gallery dating from the 1930s; and the Palais de la Découvert, Paris, which used demonstrators to explain their exhibits. Other institutions which inspired him were the Ontario Science Centre in Toronto, the State Art Museum in Copenhagen and the San Francisco Steinhart Aquarium. An exhibition put together by the Institute of Contemporary Arts in London called 'Cybernetic Serendipity' and exhibited at the Corcoran Annex, US, set the stage for the type of work he wanted to do, because it presented a mix of perception, art, technology and science (Oppenheimer, 1982: 44).

Frank Oppenheimer also stressed the importance of exchanges with scientists in universities, artists and staff, as well as contact with industries, research labs and visitors. Foremost, the Exploratorium was a composite of ideas Oppenheimer used in his previous teaching and curriculum development projects in the academic community (Oppenheimer, 1982: 45).

Today the Exploratorium contains around 700 hands-on science exhibits which visitors can explore at their own pace and experiment as they wish. Explainers are available to help visitors in case they wish to ask questions. The pedagogic orientation of the Exploratorium is based on the 'experiential learning' approach and in the belief that perception is the basis of learning. Its main idea is that exhibits should be 'intriguing', and should encourage visitors to explore and ask themselves questions. The pedagogical perspective is that exhibits should start from 'exploration' rather than from 'explanation'. Information is contained in every exhibit, but the aim is that exhibits can be 'question generators' (Duensing, 1993).

The Exploratorium can be considered as the principal pioneer of modern hands-on science centres. Interactive / hands-on exhibits have become extremely popular in many countries, such as the United States, Canada, the United Kingdom, India and Australia, and a number of museums were influenced by the Exploratorium approach to exhibits.

La Cité des Sciences et de l'Industrie and La Cité des Enfants, Paris

In Europe, the opening of the *Cité des Sciences et de l'Industrie (CSI)* by the President of France in Paris in 1986 was a landmark in the science-centre field because of its scope and monumentality. Its mission is to diffuse information on scientific research and technology development to a wide public. This national project has enlarged the science-centre concept: it is, at the same time, an exhibition centre, a documentation centre, a communication centre and a research centre. It supports the idea that a science centre can offer not only the opportunity to interact with exhibits but can also be a catalyst for the diffusion of the latest science and technology advances. The massive glass and steel building includes 30.000 m2 of permanent and temporary exhibitions, a specialised library ('*Médiateque*') and the '*Géode*' (a huge sphere in polished stainless steel - a symbol of the institution - which shows films in a 1000 m2 hemispheric screen). The building lies in the *La Villette* park, an area consisting of 55 hectares where cultural events take place during the year (Dossier de Presses, 1986-1996).

'Interactivity' is at the core of the exhibitions' concept (Cité des Sciences et de l'Industrie, 1988). Exhibitions include '*Explora*' (a large permanent exhibition, occupying two floors, dedicated to different themes, such as environment, energy, images, light, sounds, mathematics) and '*Techno Cité*' (an exhibition for teenagers introducing themes related to technology and encouraging youth visitors to create and fabricate objects for themselves). The *CSI* also runs a traveling exhibition service for France and abroad, offering around twenty different traveling exhibitions, large and small, which can meet different institutional needs.

The *Cité des Sciences et de l'Industrie* has shown a concern, from its beginning, with the provision of exhibitions for children, first with the *Inventorium* (opened in 1987) and, in 1992, with the opening of *La Cité des Enfants* ('The Children's City'), a 2700 m2 space dedicated to children aged 3 to 12 and their accompanying adults (one space for 3 - 5 years old and another for 5 - 12 years old). The *Cité des Enfants* has been planned to make the child

feel welcome and to encourage peer and cross-generation interactions ('co-éducation'). The main exhibition goals are to stimulate children's curiosity and to make the process of discovery a pleasant and rewarding one (La Cité des Sciences et de l'Industrie, 1998). In addition to this exhibition space for children, the *CSI* also provides a computerised children's library ('*La Médiateque des Enfants*') and offers large temporary exhibitions for children (such as the successful '*Electricité* ').

La Cité des Sciences et de l'Industrie is still an example of innovation in the science-centre field due to the quality of its activities, events, and temporary exhibitions, and thematic approaches.

Because of its national and international scope, the *Cité des Sciences et de l'Industrie* differs from the local science centres which spread in the UK in the 1980's and which will be described next.

1.3. HANDS-ON CENTRES AND CHILD-ORIENTATED MUSEUM EXHIBITIONS IN BRITAIN IN THE 1980s AND 1990s: SOME EXAMPLES

Introduction

Hands-on science and discovery centres were established around Britain from the 1980s. The themes used in them are generally related to science, nature, environment, maths, and/or communications. In general, they have creative names, demonstrating their intention to be recognised as informal learning environments dedicated to discovery and the exploration of particular subjects.

In 1987, a three-year Interactive Science and Technology Project was established by the Nuffield Foundation with the aim of promoting a network of contacts between hands-on centres in the UK and abroad and to assist in the development of interactive exhibition ideas and methods (The Nuffield Foundation, 1989). This project has served as a launch pad for the foundation of the 'British Interactive Group' (BIG), based in the UK, and the 'European Collaborative for Science, Industry and Technology Exhibitions' (ECSITE), administered from Brussels. The first provides support for individuals working in the interactive science communication field such as exhibit planners, designers, fabricators, gallery interpreters, researchers, and educators, while the later is oriented to provide support to institutions, such as independent science centres and museums committed to the interactive approach (Quin, 1997).

Nowadays, there is in Britain a growing movement for the provision of programmes and exhibitions aimed at children and family audiences, with the opening of new hands-on centres and children's galleries in museums. This tendency is a result of many factors, including the recognition of families as an important segment of the museum audience and the solid support, including financial, which these initiatives have within the community.

Science and discovery centres in Britain

By 1996 there were more than thirty science and discovery centres in the UK, with centres in London, Bristol, Cardiff, Manchester, Newcastle, Aberdeen, Widnes, among others (British Interactive Group, 1995; Quin, 1997; Caulton, 1998). They range from small-sized to large-sized institutions. Normally, they are concerned with working with the local community, although the larger institutions may have a wider scope.

Small scale science and discovery centres include *Satrosphere*, in Aberdeen; *Kaleidoscope*, in Mumbles; *Scope*, in Sheffield; *Inspire*, in Norwich; *Curioxity* in Oxford; *Catalyst,* in Widnes; and *Earthquest*, in Portrush (British Interactive Group, 1995). The number of hands-on exhibits in these centres range from 25, as at *Curioxity*, to 80, in *Satrosphere*.

Medium and large-sized British science centres include *Techniquest*, Cardiff, with its new award-winning building (opened in 1995), and *Explore@Bristol,* a Millennium Project, expected to open in Spring 2000. *Techniquest* (first established in 1986) is a purpose-built science discovery centre offering a variety of activities to the public, including interactive exhibits, a discovery room, a cyber library, and a planetarium. It runs outreach programmes to schools such as the KITS programme (themed collections), a portable planetarium (starlab), and discovery workshops carried out by *Techniquest* staff (Techniquest, 1998). *Explore@Bristol*, a large scale leisure, education and entertainment complex at Bristol's harbourside, is in a new generation of science centres in the UK. *Explore* will offer a variety of 'experiences' to a wide audience, through their exhibitions about the brain, the senses, communications, and great science stories. It will also offer a 'Children's Place' where smaller children can explore science safely, and will host temporary exhibitions. Part of this ambitious project is *Wildscreen*, in which cutting edge technology will present a picture of our planet and where visitors will be able to experience environmental aspects, such as walking through a rainforest. Outreach opportunities will include a website, multimedia packages for schools, libraries, and community services (Explore@Bristol Information Pack).

Interactive & child-orientated galleries in museums

In Britain, science museums such as the Science Museum, London (with *Launch Pad*); the Museum of Science and Industry in Manchester (with *Xperiment!*); and the former Museum of Science and Industry, Birmingham (with the *Light on Science* gallery), were the first to open interactive galleries in their premises. In London, the Science Museum offers a considerable provision of interactive galleries. The Museum commitment to providing learning experiences for children and families has resulted in the opening in 1995 of a whole floor dedicated to them, called *The Basement* (Porter, 1996). In this area, two exhibitions - *Garden*, an early introduction to science for under 6 years old, and *Things*, a hands-on gallery for children aged 7 to 11 - offer a special environment designed for children, families and schools groups. In addition to *The Basement* and *Launch Pad*, the Museum provides other interactive spaces such as *Flight Lab* and *On Air*, where children can explore the principles and practicalities of flying and broadcasting, respectively.

Natural history, maritime, art, and social history museums have also embraced the movement for the provision of interactive galleries for children and families. The Natural History Museum, London, was one of the first to introduce dynamic and hands-on exhibits in its galleries, with the opening of the *Human Biology* exhibition in the 1977, one of the first of its kind in Britain. Exhibitions such as '*Creepy-Crawlies*' (opened in the 1983 and redeveloped in the 1990's) are particularly attractive to children due to their hands-on exhibits and life-sized objects. Its *Discovery Centre* (opened in 1990 and now closed for refurbishment and due to reopen in 2000) was designed for children aged 7 to 11, in family or school groups.

The National Maritime Museum in Greenwich, London, has two interactive maritime galleries aimed at the children and family audience: the *All Hands Gallery* (opened in 1995) and the *Bridge Gallery* (opened in 1999). Both approach the theme of life and technology at sea.

In 1992, the Walsall Museum and Art Gallery initiated a project for the design of an Interactive Art Gallery aimed at children aged 3 to 5 years old as

part of the 'Start Project'. The aim of this temporary exhibition was "to provide early experiences of some accessible ideas about art and art activity" (Adams, 1995:3). The 'Start' Interactive Art Gallery for children was a pioneer project in art museums in the UK and stimulated discussions about the place of young children in an art gallery (Walsall Museum and Art Gallery, 1995). It served as a pilot project for the planning of future art exhibitions for children in the Museum, such as 'Me and You', and for the design of a permanent interactive art gallery, opened in 1999 (Museums & Galleries Commission, 1998:29).

Another creative children's gallery was opened at the Buckinghamshire County Museum, Aylesbury, in 1996 - the *Roald Dahl Children's Gallery* - paying tribute to the famous Buckinghamshire children's writer Roald Dahl. This Children's Gallery aims to offer an imaginative and magical educational experience through the characters from Dahl's children's stories, which introduce subjects such as natural history, sound, light and shadows, related to the National Curriculum. Children can also develop their language skills and humour in the *Matilda*'s Library, where they can listen to Dahl's stories, watch videos, and browse his books.

Children's museums in the UK

In 1992, the first children's museum in Britain opened in Halifax, named Eureka! The Museum for Children, which provides around 350 hands-on exhibits with themes linked to the daily life of children, such as the human body, the environment, communications and work. There are three basic exhibition themes in Eureka!: *Living and Working Together*, *Me and My Body*, and *Inventing and Creating*, aimed at children up to 12 and families. The exhibition design operates at different levels, in order to accommodate diverse age and ability groups (Eureka! The Museum for Children Information Pack).

The opening of Eureka! The Museum for Children in the UK can be seen as part of a children's museums movement initiated in Europe at the beginning of the 1990's. The first international conference of European children's museums was held in Berlin in 1993 and the creation of the *Hands-on! Europe Association of Children's Museums* in 1998 are indications that the children's

museum movement in Europe is becoming more vigorous (Hands-on! Europe, 1998).

Another example is the Children's Discovery Centre East London, Stratford, which is due to open in 2001. The Children's Discovery Centre is being created with and for the community of East London and is aimed at children aged 2 to 7, and their families, carers and teachers. Its main exhibition theme is 'words, language and communications'. The approaches adopted at the Children's Discovery Centre are similar to the children's museums', with visitor activities and services including hands-on exhibits, workshops, play areas, a parents' resource centre and a parent & infant space. The Children's Discovery Centre East London has developed an educational outreach programme - '*On the Move*' - which will be taking exhibits and activities to schools, community groups, shopping centres and play spaces during the year prior to its opening (Children's Discovery Centre East London, 1999).

Centres for Curiosity and Imagination

Other signs of the burst of hands-on centres and galleries for children in Britain is a project called *The Kids' Clubs Network Centres for Curiosity and Imagination*, which was launched in 1999 with the support of the Department of Education and Employment and the Museums & Galleries Commission, with the aim to stimulate and support the development of community-based discovery centres within the UK, by providing information, training, advice and network opportunities to individuals wishing to develop such centres.

This project has been inspired by the successful phenomenon of children's museums in the US and its major goals are: to foster children's curiosity, creativity, positive social interaction and self-esteem; to support the role of parents and carers in children's learning and development; to complement learning in school, home and elsewhere; and to respond to the changing needs of the local community, involving children and other local people in decision-making (Coles, 1999; Kimber, 1999).

Chapter 2:
The Influence of 20th Century Theories of Learning and Cognition in Museum Informal Education

INTRODUCTION

In the previous chapter, early nineteenth century educational visions regarding the child's nature and development and how they influenced the *child-centred movement* and the birth of children's museums and participatory exhibits were outlined and a historical overview presented. This movement became widespread in the twentieth century and diversified itself with the contribution of theorists from the fields of education and psychology which introduced new pedagogic conceptions and learning approaches in educational settings, and museums have also been affected.

In Section 2.1 of this chapter, the influential theories of Maria Montessori and John Dewey are discussed. The seminal ideas of twentieth-century cognitive and developmental psychologists such as Jean Piaget, Lev Vygotsky, Jerome Bruner, and Howard Gardner are pointed out, *since all of them have influenced developments and discussions in the domain of formal and informal education and have inspired the design of participatory and child-orientated exhibitions*. The role of play in child development is considered as well as recent psychological views of learning styles. Learning approaches such as discovery learning, situated learning, and experiential learning are also discussed, since these concepts have often been used in the museum education literature. The section ends with an overview of the educational implications of these learning theories for museum learning, with particular reference to children's learning.

Section 2.2 addresses the concepts of informal education and museum learning and presents examples of informal learning approaches from within the museum field. The chapter ends with Section 2.3, which presents an overview of the museum visitor studies field, research on children and family behaviour and learning in museums, and recent research on the characteristics of stimulating informal educational environments and museum exhibits.

Sections 2.2 and 2.3 offer a theoretical framework in which to situate the research questions explored in this study (see page 113).

2.1. LEARNING THEORIES OF RELEVANCE TO MUSEUM EDUCATION AND COMMUNICATION AND CHILDREN'S LEARNING IN THE 20TH CENTURY

Introduction

The theories of learning and cognition presented in this section have inspired museum educators and professionals interested in the design of appropriate educational experiences for children. These theories are presented here in a succinct form and their principal ideas outlined in order to provide an educational background in which to relate the main educational ideas behind the design of family and child-orientated exhibits.

In this century, three major streams of psychological and educational thinking can be identified, among others. They represent different conceptions of the developing/learning child, so suggesting different methods of education.

Maturationism

This stream of thought sees the development of the child as a result of the 'inner' nature of the immature. The course of development is assumed to be *innate*. The stages of development are seen as predetermined and so the environment should be controlled in order to help the organism to grow 'naturally'. This view has its roots in the *romanticism* of Jean Jacques Rousseau. *Maturationists* such as Montessori, for example, maintained that it is important that the environment offer the elements which help to unfold the inner characteristics of each child (Wadsworth, 1971: 2).

Behaviourism

Another theoretical position, very strong at the beginning of the century, was *behaviourism* which asserted that behavioural outputs are a result of environment inputs. Child development was seen as dependent on the

associated concepts of *stimulus and response* and *reinforcement.* Motivation for learning was viewed as *external* to the individual. The behaviourist model suggested that the child learns through direct instruction, and the teacher (or parent) should control the reinforcement of learning through punishment, rewards and frequent repetition. Supporters of this line of thought include Ivan Pavlov, Thorndike and, more recently, Skinner (Wadsworth, 1971: 2).

The behaviourist approach has been criticised for being "too simplistic to explain a range of human behaviour in social settings and too mechanistic to incorporate the individuality of human responses to stimuli" (Entwistle, 1987:10).

Constructivism

The third main stream of psychological and education thought is the *interactionist* or *constructivist* conception of learning and development, which sees cognitive development as an active interaction between the individual and his physical and social environment. According to this view, motivation for learning is primarily internal. The child is seen as having a natural curiosity about the world and critically instrumental in constructing and organising a personal view of the world from the inputs she receives from the environment. Theorists representing this stream of thought include Dewey, Vygotsky, and Piaget. They had different conceptions of education, but all of them saw "the developing/learning child as necessarily active, and that developing/learning was not automatic" (Wadsworth, 1971:10).

2.1.1. THE ROLE OF EXPERIENCE

At the turn of the nineteenth century and first decades of the twentieth, John Dewey (1859-1952) and Maria Montessori (1870-1952) published writings which intensified the discussions regarding progressive education. Their theories contrasted radically with the traditional view of education, which saw the child as a passive learner and merely receptive.

Dewey's first writings on education were '*The School and Society*' and '*The Child and the Curriculum*', published in 1899 and 1902 respectively, in which he defended the idea that the educational process should build on the

interests of the child. *'Democracy and Education'*, published in 1916, was the most comprehensive statement of his pragmatic and liberal position, wherein he stressed his belief in the unity of theory and practice in educational matters. In *'Experience and Education'*, published in 1938, Dewey discussed important aspects of his educational thinking such as his 'theory of experience', the nature of freedom, the role of the teacher as a co-worker with pupils and as a link with the local community, and his view that education is growth and essentially a social process.

Montessori's influential writings in education were expressed in her books *'Il Metodo della Pedagogia Scientifica'* and *'The Montessori Method'*, published in 1909 and 1912 respectively, and *'The Advance Montessori Method'*, written in 1917-18. In these books Montessori presented her philosophy and methods of education, which were developed particularly at her *'Casa dei Bambini'* ('Children's House') established in Rome in 1907.

The thoughts of Dewey and Montessori and their impact in the educational field are further discussed below.

Dewey and the social aspects of education

The American philosopher John Dewey exerted considerable influence in the United States at the turn of the century and during the first half of the twentieth century. His writings, which cover the areas of philosophy, education, psychology, and liberal politics, have an international reputation. His broad consideration of the field of humanities gives Dewey's view of education a political dimension. He believed that education has a *social function.* Dewey placed great importance on the role that the environment and social interactions have in pupil's development. For him, the environment is a source of understanding.

> "The only way in which adults consciously control the kind of education which the immature get is by controlling the environment in which they act, and hence think and feel. We never educate directly, but indirectly by means of the environment. Whether we permit chance environments to do the work, or whether we design environments for the purpose makes a great difference".
>
> (*Dewey* in Darling, 1994:28)

According to this idea, the child learns through interacting with a social environment, either a family or a school one, but this assumption can also include other educational environments, such as a museum. Dewey advocated that the distance between adult (teacher) and child (learner) should be minimised, and group activities and direct experiences should be encouraged in schools.

Dewey maintained that traditional education was not preparing children for the needs of a changing society and that a *new* educational attitude was required. In his book *Experience and Education*, he drew a comparison between traditional and progressive education. He declared:

> "To imposition from above [traditional education] is opposed expression and cultivation of individuality [progressive education]; to external discipline is opposed free activity; to learning from texts and teachers, learning through experience; to acquisition of isolated skills and techniques by drill, is opposed acquisition of them as means of attaining ends which make direct vital appeal [...]"
>
> (Dewey, 1938:19)

Dewey criticised the traditional educational methods of his time which rendered learning passive, as well as the notion of knowledge as a static and cold storage of information. He was against the learning of subject-matters in isolation, disconnected with the present, and stressed that knowledge should have an application in the actual life experience of the child in order to be meaningful. He questioned the validity and usefulness of the traditional concept of knowledge:

> "What avail is it to win prescribed amounts of information [...] if in the process the individual loses his own soul: loses his appreciation of things worth while, of the values to which these things are relative; if he loses desire to apply what he has learned and, above all, loses the ability to extract meaning from his future experiences as they occur?"
>
> (Dewey, 1938:49)

Moreover, Dewey supported the idea that the child, not the curriculum, should be central to educational processes. He pointed out that in traditional education "the centre of gravity is outside the child", whereas in child-centred

education "[the child] is the centre about which [the appliances of education] are organised" (*Dewey* in Darling, 1994:26).

Dewey's philosophy, due to its emphasis on the role of personal experience, social context and the freedom of the learner, has had a great impact on 20th century educational thought.

Montessori and the role of sensory experiences in childhood

Montessori's theory can be seen in a line of succession from Pestalozzi's and Froebel's thinking.

The Italian educator Maria Montessori was contemporaneous to Dewey. Although their conceptions of education differ, their theories overlap at some points, especially with regard to the child's need for freedom to make choices and the role of the environment in stimulating learning. William Kilpatrick, Dewey's disciple, regarding the similarities between Dewey and Montessori, commented:

> "The two have many things in common. Both have organised experimental schools; both have emphasised the freedom, self-activity, and self-education of the child; both have made large use of 'practical life' activities. In a word, the two are co-operative tendencies in opposing entrenched traditionalism."
>
> (*Kilpatrick* in Lillard, 1973:14)

However, there are significant differences in terms of educational methods between Dewey and Montessori. Montessori was particularly interested in developing the child's personality through motor, sensory and intellectual activity. According to her, the child develops through stages, called *sensitive periods* and, thus, it is not possible to separate sensory from intellectual activity since they are both integral part of the learning process. As Montessori emphasised:

> "In order to develop the mind, a child must have objects in his environment which he can hear and see, [...] he must develop himself through his movements, through the work of his hands; he has need of objects with which he can work that provide motivation for his activity."
>
> (*Montessori* in Hainstock, 1978:67)

In Montessori's view, work and play are often the same thing to the child. According to her, if children are allowed to work at their own rate in completing 'cycles of activity', children will develop and grow intellectually (Hainstock, 1978: 67). Montessori's main objective was to help children to act, will and think independently. However, developing independence also means developing discipline. Adults should not impose their egocentric view of the world on the child, but should approach him or her with humility (Lillard, 1973: 79). The careful observation of a child's activity helps the adult to understand the child's nature.

Montessori developed diverse activities and materials in order to encourage children to act on the environment in a creative, independent way. She believed that *concentration* on activities was an important requirement of intellectual development. Her philosophy was based on the *auto-education* and *self-construction* of the child. The adult's role was that of a sensible observer who should be able to introduce new materials to the child in the right moment (according to the child's developmental stage) without interfering with the child's inner nature and will.

2.1.2. CONSTRUCTIVIST THEORIES AND HUMAN COGNITION

This section investigates theories of human cognition and learning which have had a great impact on current educational practice and are considered to be of particular interest to museums. The theorists presented here are representatives of the constructivist stream, which sees cognitive development as an active interaction between the individual and his physical and social environment. The cognitive developmental psychology of Piaget and Vygotsky and Gardner's theory of human cognition are discussed.

Jean Piaget's (1896-1980) and Lev Vygotsky's (1896-1934) contributions to the field of developmental psychology and education are fundamental. They were contemporaneous but came from different academic backgrounds: the former did his first studies in natural sciences and biology in Switzerland, and the latter in law and philology in Russia. Their approaches to intellectual development reflect in some way their academic roots: Piaget saw intellectual development as a process of continuous change of mental

structures through *adaptation to the environment*, while Vygotsky saw intellectual development as a result of a *culturally organised process* based on social interactions. Vygotsky believed that human development was mediated by social factors. Piaget was interested in the growth and development of intellectual structures and knowledge (he preferred to classify himself as a *genetic epistemologist*), while Vygotsky sought to develop a theory of human intellectual functioning based on Marx's and Engels' thoughts.

Although Piaget and Vygotsky are considered *constructivists* since they both believed that the individual is critically active in structuring his/her own understanding, there is a basic distinction between their thinking. For Vygotsky learning is the driving force of intellectual development: "in making one step in learning, the child makes two steps in development" (Vygotsky, 1978: 84), while for Piaget developmental cycles precedes learning, that is, the individual's 'stage' of intellectual development is a requirement for new learning, and disequilibration (cognitive conflict) is considered to be the driving force of mental growth. Another important distinction between the two is that, for Piaget, children's developmental stages are given universal application, while for Vygotsky development is considered to be culturally mediated.

The theory of multiple intelligences of the American psychologist Howard Gardner currently has a strong impact on the educational community. For this reason, his theory has also received a lot of attention in the literature related to museums. Gardner presents a new view of human cognition that emphasises different aspects of human capacities and abilities. Gardner's concern with the *role of the cultural context* in the development of intelligence indicates a similar view to Vygotsky's conception of mental development.

Piaget and the constructive nature of learning

The Swiss psychologist Jean Piaget's (1896-1980) contribution to the understanding of intellectual development in human beings was decisive (Piaget, 1973, 1970, 1964, 1954). His theory presented original and revolutionary ideas which have influenced the concept of human mental growth and promoted considerable changes in the educational field during the second

half of this century. The behaviourist view of learning was still very strong during the first half of this century:

> "A change towards a learner-centred approach began to emerge in the 1960's when learning theory moved from the behaviourist's view that learning is produced by the environment upon a passive learner, to the developmental view, supported by Jean Piaget, that learning requires the learner to be actively involved with the environment."
>
> (Sykes, 1994:3)

The basic concepts proposed by Piaget were the *assimilation-accommodation model*, *equilibrium-state* and *disequilibrium-state* concepts, the '*schema*' notion, and *developmental stages* related to the chronological age of the individual. These concepts will be explained below. The main assumptions which linking these concepts are *interaction* between the individual and the physical and social environment and the *constructive process*. There is a principle of *continuity* in Piaget's theory of human mental growth and the presupposition that the mind has structures that change continually. The constructive process of intellectual development can be understood as "a process of building new structures on the foundations provided by earlier ones, and of integrating previous structures into new supraordinate totalities [...]" (Flavell, 1970: 407). *Intellectual acts* are seen as "acts of organisation and adaptation to the environment" (Wadsworth, 1971: 13), which will incite structural changes in the mind. From this point of view, the individual is seen as constantly creating and recreating a view of the world.

Piaget believed that the child develops cognitively through *stages* - the sensory-motor, pre-operational, concrete and formal operational stages - and that learning depends on the assimilation of a given experience into an intellectual framework or *schema*.

Schema

A *schema* can be defined as a mental framework constructed by the individual through stimuli received from the environment, which is constantly being reconstructed by the individual throughout his or her life. A schema can be understood as an individualised 'concept' of reality created by the individual through interactions with the external world. For this reason, every schema is

highly personal. "Schemata never stop changing or becoming more refined [...] Because they are constructions, schemata are not accurate copies of reality" (Wadsworth, 1971: 14-18). Individuals use their *schemata* to place fresh experience in an appropriate context and relationship with previous experience, and to connect things and events. Intellectual growth is therefore *constructed* upon previous schemata and assimilated new experiences: "every instruction from without presupposes a construction from within", according to the Piagetian theory (Flavell, 1970: 406).

The assimilation-accommodation model

Piaget believed that every cognitive interchange with the environment involves both accommodation and assimilation.

Assimilation is the cognitive process which allows a person to integrate new stimuli into existing schemata, so affecting intellectual development. Stimuli can be understood as any event, occurrence, perception, or concept, derived internally or externally. The process of assimilation involves the steps of accommodation and equilibration. When stimuli are integrated into existing schemata, the individual has accommodated them. Piaget believed that this is a *self-regulatory* mechanism that goes on inside every person. The comfortable balance between assimilation and accommodation is called *equilibration*. On the other hand, when the individual does not have an existing schema in which to place a new stimulus, then he or she will need to create a schema in order to accommodate the new stimulus. When stimuli do not fit in any schemata, then this situation is said to cause a state of *disequilibrium.* Disequilibrium also occurs when you are in the process of attemping to integrate stimuli into an existing schema. Disequilibration is seen by Piaget as a source of motivation for intellectual development, because disequilibrium (or cognitive conflict) will motivate the individual to try assimilating and accommodating the new stimulus, aiming to equilibrate it.

> "The sequence of cognitive structures becomes, in this interpretation, a sequence of equilibrium-state 'moments' within an ongoing, continuous process of equilibration. Each structure integrates its predecessor to form a new and higher form of equilibrium, 'higher' in terms of the equilibrial properties of field extension, mobility, permanence, and stability [...]." (Flavell, 1970: 263-64).

Cognitive structural development: the concept of stages

Piaget's studies with children prompted him to devise a system based on developmental stages and periods seen as a continuum. He believed that these developmental steps were invariant, that is, that we all have to go through them, while the chronological age at which each stage occurs could not be precisely defined.

Piaget proposed a succession of four stages: (1) sensory motor stage, which is divided in six periods; (2) pre-operational stage; (3) concrete operational stage; and (4) formal operational stage. At each stage, appropriate *schemata* reflect the child's current level of understanding and knowledge of the world (Wadsworth, 1971: 18).

Sensory motor stage

The *sensory motor stage* in the infant covers the period from birth to approximately two years old. The child grows intellectually throughout six developmental periods within the sensory motor stage, so that the two-year old becomes cognitively and affectively different from the new born infant. The six periods of development within this stage are to occur approximately every four months: (i) from birth to one month: *reflex activity period*; (ii) from one to four months: *first differentiations period*; (iii) from four to eight months: *reproduction of interesting events*; (iv) from eight to twelve months: *co-ordination of schemata* and *object permanence* (first mental representations of objects); (v) from twelve to eighteen months: *experimentation period* (aware of relationships between objects and self); and (vi) from eighteen to twenty-four months: *representation period* (invention of new representation via internal combinations) (Wadsworth, 1971: 35).

In Piaget's view, the child in the sensory motor stage is egocentric, lives in the immediate present and is mentally restricted to immediate perceptions and motor events. All schemata at this stage are sensory motor in nature and dependent on the actions of the child. The infant *at the beginning* of the sensory motor stage does not have any internal representation of objects that

he can manipulate mentally (Wadsworth, 1971). Initially, at the reflex activity period, the child cannot differentiate self from other objects. Later, in the process of stage development the child acquires notions of object permanence and at the end of it the child has acquired images of absent objects and representation of spatial relationships.

Pre-operational stage or pre-logical period

The pre-operational stage takes place between two to six years old approximately. The developments achieved during the previous sensory motor stage, such as the capability to internally represent experience, are the pre-requisite for the construction of spoken language and the child acquires language rapidly between two and four years of age.

However, the pre-operational child faces limitations of thought, since cognitive behaviour is still influenced by perceptual activities and egocentrism. According to Piaget, the pre-operational child is unable to reason successively about transformations. This happens mainly because the pre-operational child's thought is still egocentric, that is, the child considers *only* his or her point of view of reality, and he or she tends to centre mainly in the *perceptual* aspects of things and phenomena. At the pre-operational stage, reasoning is relatively inflexible, since the child is not yet able to produce *reversible operations* in her mind, that is, she is not able to follow the line of reasoning back to where it started, an important characteristic of later stages (Wadsworth, 1971: 69).

Concrete operational stage

The concrete operational stage goes approximately from six/seven to eleven/twelve years old and is a period where the child begins to develop *logical* thought. At this stage, "the world of representations begins to take on its first real stability, coherence and order" (Flavell, 1970: 265). The child is now able to *decentre* from his or her own point of view and has developed *inductive* thinking, that is the ability to go from his own experience to a general principle.

Piaget's 'tasks' carried out with children in the concrete operational stage provide interesting accounts of cognitive development. When asking children to develop the tasks, Piaget was interested in finding out the line of reasoning undertaken by the child. His studies of conservation of number, mass, volume, length, and area, among other things, are a rich part of his theory of mental growth. Regarding Piaget's methods and findings, Howard Gardner commented:

> "Piaget did pose the right questions and achieved crucial insights about the main factors involved in logical-mathematical development."
>
> (Gardner, 1983: 134)

According to Piaget, the concrete operational child is now able to follow transformations, reason, and solve problems involving inversion, reciprocity and compensation concerning mental operations. Piaget defined *'operation'* as "an action that can be internalised or thought about, and this is mentally reversible [...]" (Wadsworth, 1971: 91). The term operation is also related to the construction of important internal schemata such as serial ordering, classification, addition, subtraction, multiplication, division, and the like (Bee, 1995: 197). The chief achievement of this stage is the *conservation* of certain *object properties* in view of phenomenal change: conservation of quantity, weight, volume, etc. (Flavell: 1970, 265). The acquisition of schemata that permit conservation does not take place at the same time in all areas (Wadsworth, 1971: 75). Due to distinct levels of difficulty and reasoning in particular operations, conservation of object properties may be achieved during different phases of the concrete operational stage. For instance, Piaget's studies suggested that while conservation of number can be achieved around six-seven years old (for instance, the child becomes aware that a change in the length of a row of elements does not change the number of elements in the row), conservation of liquid volume is, in general, achieved later, around seven-eight years old (for example, when the same amount of water is poured from a thin container to a thick one, the amount of water does not change).

Children in the concrete operational stage have difficulty in reasoning about the future or about problems involving hypothetical features.

"Concrete thought is limited to solving tangible concrete problems known in the present."

(Wadsworth, 1971: 112)

At the concrete operational stage, affective reasoning is developed. The child is now able to understand the state of feeling of others and can share the viewpoint of others. Moreover, the child is increasingly capable of *evaluating arguments* and *making judgements* (Wadsworth, 1971: 109).

The educational implications for children in this stage, which includes primary school children and those in this study, is to present material *'concretely'*, that is, with opportunities for hands-on experience and inductive experimentation.

Formal operational stage

For Piaget, the formal operational stage starts at approximately eleven-twelve years of age and extends until sixteen years of age or later. It is the culmination of the previous intellectual developmental stages, and incorporates, builds on, and stretches out the development of the concrete operational stage. The individual is now able to master a vast array of internal operations and can manipulate concepts freely. He or she is now able to solve different kinds of problems - concrete or hypothetical - , make conjectures and assumptions, think about the future and the unknown, consider options and possibilities. The child develops deductive thinking and is able to draw conclusions from premises in a systematic manner. She is also capable of reflexive abstraction, which is a primary mental mechanism of logical-mathematical thought and analogy. "After this stage, there are no further structural improvements in the quality of reasoning" (Wadsworth, 1971: 111).

Affective development at the formal operational stage also attains important features, the most significant being the development of *idealistic feelings* and *personality*. In terms of moral development, the typical teenager is also able to develop an acute comprehension of rules, and acquires a sense of justice based on the consideration of intent and circumstances.

Final words about Piaget's theory

Most Piagetian writers have focused on the aspects of Piaget's theory related to cognitive development, since it is the strongest part of his theory. However, Piaget also maintained that intellectual development has, in addition to cognitive issues, affective, social, and moral components. Although his theory is not a theory of education, it provides an important framework for dealing with learning issues. For instance, his theory has influenced the current common division of educational materials and services into four: infants, preschoolers, schoolchildren, and adolescents.

Criticisms of Piaget's theory

Piaget's theory had a considerable influence in the educational and psychological fields. However, many criticisms regarding aspects of his theory have been raised. Some are related to: his concept of stage; the timing of intellectual development according to these stages; an underestimation of cognitive skills in infancy and at preschool age; overestimation of formal operational thought in adolescence; his emphasis on logical reasoning; and, finally, a lack of consideration regarding children's sociocultural background and its influence on intellectual development (Flavell, 1970; Bee, 1995; Gardner, 1993).

Piaget's stage concept has been considered to be very controversial by researchers in the field. Some scholars have suggested that Piaget's stages, correlated to *chronological age*, are incorrect, although several authors accept the idea of *sequential changes* in mental development. The timing of the stages, including its periods, are much disputed. For instance, research has shown that infants have internal representation much earlier than Piaget supposed them to. In the same way, research has proposed that children aged two and three have *some* ability to understand an other's perspective, contradicting Piaget's idea that the child is totally egocentric at this age.

It was also suggested by researchers that preschool children are capable of forms of *logic* which Piaget did not consider at this stage. However, many authors have agreed that preschool children *think differently* from older children. Research has also indicated that formal operational thought is not achieved by *all* adolescents and that this development will depend heavily on experience, sociocultural background, and environment demand (Bee, 1995: 200-15). Nowadays it is believed that adults can also benefit from a *concrete approach*, specially when they are confronted with unfamiliar situations. In such cases, adults, like children, can revert to a concrete operational stage type of thinking and may need to have a direct experience of the situation in order to understand it (Black, 1990: 23). This is of significance in the museum environment.

It has also been suggested that Piaget's picture of higher operational thought can mainly be applied to mainstream, Western, middle-class development supported by a schooling system that places high importance on logical-mathematical thought, and that other cultures may consider this system less relevant (Gardner, 1983: 134).

Finally, field research has pointed out that intellectual development is a *multidetermined* affair, and not just a matter of chronological age. From this perspective, it is crucial to consider variables residing in the individual him/herself: intellectual ability, personality, current emotional state, sociocultural background, family milieu, education, and prior experiences (Flavell, 1970: 442-46).

Vygotsky and the role of social interactions and guidance in the learning process

Lev Vygotsky (1896-1934) advocated that learning is a profound social process and, consequently, a dynamic process, and should be studied in this process of change (developmental analysis). His concept of 'social elaborated learning' and 'mediated learning' is an outcome of his belief that a distinguishing feature of human psychology is the internalisation of socially rooted and historically developed activities (Vygotsky, 1978: 57).

According to his theory, the mind has *culturally mediated structures*. His position contrasts with Piaget's, who advocates that the structures of human mind are *universal*.

Vygotsky proposed that the higher mental functions are socially formed and culturally transmitted. The use of internally oriented signs, such as language and symbolism, involves mediated activity. He also asserted that *play* has an important role in the development of a child, since it is a spontaneous activity which fulfils certain needs of the child. The creation of an imaginary situation through play is a new psychological process for the child in which she emancipates herself. In this concept of play, *imitation* of real life events is an important aspect, where the child gives *meaning* to her play and where *rules* emerge. For Vygotsky, play as a predominant feature of childhood is a leading factor in the development of the child.

He stressed that education should focus on the *emerging functions and capabilities* of the individual, instead of lagging behind developed psychological processes (John-Steiner & Souberman, 1978: 131). Vygotsky's major concept regarding the development of learning is the 'zone of proximal development'. This concept is twofold. The *actual development* of a child is the stage where he or she can do some tasks independently, by him or herself. In Vygotsky's words, "a child's actual developmental level defines functions that have already matured" (Vygotsky, 1978: 88). On the other hand, the *proximal development* level defines functions that are in the process of maturation. So, the *zone of proximal development* is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978: 88).

In his writings, Vygotsky made clear the essential role of social interactions in the learning and development processes. Social 'mediation' was considered to be at the basis of higher mental processes. Social interactions with more capable persons were considered of primary importance in passing through proximal development periods.

Vygotsky was able to inter-relate his studies on the development of human consciousness and intellect with anthropological and sociological views. His picture of learning and cognitive development is very stimulating and

original, and his ideas have strongly influenced the educational field in the last forty years.

Gardner's theory of multiple intelligences

In his book 'Frames of Mind' (1983), the American psychologist Howard Gardner challenged the classical theoretical view of intelligence. His theory of 'multiple intelligences' attempts to broaden the current understanding of human intellectual competences and to provide a more anthropological view of cognition, taking into account forms of human expression in different cultures. According to Gardner, this anthropological perspective introduces an important new element in the understanding of cognition.

> "If we want to encompass adequately the realm of human cognition, it is necessary to include a far wider and more universal set of competences than has ordinarily been considered."
>
> (Gardner, 1983: xiv)

Gardner argued that since Classical times *rationality* has been the principal focus of theories of mind in Western countries, and little attention has been given to *creativity* and *originality* as displayed at the forefront of science and arts. He stressed that, in the twentieth century, philosophers have placed great importance on the symbolic vehicles of thought, such as language, visual arts, gestures, mathematics, and other *human symbol systems*. As Gardner stated:

> "In adopting this symbolic perspective, my colleagues and I do not propose to throw away the Piagetian [theory]. Rather, we seek to use the methods and overall schemes fashioned by Piaget and to focus them not merely on linguistic, logical, and numerical symbols of classic Piagetian theory, but rather upon a full range of symbol systems encompassing musical, bodily, spatial, and even personal symbol systems."
>
> (Gardner, 1983: 25)

Gardner created a theory which could encircle diverse kinds of abilities valued by different human cultures. He argued that 'IQ' (intelligence quotient)

tests could not measure the whole of an individual's capacities, but only a few aspects of his or her intelligence.

> "There must be more to intelligence than short answers to short questions", Gardner argued. "Only if we expand and reformulate our view of what counts as human intellect will we be able to devise more appropriate ways of assessing it and more effective ways of educating it."
>
> (Gardner, 1983: 3-4)

His theory of 'multiple intelligences' proposes the existence of seven intelligences: *linguistic, musical, logical-mathematical, spatial, bodily-kinaesthetic,* and *interpersonal* and *intra-personal intelligences.* Gardner defined 'intelligence' as "the ability to solve problems, or to create products, that are valued within one or more cultural settings" (Gardner, 1983, xiv).

Central to his theory is his suggestion that these intelligences operate as *modular systems*, without needing a 'central control' to co-ordinate and guide operations (Radford & Govier, 1992, 421). He believed in the *'modularity of the mind'*, a position defended by the American philosopher and psychologist Jerry Fodor. Fodor rejected "horizontal processes like general perception, memory and judgment, in favor of vertical modules like language, visual analysis and musical processing, each with its characteristic mode of operation" (Gardner, 1983, 283). An important implication of this view is the idea that intelligences are *independent* of one another, and an individual can manifest a high level of one intelligence and a low level of another. For this reason, he did not believe in a *general intelligence* as Piaget and others did. Gardner's theory suggests that the *effects of culture* on a particular intelligence cannot be ignored since the culture may determine which intelligences are most valued, although he believes that heredity and learning may also influence the level of each intelligence. Gardner's emphasis on the role of the cultural and social contexts in the development of intelligences approximate him to the Vygotsky's position.

Gardner investigated examples of expressions of high intelligences in different cultures, how they manifest themselves, and in what conditions. He believes that the study of prodigious individuals may offer an important clue for the functioning of the mind in their particular gifted intelligence. Gardner

outlined the main characteristics of each intelligence. For instance, ***musical intelligence*** consists of the ability to perceive melody and rhythm. A composer, for example, has 'tones in his head' constantly. ***Linguistic intelligence***, according to Gardner, find its highest form in poetry and literature. Its main abilities consist of a sensitivity to the meaning of words, the order among words, and the sounds and inflections of words. The main feature of ***logical-mathematical intelligence***, for Gardner, is a love of dealing with abstraction and with analogies. Central to ***spatial intelligence*** are the abilities to perceive the visual world accurately and to be able to re-create internally aspects of one's visual experience even in the absence of the original stimuli. ***Bodily-kinaesthetic intelligence*** is the ability to have control over one's body. It is the *brain's awareness* of the position and movement of the body, limbs, etc. Finally, Gardner described two types of ***personal intelligence***, one with *intra-personal* components and the other with *interpersonal* ones. The former is the capacity to have a *sense of self*, to have access to one's own feelings, and to use this awareness to guide one's actions. The latter concerns the ability to make distinctions among individuals, including the capacity to perceive and discriminate their moods, temperaments, motivations and intentions, and use this information to behave accordingly.

Gardner stressed that every normal individual should be able to develop each intelligence to some extent, depending on the conditions and opportunities offered to him, such as early training and social milieu. He assigned a primary role to the *general context* in which learning takes place. According to him, learning tends to occur in a particular *cultural context*, and the agents of learning, such as skilled elders, relatives and teachers, also play a vital function in this process (Gardner, 1983: 336-39). So the learning of particular intelligences is directly influenced by the cultural context and by the agents of learning.

Main criticism of the theory of multiple intelligences

The theory of multiple intelligences has been criticised for being purely descriptive, and for lacking empirical data. Gardner has admitted that he was not able to tell how far intelligences actually correlate to each other, and

stressed that further studies are necessary (Gardner, 1983: xxiv-v). He is still working on developing and explaining his theory.

2.1.3. LEARNING APPROACHES AND LEARNING STYLES

A number of learning theories have been developed as an inevitable consequence of the exploration of the theories of cognition explained previously. They variously emphasise the strategies used by the learner, or the agents of learning, the characteristics of the individual, or the structure of the subject/material to be presented. In the main, these concepts are focused on learning in the formal context of the school classroom, but they can offer insights appropriate to the informal educational environment of the museum.

Bruner and the notion of 'spiral curriculum'

Educator Jerome Bruner's has had a large influence during the past three decades. His writings '*Toward a Theory of Instruction*'(1966), '*The Relevance of Education*' (1971) and '*Communication as Language*' (1981) have been infuential. One of his most widespread and translated books is, however, '*The Process of Education*' (1960), where he presents penetrating ideas regarding learning and introduces his debated concept of the 'spiral curriculum', with its coda that *any subject can be taught to any child at any stage of development if presented in the proper manner.*

Bruner agreed with Piaget's theory of intellectual development and used it as a foundation for some of his positions regarding *readiness of learning*, such as the notion that, at each stage of development, the child has a characteristic way of viewing the world. The main concept behind this idea is that the educator should begin from where the learner is, tailoring knowledge to his/her interests and capacities. In order to practice this, it is necessary to combine many skills, such as patience and honesty, and be able to present phenomena "in a way that is simultaneously exciting, correct and rewardingly comprehensible" (Bruner, 1960: 22).

For Bruner, *intellectual excitement,* an important requirement of learning, is achieved only when the learner is able to grasp the general principles and the fundamental structure of a given subject. The *arousal of interest* is considered to be an essential precursor to learning. "The best way to create interest in a subject is to render it worth knowing [...]" (Bruner, 1960: 31). So, in the learning of new topics it is crucial to make clear to the learner the *broad fundamental structure* of a field of knowledge and the *context* of the specific topic(s) being taught.

Bruner considered that the child has a natural curiosity and is willing to explore things. So, a further learning approach supported by him was the *technique of discovery*, which can help the child to generate information on his own, and then check it against other sources, gaining more new information in the process (Bruner, 1960: 51).

Bruner argued that the basic notions of academic disciplines could be introduced to young children through *intuitive thinking.* According to him, this kind of thinking involves a perception of the total problem and of its structure - a different approach from 'analytic thinking' which advances in well-defined steps. In his opinion, it is disappointing that the formalism of school learning for so long devaluated *intuition*, emphasising mainly the acquisition of factual knowledge and the correct answer, and warned educators to discover ways to develop and stimulate intuitive thinking in their students.

In summary, Bruner stressed that intellectual excitement, interest, intuitive thinking, as well as the structure, context and familiarity of the topics being taught are essential aspects to be considered in the process of education. His concept of learning has offered important insights to museum educators. Bruner drew attention to the idea that learning in informal situations should not take place in a passive context but should, rather, be based as much as possible on the arousal of interest, so that motivation for learning is internal to the individual (Bruner, 1960: 80).

The Role of Play in Child's Learning and Development

During the 20th century, attention has been given to matters concerning the individuals' opportunity for play and leisure. It is generally accepted today that children have a special right to be happy and develop their full potential, and 'play' has an important role in this context. Educators and psychologists, such as Froebel and Piaget, have supported the view that that the sensory experiences provided through play are the foundation of intellectual development (Tizard, 1977:202). For Vygotsky and Bruner, play is a leading factor in the development of the child (Vygotsky, 1978; Bruner et al., 1977).

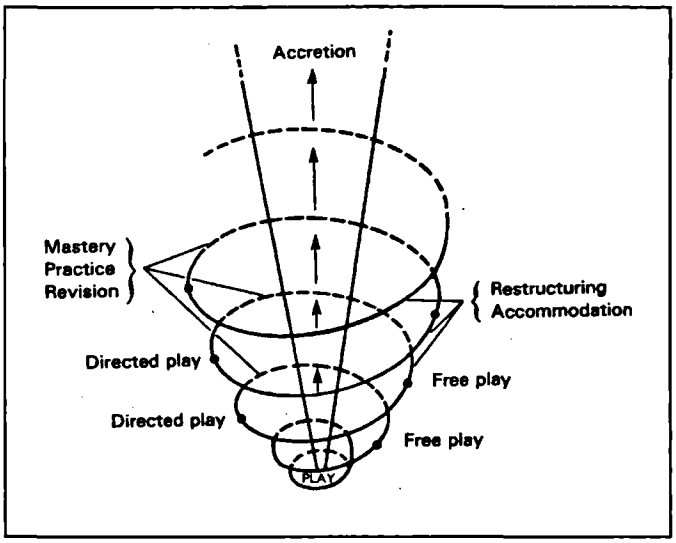
Play is also considered important for developing creativity, intellectual competence, emotional strength and stability, and is associated with general development and maturation. Basic learning requirements are provided in a play situation: stimulation, variety, interest, concentration and motivation. Play challenges the child "to master what is familiar and to respond to the unfamiliar in terms of gaining information, knowledge, skills and understanding" (Moyles, 1989: 7-8).

Three basic forms of play, which overlap with each other, are identified by Moyles, researcher and lecturer in early years education: physical play, intellectual play, and social/emotional play. *Physical play* involves a person's motor operations (gross, fine and psychomotor) in activities such as construction / destruction, manipulation, coordination, and sensory exploration. *Intellectual play* encompasses problem solving situations, and other circumstances which provide possibilities for exploration, investigation, explanation, representation, and imagination. *Social / emotional play* offers opportunities for co-operation and communication with others and mastery or control over situations, as well as the promotion of empathy/sympathy between people. She emphasises that 'play is always structured by the environment, the materials or contexts in which it takes place' (Moyles, 1989:12,17).

Discussions on whether play should be guided by the adult (*directed play*) or be self-initiated by the child (*free-play*) are frequently raised. Moyles suggests that the play process should be a spiral between *free-play* and *directed-play* (see Figure 2.1.1), since *free-play* allows exploration,

restructuring, and accommodation, while *directed-play* allows revision and mastery (Moyles, 1989:15-6).

Figure 2.1.1: The Play Spiral (Moyles, 1989)



Source: Janet Moyles, 1989 ©

Discovery learning

Learning by discovery has been defended by many educators as a technique of stimulating the learner to solve problems by him or herself.

The main idea of discovery learning is to encourage the individual to engage in *active inquiry*, through an active investigation of the subject matter by the learner (Mosston, 1972; Yamashita, 1995). The organised situation should give the learner some freedom to make choices and decisions.

In general, the discovery method encourages problem solving and *divergent thinking*, which is a kind of thinking that tends to lead to unanticipated, imaginative, and creative responses. *Convergent thinking*, on the other hand, emphasises predetermined questions which requires specific answers.

The discovery method can be applied in different ways. It can be controlled by the learner or, in some cases, the educator can take the role of a guide or facilitator. The most important aspect of the method is the process of

discovery that the learner is engaged in. The attitude of the learner towards discovery is a fundamental point.

Some scholars note, however, that the discovery learning method can be successful with some pupils and not with others (Entwistle, 1987: 19). Reasons for failure can be related to the personality of the child. For instance, while pupils low in anxiety enjoy engaging in discovery learning, more anxious children prefer the direct teaching method.

Experiential Learning

The experiential learning approach is in line with Dewey's philosophy which focus on the nature of the experience and on the belief that the process of inquiry involves reflection on the experience (Roschelle,1995: 45).

Experiential psychologists such as Carl Rogers were particularly concerned with the emotional experiences of learning and its relationships with personal growth.

> 'A feeling is an emotionally tinged experience, together with its personal meaning. Thus it includes the emotion but also the cognitive content of the meaning of that emotion in its experiential context. They are experienced inseparably in the moment [...] The stress that recent centuries have placed upon reason, thinking, and rationality is the attempt to divorce two actually inseparable components of experience, to the detriment of our humanity.'
>
> (*Carl Rogers* in Entwistle, 1987:24, 26)

The term 'experiential learning' has been frequently used in the museum field in order to describe the museum visitor experience, which is considered to include cognitive and affective domains as well as social and environmental aspects (Falk & Dierking, 1992, 1995; Hedge, 1995:116; Please Touch Museum, 1998).

Situated Learning

Situated cognition or situated learning theory has its roots in the ideas of Dewey and Vygotsky, since it holds that all learning occurs within experience transactions and emphasises the social construction of knowledge. It has emerged in the 1980's as a criticism of the information-processing approach to learning, which metaphorically sees the mind as a 'computer of symbolic data' and overlooks the influence of the physical and social contexts in learning (Roschelle, 1995:46-47).

Situated learning takes into particular consideration the relations between people and the ability to participate in a community-based culture, since it advocates that knowledge and social identity are connected. If learning is understood as conceptual change, it also involves a transformation of identity, and these two aspects operate gradually over a long period of time (Roschelle, 1995:47). This learning theory is currently receiving more attention by some museum professionals who are interested in the contextual and social nature of learning.

Learning Styles

In the second half of this century, there were two major psychological research traditions concerned with the study of learning: one represented by the *experimentalists* (which examined general learning processes but ignored individual variations) and the other represented by studies exploring how individual differences may affect learning (Entwistle, 1987:17-18). The learner-centred approach, supported by the *developmentalist* view of individuals as active learners, focused on the importance of individuality and personal learning strategies.

During the 1970's and 80's, several learning style models were devised by researchers including Kolb, Lotas, McCarthy, and Gregorc (Torrance & Rockenstein, 1988: 276-77; Schmeck, 1988). These models oppose concrete vs. abstract thinking, analytical vs. sensorial, cognitive vs. affective, holist vs. serialist learning styles. Kolb, for instance, described four types of people

based on their information reception and processing styles: *divergers*, *convergers*, *assimilators*, and *accomodators*. Lotas classified individuals as *affective* and *cognitive* learners. Fisher classified learners as *emotionally involved*, *incremental*, *sensory*, and *intuitive* (Torrance & Rockenstein, 1988: 277). McCarthy synthetised the previous models into four learning styles: *imaginative/ innovative*, *analytic*, *commonsense*, and *dynamic*. The *imaginative* learner seeks meaning and learns by listening and sharing ideas; the *analytical* learner seeks facts and learns by thinking through ideas; the *commonsense* learner seeks usability and learns by testing; and the *dynamic* learner is a risk taker and learns by trial and error (Cassels, 1996: 40).

Other researchers, based on studies of the brain hemispheres, described people as having *right, left*, and *integrated* learning styles / modes of processing information. Research indicates that the *left cerebral hemisphere* is concerned with verbal, analytical, abstract, temporal, and digital operations, while the *right cerebral hemisphere* is primarily involved with nonverbal, global/holistic, concrete, spatial, creative, intuitive, and aesthetic functions. The *integrated learner* is capable of using both hemispheres equally (Torrance & Rockenstein, 1988: 278).

Research on multiple intelligences developed by Howard Gardner indicates that the use of diversified learning modalities may enhance individual learning (Gardner, 1993a). According to Gardner's theory, individuals may have preferences for particular intelligences (Hein, 1998: 165), and different learning modalities may suit different individual preferences.

Gardner's view suggests that, although individuals may have learning style preferences, they might be likely to use different learning strategies according to different situations. Thus, it seems unrealistic to categorise someone as having *one* particular learning style, since individuals may use more than one style in their learning processes.

The major contribution of the discussions on learning styles is the acknowledgment that it is important to offer a variety of learning modalities and consider individual preferences in formal and informal education.

2.1.4. IMPLICATIONS OF THEORIES OF LEARNING AND COGNITION FOR LEARNING IN MUSEUMS WITH PARTICULAR REFERENCE TO CHILDREN'S LEARNING

The theories of active learning and human cognition proposed by Dewey, Montessori, Piaget, Vygotsky, Bruner and Gardner have had a considerable influence generally in museum education and in the design of exhibitions for children, and are still used today to provide a theoretical framework for research in museum learning and in the design of informal educational museum environments.

Bruner stressed the importance of developing an inquiry attitude toward learning and a sense of excitement about discovery in order to gain mastery of fundamental ideas (Entwistle,1987: 45-6). Piaget pointed out that children should be encouraged to make discoveries for themselves through a spontaneous interaction with the environment. In a novel setting, children show characteristic exploratory behaviour as they need to explore a novel environment in order to assimilate and accommodate new information. Thus, children can benefit from a museum environment which offers them opportunities for discovery and self-initiated learning.

According to the developmental view, the child must actively manipulate the material to be learned in order to construct meaning about it (Sykes, 1994:5). Museums are about objects and so can provide special opportunities for children through the use of a hands-on approach which offers a variety of concrete and tangible experiences not always available in formal educational environments.

Museums can also foster *inter* or *cross-generational* approaches to learning in their exhibitions. This can provide children with opportunities for the social interactions which are so important to their development (Vygotsky, 1978).

Bruner emphasised the relevance of relating knowledge to everyday experience and that the educator should begin from where the learner is, tailoring knowledge to his/her interests and capacities. This view has been very powerful in recent museum practice where the makers of exhibitions have been urged to make difficult and unfamiliar topics more familiar to visitors, relating

them to their everyday lives. The use of examples is seen as essential to make subjects more familiar and concrete, and the use of links and connections can make the encounter with exhibits more meaningful.

Piaget indicated the importance of *familiar* situations in the arousal of children's attention and concentration, which are important pre-conditions for learning. Children show more concentration in performing tasks in familiar settings, where they can feel comfortable and relaxed. In these environments, children's attention increases. Museum education workers have outlined the relevance of orientation sessions and repeated visits to museums to help children become familiar with the environment (Hein, 1991).

One of the basic conditions for learning, according to Entwistle, depends on creating a non-threatening climate in which the learner feels valued and confident (Entwistle,1987:25). The notions of physical play, intellectual play, and social/emotional play can offer a framework for the planning of children's exhibits which can provide different play situations. As stressed by early years educator Moyles, children need to be given opportunities for "creating, observing, experimenting, moving, cooperating, sensing, and thinking [...] They need to communicate, question, interact with others and be part of a wider social experience in which flexibility, tolerance, and self-discipline are vital" (Moyles, 1989:23). Exhibitions specially designed for children can offer to the young visitors and their families an environment which can meet those basic children's learning needs.

According to Bagchi & Cole, some applications of Piagetian theory to the design of exhibits may include the following experiences: "enable children to see clearly and immediately the effect of their actions; encourage problem solving by posing a challenge or problem that is solved by making something happen; and encourage children to create relationships among events and objects" (Bagchi & Cole, 1992:99).

Gardner's theory of multiple intelligence has enlarged our understanding of human capacities and allowed museums to explore new approaches in their exhibitions, through the introduction of the idea that museums should approach topics from different perspectives and accommodate to different modes of learning.

Situated learning theory is receiving growing support from museum professionals who believe in the contextual nature of learning (Falk & Dierking, 1995:12). The situated learning approach can be particularly applied in community-based projects such as children's museums and discovery centres, which have a tradition of developing programmes and exhibitions in consultation with the community (Maher, 1997). Museums which develop in-house and outreach programmes with the community can also be informed by a similar approach to learning.

Learning is a dynamic, constructive process encompassing features of remembering, perceiving and thinking. It involves knowledge, understanding, insight, abstraction and synthesis. There are also personal and affective components of learning which deal with emotional involvement, such as the development of interest and curiosity, enthusiasm, eagerness to learn, and general 'openness' to new information. So the main educational task of museums seems to be inspire and motivate the visitor, by offering him/her a variety of learning opportunities and acting as a 'mediator'. Schauble and Bartlett, who worked on the planning of an innovative science gallery at the Children's Museum of Indianapolis, stressed the important role of 'mediation' in museum education:

> "Mediation is the heart and soul of museums [...] The implication is that to take learning seriously as a goal, museums will need to become much more self-conscious and systematic about developing and studying the varieties and forms of mediation that they provide and/or shape."
>
> (Schauble & Bartlett, 1997:790)

The ideas presented in this section demonstrated that, although stressing different aspects, the constructivist theories of learning and cognition have in common the idea that learning is an active process between the individual and the environment, the emphasis on the role of experience and social exchanges.

2.2. INFORMAL EDUCATION IN MUSEUMS

Introduction

Museums, science centres, children's museums, zoos, aquariums, and other museological institutions, are places which are characterised as being informal educational environments. In an informal educational setting, people do not have an obligation to learn something or to follow any given structure, and their knowledge is not assessed. The individual is free to make his/her own choices according to his or her interests. In contrast, in a formal educational environment, such as schools, personal interests and learning style preferences, even when considered, are not the prime concern of formal educational systems. The curriculum and subject-matters are more important than individual preferences, and knowledge is assessed according to a scale of learning success or failure.

Informal education is also highly charged affectively, so that what is learned is often related to the identity of the learner (Ogbu, 1995:87). The social context of the experience also plays an important role in informal education. In this context, informal education is understood as a holistic concept fundamentally including the ideas of meaningful learning, personal growth and lifelong development, as well as the broadening of a vision of the world, rather than the notion that learning is concerned with knowledge seen as factual information. Recent studies support the view that learning is a 'process of conceptual change', rather than the 'absorption of transmitted knowledge' (Roschelle, 1995: 41).

Nature of learning which can take place in museums

Museum researchers have been trying to define what kind of learning occurs in museums. They have stressed the *relativist* nature of museum learning and its implications for research.

> "The strongly contextual nature of learning is one reason the learning that occurs in museums is so difficult both to predict and to assess. No two individuals have the same experience. As visitors make their way through the museum, they pay attention to

> different exhibits and objects, even understanding the words in a label differently. As a result, learning outcomes are always relative to the individual and the unique circumstances in which they occur."
>
> (Falk & Dierking, 1995: 12).

According to this view, museum learning goals are also likely to be of a relative and general nature. The objectives of a planned museum experience may include: to facilitate intellectual connections between facts and ideas; to affect/change visitor's values and attitudes; to promote cultural identity; to foster visitor's interest and curiosity; and to promote life-long learning (Falk, Dierking, and Holland, 1995: 18-19).

The museum environment can stimulate many of the visitor's senses simultaneously. The nature of museum learning is rich in stimulus and so perception has an important role, since all the information individuals receive is input into the nervous system via one or more of the five senses (Hedge, 1995: 108).

The physical and social environment as well as the individual's emotional state are also likely to affect the visitor's museum experience and his/her memories of it (Herrmann and Plude, 1995:57).

Can museums provide a 'flow experience' to the visitor ?

Csikzentmihalyi's theory of the 'flow experience' (Csikzentmihalyi, 1995, 1990, 1975) has provided insights for museum researchers, since it is based on studies about *intrinsic motivation* and so is particularly relevant to the free choice informal education environment of the museum.

The 'flow experience' is described as a 'state of mind that is spontaneous, almost automatic' and in which the individual is 'completely immersed' in an activity, so the sense of time is altered. This 'experiential state' seems to offer intrinsic rewards: "when we are intrinsically motivated to learn, emotions and feelings are involved as well as thoughts" (Csikzentmihalyi, 1995:73). Intrinsic motivation can play an important role in the visitor museum experience:

> "If the museum visit can produce this experience [the flow experience], it is likely that the initial curiosity and interest will grow into a more extensive learning interaction."
>
> (Csikzentmihalyi, 1995:70)

This view is supported by research on motivation in informal educational environments which points out that a *intrinsic* motivation group of school students (7^{th} graders) learned concepts and entities better and had longer-lasting motivation than *instrumental* and *situation* motivation groups (Salmi, 1993:172).

Museums may foster a *flow*, rewarding museum experience and motivate visitors to learn by capturing their curiosity, by offering opportunities for involvement, and by offering them alternative perspectives in their exhibitions.

The 'constructivist' view of the museum experience

Museum visitor research has provided insights on how to create exhibitions which can enhance the visitor experience. The work of George Hein is enlightening since he proposes that museums could adopt a *constructivist* approach in their exhibitions in order to make them more meaningful to visitors.

> "What will a constructivist exhibition look like? In fact, what will the whole museum look like if it is designed along constructivist principles? No museum in the world today may fit the criteria completely, nor is it likely that some ever will do so [...] Constructivism consists of a family of ideas, clustered around a few principles, but no actual exemplar may illustrate all the components."
>
> (Hein, 1998:155)

Major components of a *constructivist museum* are the use of *connections to the familiar* and the provision of different *exhibit learning modalities* (Hein, 1998:156-64). Exhibitions should attempt to facilitate connections between what is on display and what is familiar to the visitor. There is also the issue of 'intellectual comfort', that is, the visitor's ability to associate the exhibit content with his or her prior knowledge in order to make sense of what is presented. The aim is not only to convey the exhibition messages, but also to allow the

visitor to make coherent meaning on his own. Also, providing orientation and a relaxed and comfortable environment are essential conditions for supporting learning, according to Hein.

An important component of the *constructivist museum* is accommodation to visitors' differing learning styles by providing a variety of presentation styles and topics for different audiences.

According to Hein, also essential in the development of programmes and exhibitions in a *constructivist museum* is to work in consultation with the community and to make use of evaluation methods (such as 'front-end' and 'formative') with the aim of 'listening' to different audiences and to take their needs on board.

Considering children's needs in museum exhibitions

Lewin has stressed that *children' museums* (and we may add child-orientated galleries) are:

> "[...] a prototype of a new paradigm for the design of learning environments."
>
> (Lewin, 1989:54-55)

The very creation of children's museums, and the continuous growth of child-orientated galleries in recent decades, is an indication that museum professionals from different areas agree that museums have to address children's needs in their exhibitions in a particular way.

Jack Guichard, former educator at 'La Cité des Enfants', La Villette, Paris, discusses the main requirements for the conception of exhibitions for children (Guichard, 1998:207). His study draws upon the museum education, visitor studies, and educational psychology literature, as well as on his own practice as a museum educator, in order to create a framework for designing exhibitions for children. According to Guichard, multiple aspects have to be considered in the development of a children's gallery: exhibition planners should use a conceptual framework to develop the exhibition (based on educational, cognitive psychology, and sociological studies) and take into account the specific psychological and learning needs of children; they should

take on board the importance of fostering social interaction and social learning in the gallery; to define clear exhibit educational goals; and to make use of evaluation studies in order to conceive and plan the exhibition.

In the United States, the development of a science gallery for children and families in a children's museum ('Science Works', Children's Museum of Indianapolis) has attempted to use an innovative design process (Shauble & Bartlett, 1997). Evaluation has been used throughout the development process and research has emphasised the study of how the gallery could improve its 'mediation' role with visitors. The major educational goal of the exhibition is to foster children's understanding through the provision of a broad array of activities in each *gallery component* to support learning and allow for various levels of engagement. The gallery used a 'funnel approach' to design:

> "The strategy proposed by the theoretical framework was to adopt a 'funnel approach' featuring a wide array of options at entry levels for browsing visitors and successively narrower and deeper learning options for visitors who elect to spend more time and more focused participation in parts of the gallery."
>
> (Schauble & Bartlett, 1997:784)

The museum literature indicates that museum professionals recognise the need for creating a particular framework in which to conceive exhibitions designed for children and their families, with the aim to foster understanding, social interactions, enjoyable, and meaningful experiences for this audience.

In the next section, several studies aiming at investigating the children's and their relatives' experience, family dynamics, and learning behaviours in museums and children's galleries are presented, together with an overview of the development of the visitor studies field in museums.

2.3. RESEARCH ON INFORMAL EDUCATIONAL IN MUSEUM EXHIBITIONS

Museum Visitor Research

The need for museum visitor research is connected with the increased interest of museums in knowing their audiences and in understanding the nature of communication in an informal educational environment, and how interpretive strategies adopted in exhibits affect visitor's behaviour and perceptions.

Museum visitor research can be defined as an applied area of social sciences which is concerned with human behaviour and human communication in museum settings (McManus, 1991). It consists of visitor surveys, evaluation studies and museum visitor research projects. The topics investigated may include: demographic and psychographic data relating to the museum audience; the effects of design and the interpretive elements of exhibits on visitor behaviour and perceptions (movement, social interactions, attention, motivation, attitudes, feelings, and thoughts); systematic evaluations of the outcomes of individual exhibits or programmes during or after installation (pragmatic approach); and investigations of naturally-occurring human learning (Screven, 1988; McManus, 1991: 5).

Different kinds of research and evaluation methods derived from psychology, anthropology, sociology and education are applied in museum visitor research. The methods applied in studies range from experimental design to naturalistic (Hein, 1998:69), and include data collection techniques such as questionnaires, interviews, unobtrusive observation, participant observation, and videotaping.

An overview of the museum visitor studies field

The earliest visitor survey known from America is dated from 1897 (Borhegyi and Hanson, 1964), although there are evidences that Henry Higgins, honorary curator of the invertebrates at the Natural History Museum, Liverpool, and famous for initiating the first schools loan service in Britain and for being one of the founders of the Museum Association and its first president in 1890, have

conducted the first published museum visitor study in 1884 (Higgins, 1884). In the study, visitors were classified as *Students*, *Observers*, and *Loungers* for the purpose of discussing the educational value of museums (Hein, 1998: 42).

In the 1930s, American museums started to take a more systematic approach to the study of their visitors. Arthur Melton provided the first detailed 'tracking' studies of museum visitors, indicating the visitors' paths and number of stops through a gallery, time spent at individual displays and total time spent at the exhibition (Melton, 1935; Hein, 1998: 47). The detailed methodology used in the study was an attempt to justify it as valid and reliable.

In Britain, an early visitor studies paper, produced by Dr. Hay Murray (Murray, 1932), director of the Liverpool Free Public Museums, and entitled *'How to estimate a museum's value'*, contained data collected in the Museum about its visitors (Murray, 1932; McManus, 1991: 4). Murray was interested in understanding the impact of exhibitions on museum visitors and especially interested in whether visitors were learning something from their visit. Since visitors were vague in explaining what they had learnt, Murray decided to investigate the time visitors spent looking at the exhibitions. As a result, he obtained a *"time factor"* which could help museums to understand whether or not their exhibitions were holding the attention of their visitors (the *time factor* was calculated dividing the duration of the visit by '12', the minutes necessary, according to Murray, to walk around the displays without stopping). The relevance of this survey is related to the consistent approach undertaken by Murray and in the belief that museum visitor surveys can help museums to plan their activities more appropriately by knowing their audience. Murray's survey is a pioneer example of the interest of museums in understanding how visitors behave in museums and what people gain from attending exhibitions.

Another early (1942-43) museum visitor research project was developed by Wittlin and aimed at testing to two different types of exhibition presentations at the University Museum of Archaeology and Ethnology, in Cambridge, and observing visitors' reactions to them (Hein, 1998: 45; Wittlin, 1949).

In the 1950's, significant effort to investigate children's behaviour was carried out by Brooks and Vernon (Brooks and Vernon, 1956) at the Children's Gallery in the Science Museum, London. This survey was pioneer in reporting aspects of children's behaviour in a museum gallery. Brooks and Vernon

stressed that some children were clearly attracted to certain exhibits, such as working models rather than the static type of exhibit, and noticed that, as a whole, children were treating the Gallery as "an amusement arcade" (Brooks and Vernon, 1956:179; Hein, 1991). They concluded that the planning of exhibitions for children should be closely bound up with child psychology.

Science museums and science centres, specially in the United States, were responsible for a significant production of visitor studies during the 1970's and 1980's. In Britain, in the 1970's, the Natural History Museum was the first museum anywhere to formally integrate evaluation and visitor research into its interpretive work (Alt, 1980; Griggs, 1983, 1981).

In 1984, in the United States, a report published by the American Association of Museums called *Museums for a New Century* stressed the need for museums to develop a deeper understanding of the nature of learning in informal settings (Sykes, 1994:8). This report emphasised the educational character of museums and encouraged them to carry out visitor studies in order to understand the potential of museums as informal learning environments.

Nowadays, the practice of evaluation studies in all types of museums is relatively widespread in the United States, Canada, and increasing in the United Kingdom and other European countries. The outcomes of these researches have indicated the relevance of the visitor studies field to museum education and communication strategies and contributed to the recognition of the need for a deep understanding of the museum audiences and free choice learning environments.

2.3.1. BEHAVIOUR AND LEARNING IN MUSEUM EXHIBITIONS

Research on Children's Behaviour in Museums

In recent years, the volume of museum visitor research on children and families has been continuously increasing and a framework for assessing the effectiveness of exhibits designed for children is gradually being created (Sykes, 1992; Tuckey, 1992).

Age and behaviour in museum exhibitions

The Israel Museum carried out a visitor study in the period over 1979-1981 aimed at analysing their youth public reaction to the exhibitions at the Ruth Youth Wing. They used a technique called '*exploration route*', because it could give a graphic documentation to the very movements of the visitors. The behaviour of several age groups was investigated: up to age 5; 6 to 10 years; 10 to 14 years; and 15 to 20 years. The findings from these four age groups were then compared with each other and with adults behaviour (Gordon, 1991). The study suggests that the balance between observation of, and participation at exhibits, is achieved in the 10 to 14 age group. It has demonstrated that the observation of exhibits by young people increases with age, while the participatory actions dramatically decline with age. For example, most children aged under 5 showed an irregular pattern of spontaneous motion through the exhibition, while children aged 6 to 10 years old spent the majority of their time in participatory actions. Normally, the 15 to 20 age group behave in a very similar way to adults. These findings suggest that distinct age groups have different needs in a museum environment, and museums should diversify their exhibits in order to provide experiences which can meet the needs of children and adults.

Evaluation of exhibit components

In 1991 the Please Touch Museum, Philadelphia, US, which is aimed at children aged 7 and younger and their families, developed an evaluation

programme with the purpose of producing a set of data which could support *a general standard* for evaluating its exhibits (Sykes, 1992). The behaviour of children was evaluated according to the most and least engaging components present in two of the Museum exhibitions, the *Foodstatic Journey* and *Gateway to China.*

The exhibit components were evaluated according to their potential, as follows: *hands-on* (manipulation of objects and construction of new creations); *large motor activities* (exercise of large muscles); *pretend play* (imitative behaviour and role playing); *adult and peer interactions*; *child-initiated* and *child-directed* play. The most engaging exhibit components were *hands-on*, followed by opportunities for *child-initiated* and *child-directed* play.

Interaction with adults engaged sixty per cent of the children, contrasting with only a third of the sample engaging in peer interactions. These findings were used to support the development of guidelines for the quantity of behavioural components in the Please Touch Museum exhibits (Sykes, 1992).

The findings also demonstrated that children were significantly more attracted to the familiar components of *Foodstatic Journey* than to the novel components of *Gateway to China* ($p<.0001$), and that the average time spent in the first was greater than in the latter (3min.25sec. compared to 1min.40sec., respectively). The findings suggest that an exhibition about a familiar topic (*Foodstatic Journey*) attracted more children than an exhibition about an unfamiliar topic (*Gateway to China*). These findings may be supported by Piaget's theory of schema which suggest that children might be more open to experiences which embody familiar elements because they can build upon their past experiences.

Research on Children's Perceptions and Learning in Museums

Children's perceptions

Some visitor studies have focused on the affective components of the museum visit, such as the child's feelings, attitudes and perceptions towards the museum/exhibition. A study developed by Nina Jensen in Manhattan, New

York City, aimed at exploring how children perceived their experiences in museums in relationship to other places they visited (Jensen, 1994). This study adopted a contextual perspective which put museums together with other places children visited. According to her findings, the most frequent places named by children, *excluding* museums, were "stores, home, friends' home, sports, other cities/states, parks, relatives' houses, restaurants, school, and amusement parks" (Jensen, 1994: 308). Among the museums that children visited, the most quoted were the Children's Museum of Manhattan, the American Museum of Natural History, some art museums such as the Metropolitan, and zoos.

From a sample of 22 interviewed children, aged nine and ten, six of them liked *only* children's museums. She used a methodology of affective place descriptors to investigate children's perceptions of the museums they visited. The descriptors used were *fun, boring, learning* and *non-learning.* The research instrument (a circular model divided in four quadrants) defined four combinations of descriptors: *fun/learning*; *learning/boring*; *boring/non-learning*; and *non-learning/fun.* During the interviews, children were asked to place the museums they visited in one of the four quadrants.

The findings indicated that children had a varied perception of museums:

> "In order of frequency, museums appeared in groupings with the following quality descriptors headings: learning/educational; fun; boring; boring/fun; adventure; mixed feelings; relaxing and slow; peaceful; quiet; happy; love to go; and interesting."
>
> (Jensen, 1994:310)

According to Jensen, *affect* plays an important role in the museum experience of children. The term 'fun' is directly associated with *exciting* and *pleasant feelings*, while the term 'boring' is associated with *gloomy*, *unpleasant* or *sleepy.*

A significant finding showed that most of the children "prefer visiting museums with family and friends" and "perceived the role of the teacher as interfering with their desire to look and act freely" (Jensen, 1994:311). According to Jensen, children aged nine and ten are articulate about the places they like to go to and value a certain degree of independence in museums.

Active participation and variety of experiences are key elements if a museum is to be considered *fun* by children.

Children's learning

A recent study developed by the Please Touch Museum, Philadelphia, as part of the Project Explore, has investigated how young children learn in a children's museum, how adults mediate children's involvement with exhibits and how children's learning can be enhanced (Please Touch Museum, 1998). The research indicates that different types of learning occur as children interact with exhibits, including factual learning, procedural learning, and cause and effect learning.

Regarding the adult's role in enhancing the child's learning, the findings suggest that adult *indirect* instruction (adults' suggestions and reflexive questions) may create more opportunities for children's learning than *direct* instruction (show or inform how to solve problems directly) (Please Touch Museum, 1998: 54).

Research on Family Learning

Family groups have an important role in the building of a constant audience in museums. Some authors credit family visits to museums as "the major influence in mature museum-going behaviour", while school related visits play a minor role according to recent researches (Jensen, 1994: 302). Visitor studies carried out in museums in Europe and in North America have suggested that family groups visiting a museum have special features: families function as a *social unit.* The family group works collectively to build a *family experience* of communication from the museum (McManus, 1994: 81).

Research has also suggested that the family functions as a flexible learning system, and that they pursue a clear agenda to learn while in the museum (Hilke, 1989). The understanding of families as a *social unit*, with a particular agenda and behavioural characteristics, brings implications to museums, which should be able to provide facilities and special provisions suitable for this audience. In order to design museum experiences for family

groups, museums need to understand how families behave and what their needs and expectations of a museum visit are (Falk, Moussori, and Coulson, 1998).

Social context and family learning-related behaviours

The museum environment is not only a space containing exhibits but also a public social setting. Many authors have described the part that the social context of a visit plays in the museum experience (McManus, 1987; Blud, 1990; Falk & Dierking, 1992). McManus found out that the social context of visitors affect their learning-related behaviour (McManus, 1987). Ethological observations carried out at science museums indicate that family groups are likely to demonstrate teaching behaviours which include showing, pointing, describing something and raising questions (Diamond, 1986). This study concluded that *teaching* occurs as a fundamental aspect of the spontaneous social interaction of family groups (Diamond, 1986:152). Recent surveys carried out in museums have indicated that family groups seek enjoyment and educational experiences and that they want an easy and relaxing environment for social activity (McManus, 1994).

Families and interactive exhibits

Research carried out at the Science Museum, London, showed that fully interactive exhibits stimulated much more discussion within the family group than static traditional displays, and encouraged much more debate and argument (Blud, 1990b:259). The author pointed out, however, that not all interactive exhibits encourage social interactions. For example, an interactive exhibit which only one person can use will not encourage social interactions, while an exhibit which can be fully manipulated by several people will provide opportunities for social exchanges. The findings suggested that manipulative exhibits can arouse and keep visitor's attention, which is considered an important component associated with learning (Dierking, 1987; Borun, 1995).

Blud also investigated whether the notion of socio-cognitive conflict, put forward by socio-psychologist Doise based on Piaget's studies on cognitive

conflict, could be used to examine family learning in museums, and specially cognitive outcomes regarding the understanding of a process illustrated at exhibits (Blud, 1990a). Blud interviewed 50 family groups at each of three different exhibits - a fully interactive, a push button exhibit, and a static - which demonstrated the technological process of the operation of gear wheels. She devised a questionnaire to be applied to children and their parents after attendance to each of the three exhibits, and the *correct* answers were scored. This investigation did not provide statistically significant results which could show that interactive museum exhibits were more effective than more traditional ones regarding the learning of specific contents (Blud, 1990a: 49). However, interactive exhibits encouraged much more discussions within the family group (Blud, 1990b).

Blud's research aimed at examining learning based on the acquisition of knowledge and cognitive outcomes and family interactions at different museum exhibits. This study opted to apply a formal educational assessment (visitor's *correct* answers) to an informal learning environment (museum), which is characterised by free-choice, multiple perceptions and social interactions. Although it is possible to use museum exhibit evaluation to assess only the cognitive outcomes of a visit, researchers and museum professionals should consider, whenever possible, the broad nature of the museum experience, the role that affective experiences play in this context, and how these factors may influence cognitive outcomes.

Family learning strategies in museum exhibitions

Research in museums has also aimed to investigate family strategies for acquiring and exchanging information. Hilke aimed to explore the effectiveness of museums as learning environments and how families behave and learn in two types of museum environments: a participatory hall with hands-on opportunities, and a traditional hall where artefacts were displayed in showcases or behind railings (Hilke, 1989). The study sample consisted of 42 intergenerational groups (containing at least one child and one adult) totaling 128 participants.

Hilke recorded the pattern of spontaneous actions (*action-events*) between family members at exhibits, through the use of *observational*

sentences considered to be *learning related*, such as 'ask to describe', 'ask name of', 'look graphics', 'listen', 'touch' (Hilke, 1989). A total of 98 codable action-events were found, which were related to *personal* and *cooperative* learning strategies.

According to his findings, although family members employed both personal and cooperative strategies for acquiring and disseminating information, approximately 72% of all behaviours that functioned in the purposeful acquisition of information were related to *personal strategies*. The findings indicate that the focus of family members' learning strategies in the museums investigated were the *exhibits*, confirming that *exhibits are the principal focus of the family learning agenda.*

He also found that children were more apt to seek information about the exhibits, whereas adults were more likely to transfer information concerning the exhibits, so actively facilitating the learning of their children. Hilke concluded that the family can be considered a viable social context for the acquisition and transfer of information, adjusting their behaviours with flexibility to take advantage of the particular learning opportunities offered by different museum environments.

2.3.2. RESEARCH ON THE CHARACTERISTICS OF ENJOYABLE AND MOTIVATING EXPERIENCES, FAMILY FRIENDLY AND MULTI-MODAL EXHIBITS

Museum researchers have been seeking to devise guidelines for the design of exhibits/exhibitions which may create more meaningful and enjoyable museum experiences to the visitor, foster 'mindfulness', and social interactions. Some examples from current research are presented below.

Characteristics of 'Enjoyable Optimal Experiences'

Researchers (Hedge, 1995) interested in environmental design believe that it is possible to design museum settings in which basic requirements of an enjoyable and rewarding experience are provided to visitors. Hedge proposed that museums could take insights from Csikzentmihalyi 'enjoyable optimal experiences' model (PACIFICS), which presents eight requirements: purpose/goal-oriented activity; attention; challenge; involvement; feedback; immersion; control; and sense of time (Hedge, 1995:113-115; Csikzentmihalyi, 1990). The implications for museums would be that exhibitions should engage the visitor in an activity which has meaning to him or her; to offer him/her the possibility to concentrate in the task at hand; the individual has to feel challenged to complete the task and should get sufficiently involved; the museum should provide him or her with appropriate feedback; the individual should feel in control and total immersed in the task, so that to 'lose' a sense of time.

Characteristics of Intrinsically Motivating Exhibits

In a study about intrinsically motivating museum exhibits developed by Perry at The Children's Museum of Indianapolis, she identified, through a process of formative evaluation, prototype testing, observations and interviews with visitors, six components of motivating museum exhibits: curiosity; confidence; challenge; control; play; and communication / social interaction (Perry, 1994:26). Perry's model shares similarities with Csikzentmihalyi's, such as

feeling *challenged* by, and in *control* of, the experience. According to Perry, the visitor should be curious about the exhibit; he or she should feel challenged by it and have a sense of competence over it; the exhibit should promote feelings of self-determination and control; it should provide sensory enjoyment and playfulness and promote communication and social interactions.

Characteristics of Family Friendly Exhibits

Borun and others (PISEC, 1998) developed a family learning research project in four American institutions (Academy of Natural Sciences, The Franklin Institute, The New Jersey State Aquarium, and the Philadelphia Zoo) and identified, through the observation and testing of exhibits, seven characteristics of successful family exhibits: multi-sided; multi-user; accessible; multi-outcome; multi-modal; readable; and relevant (PISEC, 1998:23). The project team stressed that all characteristics are rarely met in one museum exhibit. For instance, they found that only 6% of 250 displays at the Franklin Institute incorporated all seven characteristics.

According to the family-friendly exhibit characteristics, it is important that family members can cluster around the exhibit (multi-sided); that more than one person can use it at the same time (multi-user); the exhibit should be appropriate for different age groups (accessible) and foster group discussion (multi-outcome); it should appeal to different learning styles (multi-modal); exhibit labels and text should be easily understood (readable) and exhibit content should provide links with visitors' prior knowledge (relevant) (PISEC, 1998:23; Borun & Dritsas, 1997).

The project team found out that the family groups who used the 'enhanced exhibits' (which included the seven characteristics) demonstrated significantly higher numbers of performance indicators ('answer a question', 'ask a question', 'comment/explain', 'read silently', 'read aloud') than families who used the original exhibits (before the treatment) (PISEC, 1998:46; Borun, Chambers, Dritsas & Johnson, 1997). The seven characteristics of family-friendly exhibits identified in the study provide very good insights for the planning of exhibits for the family audience.

Multi-Modal Exhibits: the 'Entry points' Approach

The 'Entry Point Study' was a research project developed in conjunction with the Please Touch Museum and Harvard University as part of 'Project Explore', which aimed at investigating which learning modalities children and their adult companions use at children's exhibits (Please Touch Museum, 1998). The study used Gardner's proposition that any concept can be approached in at least five different ways, or five 'entry points' as a framework: *foundational*; *narrative*; *logical / quantitative*; *experiential*; and *aesthetic*. This approach is based on Gardner's theory of multiple intelligences which encourages teaching through multiple modalities and perspectives (Gardner, 1983, 1991, 1993).

The entry points are defined as follows:

> "A Foundational entry point approaches a concept from its philosophical and terminological facets [...]. Taking a Narrative entry point approach might involve studying the sequence of events in a period of history or the legend depicted in a painting. In using a Logical/Quantitative entry point, the subject or concept is approached by invoking numerical consideration and/or deductive reasoning processes. An Experiential entry point offers a hands-on approach, with learners dealing directly with materials that embody or convey a concept [...]. Lastly, the Aesthetic entry point emphasizes sensory or surface features and approaching a subject from an artistic stance."
>
> (Please Touch Museum, 1998:33)

The findings indicated that adults and children in the sample used all of the five entry points, but in different proportions. The '*experiential*' entry point was the most common in both children's and adults' behaviour at the children's exhibits observed, followed by the '*narrative*' entry point. The '*foundational*' and '*aesthetic*' entry points were observed infrequently at the exhibits. The study has demonstrated that children's museums' exhibits may provide multiple windows, or entry points, to accommodate different learning approaches, but "more efforts need to be made to generate more varied entry point activity" (Please Touch Museum, 1998: 45, 50).

Museum educationalist Hooper-Greenhill has also pointed out the importance of multiple learning modalities in exhibitions:

> "[...] each individual in our audience has a different learning pattern; multisensory exhibition experiences that offer many entry points could facilitate a range of learning experiences, without prejudice."
>
> (Hooper-Greenhill, 1996: 6)

Conclusion to Part One

Part One presented a historical and theoretical background in which to situate the study of child-orientated exhibitions. The first two chapters presented a comprehensive summary of the development of participatory and child-orientated museum exhibitions in the 20th century and outlined theories of learning and cognition which have influenced museum education and the design of informal educational environments in museums in recent decades.

The overview presented in Chapter 1 indicates that participatory / interactive exhibitions are widespread today and that a growing number of museums are integrating these approaches in their exhibitions, creating new environments and forms of communication with their visitors, aiming at encouraging visitors' active engagement with exhibits. The planning of museum environments for children and families is in full development in the UK and Europe and such environments are likely to grow in number.

The topics and practices illustrated in Chapter 2 presented an overview of influential theories of active learning (section 2.1) and a background to understanding current museum visitor studies on children and families and on elements of the design of successful exhibits (sections 2.2 and 2.3). The sections 2.2 and 2.3 on informal learning and visitor studies offered a theoretical framework in which to situate the research questions addressed in Chapter 3 (see page 113).

In the next part of the thesis (*Part Two*), the methodology and procedures used in the study are described (Chapter 3), followed by four analyses chapters - the analysis of the observation of family behaviour at exhibits (Chapter 4), the analysis of children's drawings (Chapter 5), and the analysis of the interviews (Chapters 6 & 7) - and a concluding chapter.

CHAPTER 3 : METHODOLOGY

This chapter considers the methodology and approaches adopted in the present study. It presents operational definitions used in the context of the study and a definition of *child-orientated exhibition*; describes the design and nature of the investigation along with its research questions; specifies the research instruments employed and their strengths and weaknesses; gives a detailed explanation of the data collection procedures; and offers a description of the galleries chosen for investigation.

3.1. OPERATIONAL DEFINITIONS

Family group

In the context of this study, a 'family group' was considered as a multi-generational group composed of at least one adult and one child who have a direct relationship and familiarity with each other. Nuclear families (parents and their children), extended families (grandparents, aunts, uncles), family friends, and carers are included in this definition (see also PISEC, 1998: 10).

Behaviour

Behaviour was considered as the comportment and reactions from an individual to an event or social situation (in this case interactions with exhibits and/or other individuals or members of their family while at child-orientated exhibits), as expressed through nonverbal, spatial and linguistic behaviors (facial expressions were not taken in consideration in this investigation) (Frankfort-Nachmias & Nachmias, 1996).

Perception

This study recognises the fact that what is perceived is not uniquely determined by physical stimulation (sensory input) but, rather, is dependent upon a host of personal and external factors (Reber, 1995). Prior experiences (Falk and Dierking, 1995), cultural and educational backgrounds, social class, characteristics of the environment, as well as the individual's intrinsic qualities affect the perception of an event or social situation. Accordingly, the physical, cognitive, and affective dimensions of the perception of an individual's experience in a child-orientated gallery were taken in consideration in this investigation.

Museum learning

The present study employs a constructivist view of learning, recognising human beings as active thinkers and participants in the construction of their own individual and personal knowledge.

The study also adopts a view supported by many museum professionals (Hein, 1998; Falk & Dierking, 1992, 1995) that learning in *informal learning environments* (such as museums) should encompass a wide array of experiences and perspectives, in opposition to learning in formal settings (such as schools). *Museum learning* is considered to be very personal (based on visitors' interests and prior experiences which affect meaning making processes) and is often unpredictable (Falk, Dierking, and Holland,1995:17). Accordingly, the approach to learning used in the present research did not attempt to *measure* learning, but to demonstrate the individuals' perception of their own learning during their visit to the child-orientated galleries.

A definition of 'child-orientated exhibition': characteristics, variations, and approaches

Child-orientated galleries were defined for the purpose of this study as exhibitions which are distinguished by the deliberate use of communication and learning approaches in museum displays which aim to meet the needs of children in particular ways, providing a museum experience that can be more meaningful to them. A major characteristic of an exhibition designed for children are the opportunities for children to 'participate': to interact directly with the exhibit through hands-on experience; to express their ideas freely and to interact with adults and peers, so facilitating inter- and cross-generational communication. The language and messages used in labels are also planned taking children's age and interests into account. The gallery environment also has an important role in a child-orientated exhibition, welcoming children and their carers through the use of colours and materials which contribute to the creation of an informal atmosphere in the gallery.

Child-orientated exhibitions may have similar characteristics but may also vary from one another. Differences may be related to their location, target audience, access, design approaches, content and interpretation, and activities performed inside the gallery (see Table 3.1.1 on the next page).

TABLE 3.1.1: CHARACTERISTICS AND VARIATIONS OF CHILD-ORIENTATED EXHIBITIONS

(each column should be read independently of the others)

TYPES & LOCATION	TARGET AUDIENCE	ACCESS	APPROACHES	INTERPRETATION	DESIGN & PRESENTATION	ACTIVITIES
Exhibitions in Children's Museums. Children's galleries inside museums (in general related to the museum subject-matter). Discovery galleries inside museums. Interactive science exhibitions inside Science Museums. Interactive science exhibitions in Science Centres.	Planned mainly for children according to age groups. Children and families as main target audience. School groups as main target audience. Planned for all visitors.	Open to all museum visitors. Restricted to children (attended by museum staff). Restricted to school groups. Restricted to family groups. Restricted time (length of stay in the gallery).	Interactive, hands-on, and participatory exhibits. Hands-on combined with educational materials. Hands-on combined with museum objects in showcases.	Units involving topics within a context / theme (possibly related to the museum subject(s)-matter). Isolated units involving different and mixed subjects out of context. Differentiated content levels directed to distinct age groups. Content 'familiar' to children and, when possible, relating to themselves. Availability (or not) of an interpreter in the gallery.	Child-sized exhibits. Eye-level labels according to children's needs. Large type size labels. Language: informal; use of questions and short sentences. Use of colours in the environment and exhibits. Designed for the use of only one individual at a time. Designed to encourage a social use of exhibits (co-operation, teamwork) between children and/or between adults and children.	Demonstrations. Hands-on sessions with museum objects. Live performances. Workshops for children. Workshops for families. Workshops for school groups.

3.2. THE CHILD-ORIENTATED GALLERIES CHOSEN FOR INVESTIGATION

Common features shared by the child-orientated exhibitions investigated

The fieldwork sites investigated were child-orientated exhibitions planned for children in museums in Britain. The galleries chosen were: the *All Hands Gallery*, National Maritime Museum, Greenwich (London); *Launch Pad*, Science Museum, London; and *Me & My Body exhibition*, Eureka! The Museum for Children!, Halifax. The three galleries aim to provide a supportive and safe environment for children.

One of the shared characteristics between the three galleries is that they were planned mainly for children aged 7 to 11, visiting in school and family groups, but were also aimed at providing something for all ages, in order to meet a variety of needs.

A further common feature is that the galleries have *trained staff* on hand to facilitate visitors' interaction with exhibits (called 'interpreters' at the All Hands Gallery, 'explainers' at Launch Pad, and 'enablers' at Eureka!). In general, gallery staff do not intervene with the family interactions unless requested or when they feel that the family group needs help to use an exhibit.

Description of the galleries investigated

All Hands Gallery

The *'All Hands Gallery'* at the National Maritime Museum is an exhibition about seafarers and the skills needed at sea which aims to stimulate co-operation and curiosity by providing opportunities for children and adults to interact in a meaningful way with the exhibits. The exhibits are grouped according to unit themes (The Viking, The Explorer, Victorian Shipbuilder, Gunnery, Cargo Handling, Diving, Signalling, etc.). Labels attached to the exhibits give a brief explanation of the exhibit and pose questions to visitors in

order to encourage them to discover the answers by interacting with the exhibit (e.g. chests which children have to open to see and feel the objects inside). There are also large panels on the walls containing information related to each unit theme. These panels offer a historical / chronological view of the unit theme and are illustrated with historical photographs and drawings.

One of the main features of the gallery is that it combines hands-on exhibits with museum objects in showcases with the aim of providing an historical context for the hands-on exhibits.

The educational objectives which underpinned the planning of the gallery were: *"to encourage the development of observation and investigation skills"; "to create a gallery that positively encourages teamwork, co-operation and social interaction"; and "to provide an enjoyable and effective learning experience"* (Reid & Cave, 1995).

The gallery covers around 350 square meters (see Figure 3.2.1 for *All Hands Gallery* floor plan on page 108).

Launch Pad

'Launch Pad', at the Science Museum, is a hands-on gallery containing more than 50 different science experiments. The educational objectives of Launch Pad are to *demonstrate aspects of science and technology which we may use in our everyday lives* and to *introduce concepts/principles from the physical sciences related to light, sound, forces, energy, and structures* (Science Museum, 1995). The idea is to provide an opportunity for children and adults to experience science and technology for themselves. It was intended to encourage visitors' active participation and engagement with the exhibits. Visitors are able to manipulate the exhibits and see their effects. Most exhibits were planned to be used by more than one person at the same time, thus encouraging social interaction and the sharing of experiences. The exhibits are *not* grouped according to themes.

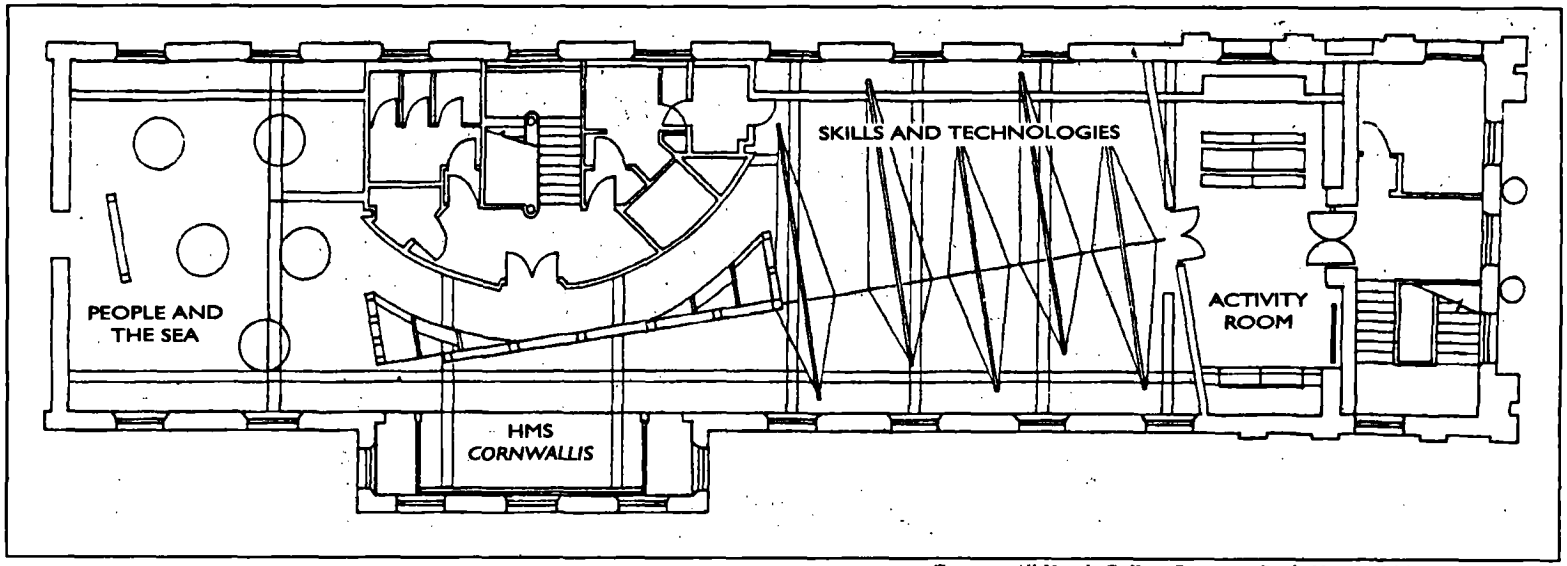
The gallery currently covers 790 square meters, including a space for science demonstrations (see Figure 3.2.2 for *Launch Pad* floor plan on page 109). In the second half of the year 2000 Launch Pad will be transferred to another Museum floor.

Me and My Body

The main educational objectives of the *'Me and My Body'* exhibition, at Eureka! The Museum for Children, are to *increase children's understanding of how the body works* as well as *children's awareness of their own bodies* and *how decisions they make may affect their health* (Education Resource Pack, Eureka!). The exhibition provides opportunities for children to relate to themselves. Exhibits offer a series of tasks which also encourage children to identify their current skills and motivates them to ask questions and share the answers with accompanying adults. Exhibits are conceptually linked and emphasise different aspects of the theme related to the body and its functioning.

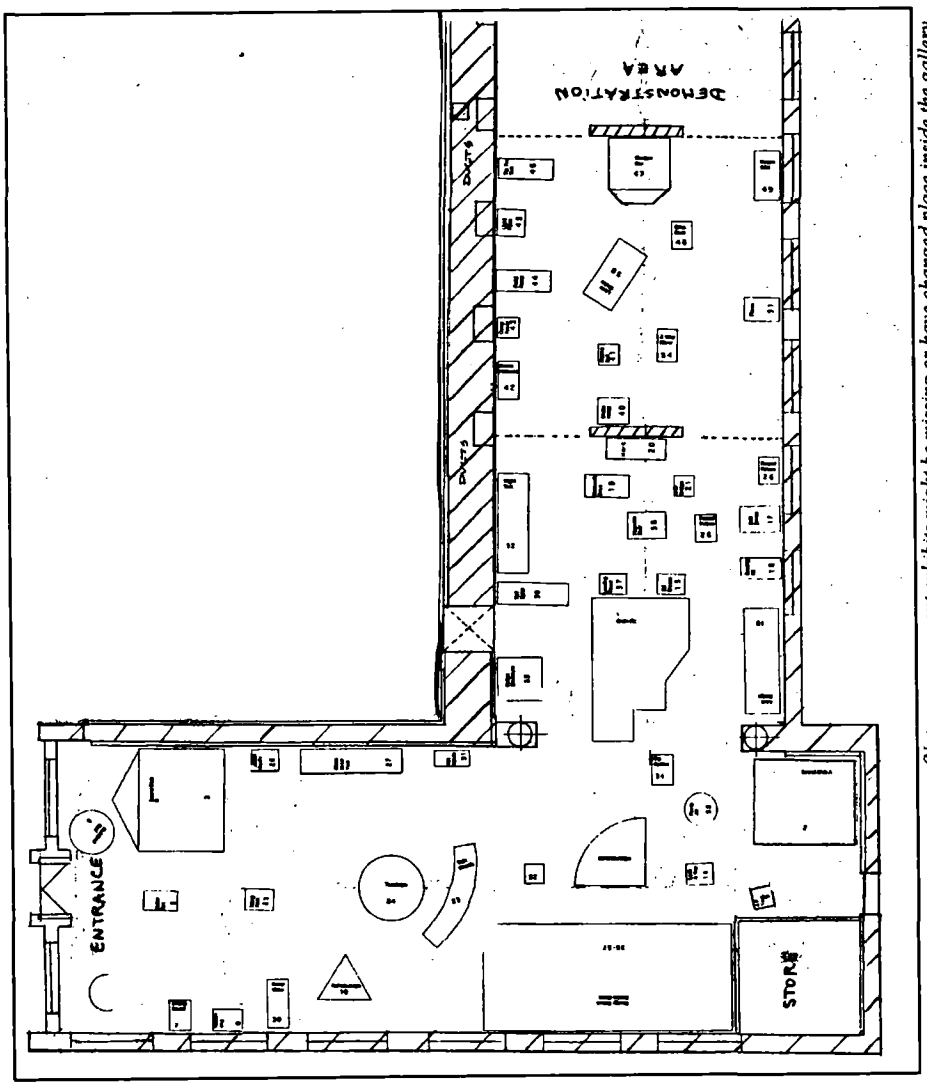
The gallery covers around 450 square meters (see Figure 3.2.3 for *Me & My Body* exhibition floor plan on page 110).

Figure 3.2.1: All Hands Gallery floor plan, National Maritime Museum



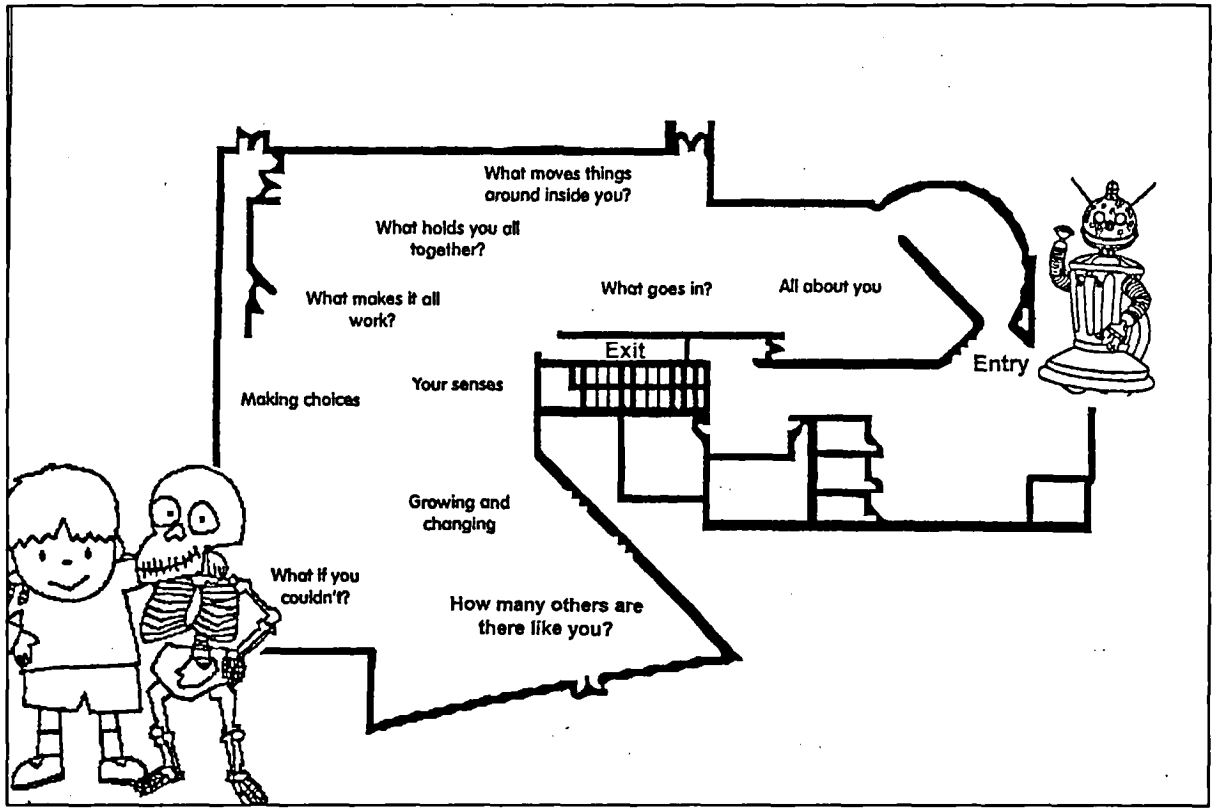
(Source: All Hands Gallery Resource Pack, National Maritime Museum)

Figure 3.2.2: Launch Pad floor plan, Science Museum



(Note: some current exhibits might be missing or have changed place inside the gallery. Reproduction by courtesy of the Science Museum.)

Figure 3.2.3: Me & My Body exhibition floor plan, Eureka! The Museum for Children



(Reproduction by courtesy of Eureka! The Museum for Children.)

3.3. THE DESIGN OF THE STUDY

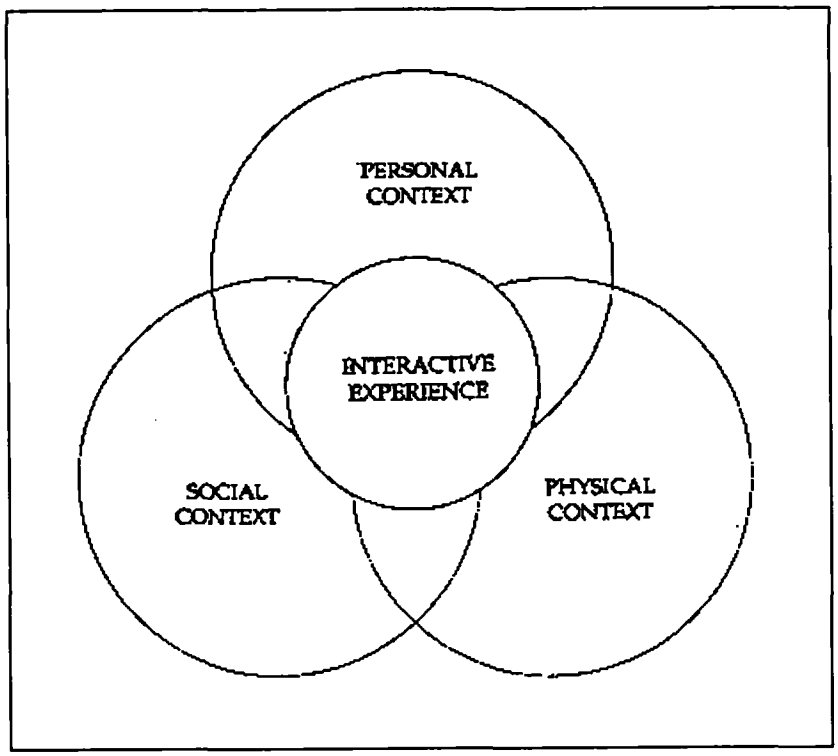
Nature of the study

The research design used to investigate the children's and their families' perceptions and behavior in child-orientated museum exhibitions was inspired by an exploratory and naturalistic approach to inquiry, although the research involves both qualitative and quantitative approaches. The study is qualitative in the sense that it involves fieldwork (data is collected in the natural setting, and records are related to people's own words), it is descriptive (the researcher is interested in people's understanding and experiences), and it follows an exploratory, inductive line of inquiry (the researcher looks for patterns during the analysis phase and does not attempt to test pre-determined hypotheses) (Creswell, 1994). It is quantitative in the sense that it quantifies the data gathered in order to help build a picture of the situation investigated, to examine the frequency which an event or variable occurs, and to explore possible relationships between variables (Denzin and Lincoln, 1994:4).

Child-orientated exhibits have been generally studied from an educational / learning perspective (PISEC, 1998; Please Touch Museum, 1998), but the guiding principle of the present study was to adopt a holistic approach to the situation under investigation, taking into consideration different aspects of the family experience - child and adult - at the child-orientated museum exhibitions examined. Falk and Dierking's interactive experience model (Falk and Dierking, 1992:5) offers a valuable framework for investigating the visitor's museum experience, through consideration of the *personal*, *social*, and *physical* contexts of the visit (see Figure 3.3.1). The *personal context* includes visitors' previous experiences and knowledge, interests, background, motivations, and expectations for the museum visit. The *social context* takes into account the fact that the museum visit is affected by the group composition in which the individual is visiting the museum (alone, with family or friends, in a school group, with one or more children, etc.). Whether or not the museum is crowded also affects the visitor experience. The *physical context* includes the museum architecture, the gallery atmosphere, the exhibits and objects on display, the colours used in the environment, sound & noises, smells, and

comfort provided (Falk and Dierking, 1992:2-3). All these contexts and elements interact with each other and affect the visitor museum experience.

Figure 3.3.1: The Interactive Experience Model (Falk & Dierking, 1992)



Source: Falk & Dierking, 1992 ©

As stressed by Hedge at the conference 'Public Institutions for Personal Learning':

> '[...] the museum experience should be conceptualized and analyzed as a gestalt, a holistic experience. Investigating this holistic experience will necessitate a multimethods research approach capable of assessing affective dimensions such as pleasure and enjoyment, as well as cognitive dimensions, such as information clarity and subsequent recall.'
>
> (Hedge, 1995:116)

Aspects such as the visitors' behaviour and affective reactions to the exhibition, their views and attitudes about the galleries, their personal elaboration of the information provided by the exhibits, as well as their perceptions of the environment and social aspects of their visit were explored in this research. The study did not attempt to measure learning, but to explore

whether children and adults *perceived* that they learned something in such galleries and/or that they were in a learning environment.

Research Questions

The research questions asked in this study derived from the museum literature on informal learning environments and the visitor studies literature on children and families presented in Chapter 2, sections 2.2 and 2.3 (see pages 82-100) and from the exploratory nature of the study.

Research Question 1:
What aspects of the visit to a child-orientated gallery do children and adult relatives value and why?

Research Question 2:
Do children and adults perceive themselves to be in a learning situation in a children's gallery or are their perceptions more oriented towards having a 'fun' experience?

Research Question 3:
How do children perceive their visit to a museum in a family situation in comparison with a school situation? What do they value in the family context of the visit?

Research Question 4:
How do adults and children behave at child-orientated exhibits and what are the family dynamics ?

Research Question 5:
In which ways are child-orientated exhibitions similar and different from each other and how do any differences affect the child and adult experience ?

Research Question 6:
Which variables (personal, social, or museum aspects) may affect children's and adults' perceptions of learning?

Research Question 7:
Can age and gender affect the child and/or adult experience in child-orientated galleries ?

Research Question 8:
Are the educational goals of child-orientated exhibitions being met ?

Research Question 9:
What exhibit elements can be considered successful in child-orientated exhibits?

Subjects investigated in the research

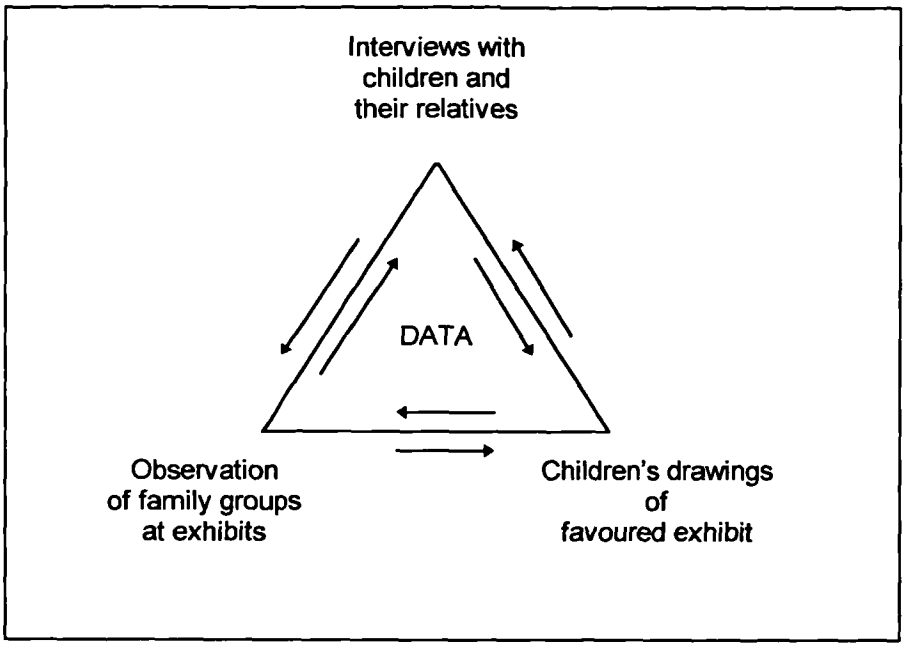
The subjects investigated in this study were *family groups* visiting children's galleries in museums with one or more children *aged between 7 and 11.*

One of the reasons for choosing children aged between 7 and 11 as a target group was because the galleries chosen for investigation were planned having children aged between 7 and 11 as their main target audience. Another supporting reason is that children in this age group are at a stage where they are more familiar with language and consequently have more autonomy of thought and are more able to express their feelings with coherence than younger children. Moreover, this is the age group where children start to make school field trips to museums, so they can compare their experience of visiting a museum with a school group with their visit in a family situation.

Research Methods Employed

Three different types of investigation were employed in order to explore the children's and adults' perceptions and behaviour in child-orientated museum exhibitions: *interviews, observations,* and *children's drawings.* Social science researchers agree that the use of combined methods of investigation (triangulation) may offer more valid and reliable findings, since it is possible to cross-reference the findings obtained from each method (Adler & Adler, 1994: 382; Frankfort-Nachmias & Nachmias, 1996: 204-205) (see Figure 3.3.2).

Figure 3.3.2: Data Triangulation



Another important research procedure, carried out in this study, is to test the data collection instruments in advance in the field and with the target research audience through *pilot studies* (Hein, 1998: 116), such as interview questionnaires or observation schedules.

Research instruments' strengths and weaknesses

Interviews

Interviews are widely used in social science research but, according to some scholars, 'asking questions and getting answers is a much harder task than it may seem at first' (Fontana & Frey, 1994:361). Many factors, such as the length of an interview, its structure and format, type and nature of questions, interview location, number of interviewees, characteristics of the interviewer, etc., may contribute to the success or failure of an interview.

One of the main advantages of personal, face-to-face interviews (the interview technique used in the present research), is that the *interviewer has control of the interview situation*, that is, he or she can ensure that the

respondents answer *all* the questions in the appropriate sequence established, the interviewer can repeat or clarify questions to respondents when necessary as well as record interviewees' spontaneous reactions. The disadvantages are particularly related a possible *interviewer bias*, that is, innate characteristics of the interviewer, such as personality, body language, and race, which may affect respondents' answers (Frankfort-Nachmias & Nachmias, 1996: 237-239).

Children's drawings

Children's drawings are an important source of qualitative data because they are a direct self-expression and provide documentary evidence. A high level of thinking can be illustrated and expressed in a drawing by a child who has not yet developed the full linguistic range needed to make an explicit verbal explanation.

One of the main difficulties of the use of children's drawings in research concerns their interpretation. For this reason, it is important that the author of the drawing (the child) gives his or her own interpretation of its elements to the researcher.

Unobtrusive observations

Observation studies are at the root of social science research, since most social science research employs empirical observation (Frankfort-Nachmias & Nachmias, 1996: 206). The techniques and types of observation, however, vary greatly.

One of the main strengths of direct observation is that it allows for the study of behaviour as it occurs in natural settings. However, the chief criticisms of observation concern its validity and reliability (Adler & Adler, 1994: 381), so researchers must ensure that the data are systematically obtained and reliable by defining precisely what to observe, when to observe, how to record, and how data will be analysed (Frankfort-Nachmias & Nachmias, 1996: 206).

With unobtrusive observation (the observation technique used in the present research), the observer does not interfere with the subjects observed, therefore having a more passive role (observing and recording behaviours).

One of the advantages of unobtrusive observations is that, since the observer is unobtrusive, subjects are more likely to behave naturally. Although in public spaces any individual is subjected to be observed by another, ethical issues should be considered. Whenever possible, museums should indicate that observation studies are being carried out in the area.

Description of the methods adopted

The research methods used to collect data are detailed below:

- face-to-face interviews after the visit to the gallery using a structured questionnaire with closed and open-ended questions, with an individual child aged 7 to 11 and with an individual parent/relative from the same family group, based on two questionnaires - one for the child and one for the adult (interviews were carried out separately);

- collection of interviewed children's drawings of their favorite exhibit at the gallery;

- unobtrusive observation of family interactions at exhibits in the galleries, using an observation schedule (the exhibits observed were designated according to the children's favourite exhibits determined in the interview stage).

  Note: the interview sample (families interviewed) and the observation sample (families observed) were distinct. The sample of drawings was collected from the interviewed children who agreed to make a drawing.

Samples

The number of children and adults interviewed, drawings collected, and families observed are described below:

Interviews: 300 individuals from 150 family groups *(150 children and 150 adults)*
Drawings: 120 children's drawings
Observations: 450 family groups were observed
(150 family groups in each of the three galleries investigated)

Pilot studies

Pilot studies were carried out in order to test the questionnaires used in the interviews and the observation schedule used in the observations. Forty individuals (20 adults and 20 children) were interviewed at the All Hands Gallery, National Maritime Museum, and a total of 89 individuals were observed at exhibits in the same gallery (Studart, 1996; Studart, 1997).

Adjustments regarding 'rephrasing' were necessary in the interview questionnaires and a few new questions were included in the last draft of the questionnaires. The observation schedule worked well and did not require any major change.

3.4. DATA COLLECTION PROCEDURES USED IN THE INTERVIEWS, CHILDREN'S DRAWINGS AND OBSERVATIONS

Data Collection Procedures used in the Interviews

Interviews were carried out at the *'All Hands Gallery'* (National Maritime Museum, Greenwich, London), *'Launch Pad'* (Science Museum, London), and *'Me and My Body'* exhibition (Eureka! The Museum for Children, Halifax) on weekends and school holidays, from March to September 1997. Family groups were interviewed when they finished their visit to the children's gallery and were leaving it. One adult and one child (aged between 7 to 11) from the family group were interviewed. The total sample of individuals interviewed amounted to 300 individuals from 150 family groups: 150 adults and 150 children (50 adults and 50 children per museum). A table and seats just outside the galleries were available so that the family and the interviewer could sit and talk about the visit they had just concluded. A small microphone connected to a portable tape recorder was used to record interviewees' responses, with their permission. Notes were taken throughout the interview. Interviews took in general around twenty minutes to complete with a family group. Each interview questionnaire (the adult's and the child's) had around twenty questions and took an average of ten minutes to be applied (the length of the interview would also depend on the interviewees, whether they responded to the interview questions quickly and objectively or took time expressing their views).

Families were interviewed in the museum setting, just outside the gallery, in order to minimize changes in the physical and social contexts of the visit as well as in the emotional states of participants. Only family groups containing a child/children aged between 7 and 11 were approached as they left the gallery (families were chosen randomly; the first family with the characteristics described above which was leaving the gallery was approached by the researcher). Families with only small children (below age 7) or only older children (above age 11) were not interviewed.

Interview format

The interview format adopted was the following: children were asked to make a drawing of their favourite exhibit while adults were being interviewed. Then, when the adult interview had finished, a self-completed questionnaire with demographic information was given to the adult to complete while the interviewer was talking to the child. This interview format was employed in order to avoid adults inhibiting the child's responses or interfering in the child's interview (or vice-versa), since the study was looking for the child's and the adult's points of view separately, in order to compare them in the analysis stage.

Interviews structure

The structure and topics of the interviews with children and adults are presented below (for questionnaires see Appendix A). A combination of closed and open-ended questions were used in the interview questionnaire. *Open-ended questions* were used in order to give the opportunity to respondents to express their thoughts and points of view in their own words. *Closed questions* were looking for agreement or disagreement (*yes, no,* or *don't know* answers) or specific information which did not require the expression of a point of view.

Structure and topics of adults' interview

A. Information about family visits to museums
. *Annual frequency of visits to museums with their children*
. *Reason(s) for taking their children to visit a museum and to the gallery.*
. *Time spent at the gallery*

B. Relatives' perceptions of the exhibition
. *Description of the exhibition.*
. *Description of the 'atmosphere' of the gallery.*
. *Likes and dislikes. Reasons.*

C. Relatives' perceptions of their child's experience
. *Perceptions of child's involvement with exhibits.*
. *Pleasure in seeing the child doing ..... Reasons.*

D. Relatives' engagement in exhibits with children
. *Relatives' use of exhibits with children.*

E. Adults' perceptions of their own learning and of the outcome of the visit to the child
. *Perception of the outcome of the visit to the child.*
. *Perceptions of own learning in the gallery.*

F. About children's galleries in general
. *Visits to children's exhibitions in other museums.*
. *Relatives' opinions about the opportunity for children to interact with exhibits in a museum.*

G. Identification (self-completed)
. *Relative (gender and relationship)*
. *Group composition of the visit*
. *Age group*
. *Education*
. *Occupation*
. *City where the respondent lives*

Structure and topics of children's interview

A. Identification
. *Gender (name)*
. *Age*
. *Social composition of the visit.*

B. Task the child was asked to do:
. *a drawing about an exhibit the child liked at the gallery*

C. Child's perceptions of the exhibition
. *Description of the exhibition.*
. *Description of the 'atmosphere' of the gallery.*
. *Likes and dislikes. Reasons.*

D. Children's perceptions of their experience
. *Favourite exhibit(s). Reasons.*
. *Feeling while using exhibits.*
. *Preference for using exhibits on one's own or with someone. Reasons.*

E. Children's perceptions of their own learning in the gallery
. *What the child found out while using their favourite exhibit.*
. *What (else) the child learned during the visit to the gallery / museum.*

F. About children's galleries in general
. *Why child likes to use hands-on exhibits*
. *What children remember from their visit to other children's exhibitions / museums.*

G. About museum visits and their social context
. *Social group in which the child generally visits museums and number of previous visits to museums.*
. *Social group in which the child prefers to visit museums with: family or school. Reasons.*

Difficulties encountered during the interviews

Interviewing a family group is not as easy a task as it might seem at first. All members of the family must agree with the interview (some of them have to agree to wait while others are being interviewed). Also, the interviewer needed to make sure that everybody was comfortable before starting the interview and, although the interviewer would be mainly focused on the respondents, attention to other members of the group could be requested. On a few occasions, the researcher had to deal sensitively with *shy* children during the interview.

It was difficult to approach families to be interviewed if one of the children was crying or if they were having an argument (as it might occur when families were leaving the children's gallery, because some children did not want to leave it). Families with toddlers or very young children were more likely to refuse to be interviewed, because the parent / relative feared that they might not be able to concentrate in the interview since toddlers and very young children require full attention.

Data Collection Procedures used in the Children's Drawings

The data collection of children's drawings was as follows: the researcher accommodated the family group (randomly chosen for the interview) around a table situated just after the gallery exit. Children were immediately provided with paper and coloured pens, and asked to draw their favourite exhibit in the gallery while their relatives were being interviewed. The children drew *from memory* since they were not 'in front' of the exhibit.

The children were free to choose whether they wanted to make a drawing or not. This approach was taken in order to maintain the quality of drawing as a free, self-motivated, and spontaneous activity. After the children finished their drawings, they were interviewed. The researcher could then ask children what their drawings were about. It is important, for evaluation as well as for research purposes, to ask children about their drawings in order to get as full as possible a picture of the child's intended meaning. Each drawing represents, therefore, a specific viewpoint of the exhibit from a particular child's perspective.

Difficulties encountered in the collection of drawings

The researcher should be able to provide a comfortable place for children to draw, enough coloured pens (with a range of colours), one or two sheets of paper (otherwise children might tend not to focus on *one* drawing), and check from time to time whether all the pens work (some colour pens, like black, might finish before others).

Although many children were in general happy to make a drawing (since they have a natural interest in this activity), some children preferred not to do it. In this case, the researcher had to accept the child's choice and agree that the child listened the adult interview.

Data Collection Procedures used in the Observations

Unobtrusive observations of family groups at the three most popular exhibits (according to children's responses at the interview stage of investigation) at each child-orientated gallery were made on weekends and school holidays, when the percentage of families visiting a museum, accompanied by mothers, fathers, or other relatives, is higher than on weekdays. Groups containing at least one adult and one child (between 7 to 11 years old, estimated) were observed. Very young children or teenagers were observed *only* when they were part of a group containing also a child aged between 7-11.

Before starting the observation, the observer looked first at the kind of relationship that existed between the group members, to see if the members could be identified as a family group. Often it was possible to listen to children calling for their parents and grandparents ('Mum', 'Daddy', 'Grandma', etc.). Groups of children with teachers were not observed. The observations were made at the exhibits (it was not a tracking study), so this measure indicates the family composition when *attending the exhibit* (it does not record the total number of family members if they were not together attending the exhibit as a 'family unit').

The observer took notes of events as they occurred using an observation schedule. A stopwatch was used to record the total time spent at an exhibit by a family group.

The Observation Schedule

The observation schedule devised (see Appendix B) included ten behavioural categories. The behavioural categories defined aimed at exploring *social aspects of the visit* (group composition); *use of exhibit by family*

members (total time spent by the family group at the exhibit, member(s) of the family group who manipulated the exhibit, whether family members used the exhibit in an appropriate way, whether the family group had to wait its turn to use the exhibit); and *family dynamics* (member(s) of the family group who 'split' (i.e. left the group), member(s) of the group who engaged in joint activities, proximity between family members, member(s) of the group who read labels aloud to others, and member(s) of the group who engaged in conversation).

The behavioural categories considered in the observation schedule are described below. They were defined prior to the collection of data and used as a guide to the observations.

Group composition: the group composition of a museum visit is an important aspect of the social context of the museum experience and therefore relevant to the study. All members of the family group who were attending the exhibit were recorded (once they split from the group, they were not followed, so they were no longer observed). The family groups observed consisted of at least one adult and one child (estimated between 7 and 11 years old). Very young children or teenagers were observed *only* when they were part of a group also containing a child aged between 7-11. This measure indicates the number of individuals in the family group, their gender, and group composition.

Total time spent at the exhibit: this measure indicates the total time spent by a family group/member at an exhibit, from the arrival of the first person until the last person left it. The observer made records until the last family member(s) stayed interacting with the exhibit. This measure is relevant to the study since time spent at an exhibit is an indication of the exhibit ability to hold the visitor's attention (the ability to create interest and motivate the visitor to spend time on it).

Manipulate: this measure indicates the gender and number of individuals within the family group who manipulated an exhibit ('physical engagement'). This measure can give an indication of the success of the hands-on task with children and adults. For instance, it may indicate whether the nature of the exhibit task has attracted adults or motivated them to use the exhibit with their children.

Used appropriately or as intended: in this study, the exhibit was considered to be used appropriately or as intended when members of the group aimed at understanding how the exhibit worked and/or its purpose and at using it in an appropriate way (not misusing it). Two levels were considered: *Yes* (when the visitor(s) aimed at using the exhibit purposefully or as intended; and *No* (the visitor(s) did not use the exhibit in an appropriate way or as intended). This measure aims at assessing whether users are interacting with the exhibit in an appropriate way and whether exhibit goals are being met.

Waited to use exhibit: this measure indicates whether the family had to wait its turn to use the exhibit. This measure can give an indication of the popularity of the exhibit and how busy the exhibit was at the time of the observation. These aspects of the social context of the visit are relevant to the study since they may influence family behaviour.

Split: 'splitting behaviour' was recorded when family members split from, or left, the group, going to see or do something else in the gallery, and did not come back to the exhibit (leaving the remaining family members using the exhibit on their own). This measure indicates the gender and number of individuals who split from the group in an exhibit. Therefore, 'splitting behaviour' may give an indication that an exhibit did not hold the attention of all family members (for instance, male or female adults, boys or girls).

Joint-activity: joint-activity was recorded when at least two persons from a family group did an exhibit-related activity together or with a gallery staff person. Joint-activity is an important sign of social interaction, an aspect which child-orientated galleries are keen to encourage between family members. This measure indicates the most and least common joint-activity group compositions between family members at the observed exhibits.

Proximity: proximity between family members was defined according to McManus's study on visitor behaviour, as a measure of cohesiveness (McManus, 1987). McManus defined three levels of cohesion between group members according to the level of proximity between them: *Poor*; *Good*; *Very Good.* The following levels of *proximity* between family members were considered, according to the McManus study parameters: *More than one meter apart* (when members of the group are more then one meter apart); *Close* (when at least two members of the group are acting in close association or in a complimentary way); *Touching each other* (when at least two members of the group are touching each other). In the present study, this measure may indicate whether the design of an exhibit encourage (or not) 'proximity' between family members while interacting with an exhibit.

Reading aloud: reading aloud behaviour was recorded when a member of the family group was observed reading aloud labels, panels or instructions to others. This measure indicates whether or not family members are reading exhibit labels aloud to others. It also illustrates the gender of individuals (adults and/or children) who are taking the 'reading aloud' role within the family group.

Talking and type of conversation: talking is a sign that the exhibit is eliciting conversation between family members and therefore likely to be contributing to meaningful social interactions.

Three types of conversation - 'telling what to do', 'explaining the exhibit', and 'chatting about exhibit' - were recorded when a family member, or gallery staff, talked to another member of the group or engaged in conversations about the exhibit: '*Telling what to do*' was recorded when one person told another how to use an exhibit and what to do. '*Explaining the exhibit*' was recorded when someone explained the exhibit to another, how it worked and its purpose. '*Chatting about exhibit*' was recorded when a person chatted about the exhibit, in an informal way. This measure indicates the number of family groups who engaged in talking and the most frequent types of conversation between family members at the observed exhibits. This measure can give insights into how interpretation (labels) and/or the nature of the exhibit may affect the type of conversation between family members.

Extracts of conversation, taken during the data collection stage, are presented here as examples to illustrate the 'type of conversation' categories used in the observation:

(Code: M= male adult; F= female adult; b= boy(s); g= girl(s); GS= gallery staff)

'TELLING WHAT TO DO'

Female adult to boy:
(Gunnery exhibit, All Hands Gallery, #14)

F: "Too far. Move just a little bit down."
"Good, looking good."
"Fire!"
"You've got it! Well done!" [and clap]

'EXPLAINING THE EXHIBIT'

Gallery staff, girl, and female adult:
(Cargo Handling exhibit, All Hands Gallery, #35)

GS: "Where is the boat heavier?"

g: "There."

GS: *"You need to try to keep balancing it."*
"I think we need one [box] on this side."
"Well done! It is just balanced."

g: *"Mum, I did it!"*

F: *"I am sure you did."*

'CHATTING'

Female adult, boy, and male adult:
(Slow Bubbles exhibit, Launch Pad, #12)

b: *"Look the bubbles!"*

F: *"It is nice, isn't it?"*

M: *"Do a small one than a big one."*
"Look! The big one catches the small one !"

F: *"So, what do you think it would happen if it was water? [water instead of silicone inside the container]*

b: *"The bubbles go faster!"*

Female adult and girl:
(Skeleton exhibit, Me & My Body, #12)

F: *"It's you!" [reflected in a skeletal form]*

g: *"No, it is not!"*
"It is just a skeleton on the back. I put my hands off and the skeleton didn't!"

Difficulties encountered during the observations

During the pilot testing of the observation schedule, it was noted that it can be difficult to observe family groups larger than six people, so six was considered the maximum number of people in a group to be observed (see also PISEC, 1998:10).

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In the next chapters, the findings from the observations, children's drawings, and interviews are presented. Several analysis of the findings were carried out, aiming to offer a rich view of the aspects and dynamics involving the experience and perceptions of children and their families in child-orientated museum environments.

CHAPTER 4:
ANALYSIS OF THE OBSERVATION OF FAMILY GROUPS AT CHILD-ORIENTATED EXHIBITS

4.1. INTRODUCTORY SECTION

4.1.1. INTRODUCTION

Observations of family groups were carried out in three child-orientated exhibitions (*All Hands Gallery*, *Launch Pad*, and *Me & My Body*) in order to explore how adults and children use exhibits and interact with each other at the galleries, how different exhibit designs may affect children's and adults' behaviour and interactions, and to enhance understanding of similarities and differences between children's galleries (see Chapter 3, research questions nos. 4 and 5).

This chapter, which describes the findings from the observation study, is presented before Chapter 5 (children's drawings) and Chapters 6 & 7 (interviews), in order to offer the reader a large picture of family interactions and use of exhibits at the three galleries, prior to the analysis of children's and adults' perceptions of their experience in such spaces.

The behaviours observed aimed to find out whether adults and children in a family group: manipulate the exhibits, split from the group, read labels aloud to others, engage in conversations about the exhibit, engage in joint activities, and proximity between family members and how much time they spent at the exhibit. The behavioural categories used in this study were described in Chapter 3 (pages 124-25).

Two analyses from the observations were carried out: first, a profile of children's and adults' behaviour at the nine exhibits designated for observation (three in each gallery) and, second, a comparison of the overall findings from each site. The chapter ends with an overview of the findings from the three locations.

4.1.2. THE NINE EXHIBITS DESIGNATED FOR OBSERVATION

The choice of the nine exhibits for observation was based on children's responses to interviews, carried out in the first phase of the study, regarding their favourite exhibit (the sample of family groups observed is distinct from the sample of children and their accompanying adults interviewed - see Chapter 3, pages 117-118). Since the researcher did not want to make an arbitrary choice of the exhibits to observe, the researcher asked the children interviewed about their 'favourite exhibit' in the galleries. Examining the characteristics of children's favourite exhibits may provide interesting insights about successful attributes of child-orientated exhibits.

At the **All Hands Gallery**, National Maritime Museum, the three favourite exhibits were: the *Cargo Handling* exhibit, followed by the *Gunnery* exhibit and *Diving.* At **Launch Pad**, the three most quoted exhibits by the children were: *Turntable*, *Shadow Box*, and *Slow Bubbles.* At the **Me & My Body exhibition**, at Eureka! The Museum for Children, the three most favoured exhibits were: the *Skeleton*, *'What if you couldn't' (about disability)*, and *Feed Me!.*

The nine exhibits are described in the next section (4.2.1), which includes photographs of the nine exhibits and a summary of the behavioural findings at each exhibit. Section 4.2.1 is followed by a *'Comparison of overall findings in each gallery'* (section 4.2.2), which considers the findings from the three locations as a whole, indicating differences between the galleries.

Attributes present at the observed exhibits

The researcher noticed particular exhibit attributes & design characteristics which are present, to different degrees, at the observed exhibits. They are: element of fun; challenging situations; element of surprise (see a result); opportunity for experiencing things; child-sized design; imaginative design; opportunity for role play; interactive machine/game; and teamwork (see Figure 4.1.1 on page 130).

For instance, the *Shadow Box,* the *Skeleton*, and the *Slow Bubbles* share the characteristic of being an activity which has an element of 'surprise' (the shadow, the skeleton reflection, the bubbles in the silicone liquid) and an element of 'fun' (see descriptions of exhibits in section 4.2.1). The *Gunnery* exhibit, which works as an 'interactive game', offers a 'challenge' to the participant. The exhibits on *Disability*, *Diving*, and the *Turntable* provide children with the opportunity of 'experiencing' something new with their own bodies. The *Cargo Handling* and the *Skeleton* exhibits were ergonomically 'child-size' designed, to be used especially by children. *Cargo Handling* also offers opportunities for teamwork and cooperation. The exhibit on *Disability* provides something which children find very special: the opportunity to 'role play'. The *Feed me!* exhibit is a large-size 'imaginative' machine which captures children's imagination.

Of the nine attributes present in the observed child-orientated exhibits, 'element of fun' and 'challenging situations' were the most common attributes, followed by 'element of surprise', 'child-sized' and 'imaginative' design (see Table 4.1.1 on page 131). 'Teamwork' was the least common attribute among the exhibits investigated. None of the exhibits presented all nine attributes. The average was three attributes per exhibit, although some exhibits presented four or more attributes (*Diving* and *Gunnery*, at the All Hands Gallery, and the *Skeleton* and *Disability* exhibits, at the Me & My Body exhibition).

The attributes present in the observed exhibits are related to the qualities of play situations, suggested by Moyles (1989) (see Chapter 2, section 2.1.3), which should be encouraged in environments designed for children: *social* and *emotional* play, such as 'teamwork' and 'role play'; *intellectual play*, such as 'challenging situations' and 'interactive games'; and *physical play*, such as 'experiencing'. This suggests that the design of the child-orientated exhibits investigated is reflecting aspects of the literature on the role of play in child development and learning.

Figure 4.1.1:
Attributes present at the observed child-orientated exhibits

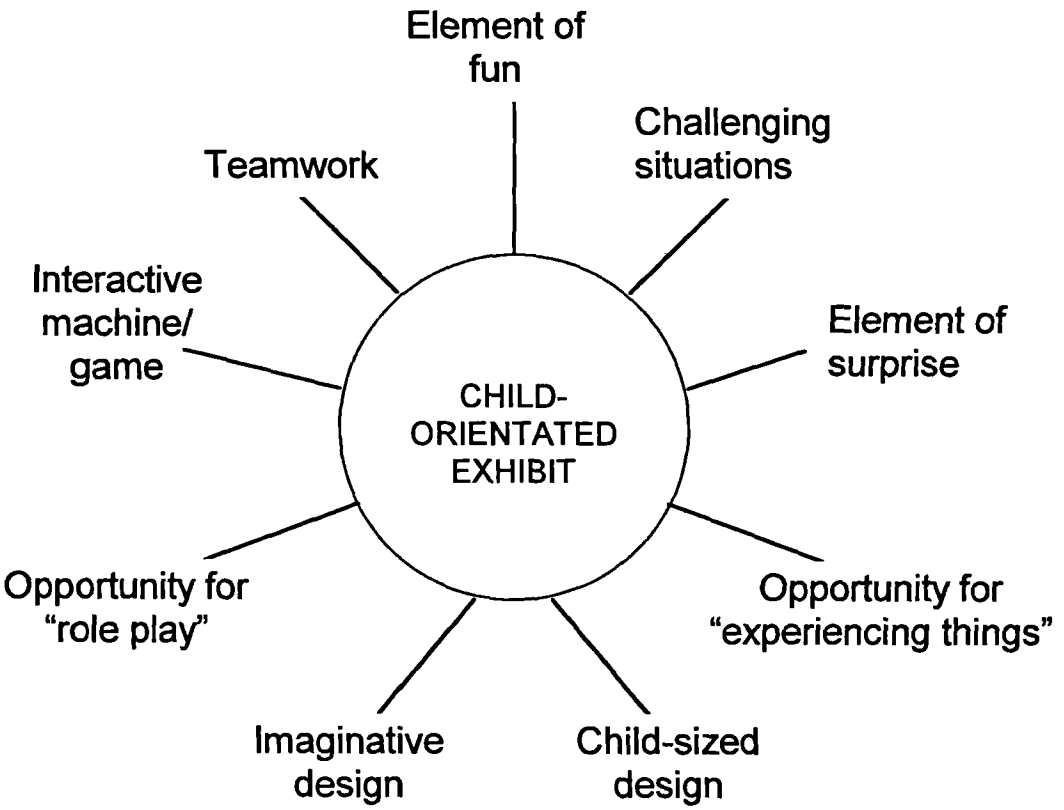


TABLE 4.1.1: Number of exhibit attributes in each of the nine observed exhibits

	NATIONAL MARITIME M. ALL HANDS			SCIENCE MUSEUM LAUNCH PAD			EUREKA! ME & MY BODY			TOTALS			
EXHIBITS:	Cargo	Gunnery	Diving	Turntable	Shadow Box	Slow Bubb.	Skeleton	Disability	Feed Me!	N.M.M.	Sc. M.	Eureka!	ALL
ATTRIBUTES:													
element of fun	-	x	x	x	x	-	x	-	-	2	2	1	5
challenging	x	x	x	x	-	-	-	x	-	3	1	1	5
element of surprise	-	x	-	-	x	x	x	-	x	1	2	2	5
child-sized	x	x	-	-	-	-	x	x	-	2	0	2	4
'imaginative'	-	x	x	-	-	-	x	-	x	2	0	2	4
'experiencing'	-	-	x	x	-	-	-	x	-	1	1	1	3
role-play	x	-	x	-	-	-	-	x	-	2	0	1	3
interactive machine/game	-	x	-	-	-	-	-	-	x	1	0	1	2
teamwork	x	-	-	-	-	-	-	-	-	1	0	0	1
Total attributes:	4	6	5	3	2	1	4	4	3	15	6	11	32

4.2. FINDINGS FROM THE ANALYSIS OF THE OBSERVED FAMILY GROUPS AT EACH EXHIBIT / GALLERY

This study aims to describe how children and their relatives use child-orientated exhibits and interact with each other at exhibits in a family situation (see Chapter 3, research question n. 4). This descriptive approach was taken in order to explore family behaviour and dynamics in children's galleries and to understand the sort of design problems that family members may encounter while using such exhibits.

4.2.1. DESCRIPTION OF THE OBSERVED EXHIBITS AND PROFILES OF FAMILY BEHAVIOUR

The description of the nine observed exhibits at the three locations (*accompanied by photographs*) and the profiles of behaviour at those exhibits are described below. The profiles of family behaviour provide an overview of family dynamics at the observed exhibits. These descriptions may offer insights to exhibit planners and designers about the family dynamics in child-orientated exhibits and the design complexity of such exhibits and how it may affect family behaviour.

LOCATION 1:
ALL HANDS GALLERY, NATIONAL MARITIME MUSEUM

'CARGO HANDLING' EXHIBIT

Description of the exhibit

Cargo Handling is an exhibit which deals with the theme of loading and balancing cargo so that a ship can remain stable at sea. The exhibit was planned to be very manipulable and to encourage teamwork (it has to be used by, at least, two persons). It comprises a large scale crane (child-sized), wood containers and a boat. In order to perform the activity well (to load the

containers inside the boat and to balance it), a person on the crane (in general a child, due to the size of the crane) needs the help of another person to fit the containers in the crane and then, after swinging them over the boat's hold, to arrange them inside the boat in order to balance it (see Figure 4.2.1). There is a label (placed close to the platform) with a red/green light which shows when the boat is balanced and so *safe to sail* (green light) or unbalanced and so *not safe to sail* (red light). The exhibit provides another label which introduces the subject of loading a ship.

Figure 4.2.1: Cargo Handling exhibit, All Hands Gallery, National Maritime Museum

The main design attributes of this exhibit are its child-sized design, the opportunity for teamwork (the exhibit task encourages collaboration), opportunity for role-playing a cargo worker, and the challenge to balance the boat.

Summary of profiles of behaviour at the Cargo Handling exhibit

Family members spent a very long average time at the *Cargo Handling* exhibit (8min.24sec.), suggesting that a number of families took their time at the exhibit in order to balance the boat and/or that children were likely to repeat the activity until they mastered it (see Appendix C, Table C1, for sample and group

composition of family groups at the All Hands Gallery, and Tables C2 and C3 for behavioural findings).

Cargo Handling was likely to motivate accompanying adults to use the exhibit with children, probably due to the teamwork nature of the task and to the fact that adults can approach the exhibit from different sides. At *All Hands*, this exhibit elicited the highest number of joint-activities between family members, indicating that the co-operative design of the exhibit was successful. However, the *purpose of the exhibit* (to balance the boat) was not always clear to family groups and, for this reason, gallery staff had an important role in introducing the purpose of the exhibit to families when necessary. The exhibit elicited a lot of talking between family members (98% of family groups) and 'explaining' conversations from female adults and gallery staff, which were informative and educational (see Appendix C, Tables C2 and C3).

The findings indicate that the collaborative attribute of the exhibit design (opportunity for teamwork) can be considered successful, since it facilitates joint-activities between family members, fosters 'explaining' types of conversation from adults and gallery staff, and invites children and adults to spend time using the exhibit.

GUNNERY EXHIBIT

Description of the exhibit

Gunnery is a computer-based exhibit which deals with the subject of weapons used to reach targets at sea. It works like an interactive computer game. It comprises a cannon that can be manipulated by using two small cranks (one to move the cannon *up and down* and another to move the cannon *left and right*), a button on the cannon to shoot at the target, a screen facing the user which gives instructions and shows where the target is located, and a second screen to the side which shows a computer chart depicting the chosen trajectory of the shell from the cannon to the target (see Figure 4.2.2).

The chart on the latter screen also shows the numbers of shots available to shoot the target (five shells in total). This screen allows exhibit users to refine their aiming skills. The cannon and the computer chart showing the trajectory of the shot are located inside an iron compartment which simulates a warship location. The screen facing the user can be seen by visitors through an open window which simulates the window of the warship (where the cannon is positioned).

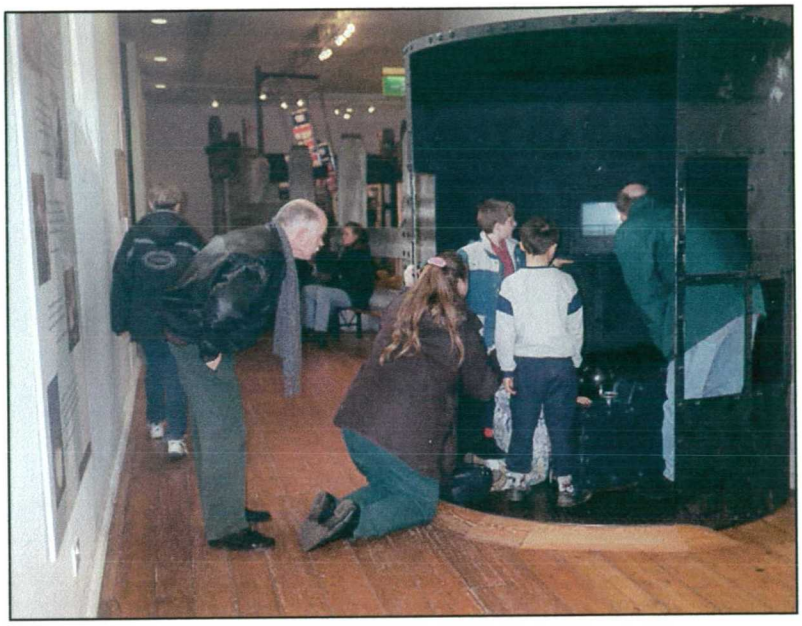


Figure 4.2.2: Gunnery exhibit, All Hands Gallery, National Maritime Museum

There are two different 'games' to be tried in the exhibit - a 'moving target' and a 'target on the side' (each game lasts about one minute to use all the shots but, for instance, if the visitor shoots the target at the second shot, the game may last for a shorter time).

The main design attributes of this exhibit are its interactive and challenging game nature, an element of surprise (see a result, such as shooting the target), an element of fun (entertaining game), and its child-sized design (the cannon is placed very low, so children can manipulate it easily).

Summary of profiles of behaviour at the Gunnery exhibit

Families were likely to repeat the exhibit task (game) at the Gunnery exhibit several times, since the average time spent at the exhibit was 4min.07sec. and the game takes around one minute to complete. A third of family groups had to wait to use the exhibit, indicating that it was popular. Family members usually watched others using the exhibit while waiting for their turn. This is a social way in which visitors familiarise themselves with the task and learn how to use the exhibit. The sample observed is described in Appendix C, Tables C1 and C2.

There was a possible gender effect regarding the manipulation of the *Gunnery* exhibit. The percentage of male adults and boys manipulating this activity was much higher than the percentage of female adults and girls (58% of males compared to 17% of females, and 96% of boys compared to 64% of girls) (see Appendix C, Table C2). The fact that male adults and boys were very active at this exhibit might suggest that the exhibit theme and the nature of the game particularly stimulated male interest and that they may have, accordingly, dominated the activity. Another aspect which supports this gender effect is that, here, splitting behaviour was greater between females adults and girls than male adults and boys. Also, female adults were more likely than male adults to take the role of reader of instructions aloud to others (see also PISEC, 1998). However, overall splitting behaviour within the family group was less frequent at the Gunnery exhibit than at the other two exhibits in *All Hands*. The 'game' nature of the task with its elements of surprise and challenge and the design of the compartment (embracing / protecting family members) might have played an important role in keeping family members together. The Gunnery exhibit seems to have encouraged the 'tell what to do' type of conversation more than 'explaining' and 'chatting', probably due to the game instructions on the screen (see Appendix C, Table C3).

Although this exhibit was successful in holding family members attention, it is important to be aware of its possible male gender effect. Exhibit planners should anticipate exhibit gender effects and aim to create a gallery which is gender balanced.

DIVING EXHIBIT

Description of the exhibit

Diving is an exhibit which aims at providing visitors with an opportunity to experience what it is like to work in a diving suit underwater at atmospheric pressure. The exhibit consists of a showcase tank filled with water, with pipes and valves inside and the sleeves of a diving suit projecting into the tank from 'portholes'. The visitor can put his/her arms inside the suit arms and his head in a viewer projecting into the tank (simulating a diving suit helmet) and manipulate the valves underwater. The pipes and the valves aim to reproduce an underwater work environment (see Figure 4.2.3). The task is to avoid air coming out of the different outlets (pipes) and to turn the valves in order to stop air coming out. While someone is manipulating the valves using the sleeve suit, someone else can go to the other side of the transparent tank and see what the person is doing and/or comment on it. The exhibit provides a label encouraging visitors to experience diving: '*How does it feel?*'

The main exhibit attributes are the opportunity to 'experience' something new (diving) and to 'role-play' (being a diver), as well as the challenge to perform the exhibit task (to work under water) and the imaginative exhibit design (with the water tank and the yellow diving suit) which is very attractive.

Figure 4.2.3: Diving exhibit, All Hands Gallery, National Maritime Museum

Summary of profiles of behaviour at the Diving exhibit

The average time spent by families members at the *Diving* exhibit was smaller when compared to *Cargo Handling* and *Gunnery* (2min.28sec., compared to 8min.24sec. and 4min.07sec., respectively) (see Appendix C, Table C2). The sample observed is described in Appendix C (Tables C1 and C2).

The findings suggest that the visitors experienced some problems (which are described below) while using *Diving*, which might have affected the time spent by family members at the exhibit. Also, the fact that the exhibit does not allow its use by more than one person at a time may have discouraged families from staying longer. But the main problem might have been the fact that the exhibit is hard to manipulate, as a female adult visitor has commented: '*You need to be really strong!*'. The design of the exhibit posed problems for some children (the exhibit was too high and/or too hard to use) and for a few female adults who found it hard to turn the valves. The consequence of these discomforts was that those individuals lost interest in the exhibit quickly and moved to something else. Furthermore, the purpose of the exhibit was not always clear to the visitor (children often asked adults what they were supposed to do). As the findings indicate, girls and female adults were more likely to split from the group here than males. The complex design of the exhibit posed obstacles for the social use of it and made it difficult for family members to make eye-contact. This might be the main reason why the *Diving* exhibit elicited less joint-activities and less talking between family members than the *Cargo Handling* and *Gunnery* exhibits. When family members talked to each other, the most common type of conversation was 'chatting' about the exhibit (see Appendix C, Table C3). The fact that there are no set rules to use the exhibit (the visitor has to try and find out for him/herself) might have encouraged this type of conversation.

This exhibit, which contains several attractive elements, would benefit from a few alterations in order to facilitate the children's use of it. However, its imaginative design and the opportunity to experience diving make this exhibit very attractive to children and adults.

LOCATION 2:
LAUNCH PAD, SCIENCE MUSEUM

TURNTABLE EXHIBIT

Description of the exhibit

Turntable is an exhibit about spinning effects (see Figure 4.2.4). The visitor can learn about the forces acting during spin using his or her own body. The speed of the turns will depend on visitor's size and position (and on the strength of the push that get him/her started). When standing on the moving turntable and holding on its central column, if the visitor leans in, s/he will go faster (the body makes a small circle so the number of turns increases). If the visitor leans out, s/he will go slower (the body makes a bigger circle so traveling a further distance, so making fewer turns).

Figure 4.2.4: Turntable, Launch Pad, Science Museum

No label is provided to this exhibit. In general, gallery staff (*Explainers*) explain to the visitors how to use the exhibit and help them. If the visitor requires further information, s/he can talk to an *Explainer* or read the files with information about the exhibit(s) which is located close to the helpdesk.

The main design attributes of this exhibit is the opportunity to experience 'spinning' with one's own body. This experience is both challenging (to spin fast) and fun to participants.

Summary of profiles of behaviour at the Turntable exhibit

The *Turntable* exhibit was very popular with children (three-quarters of the family groups observed had to queue to use it). Queuing might have affected the *average time* spent by family groups at the *Turntable* exhibit, which was 1min.48sec., although some families spent as long as 13min.15sec.. The majority of the children observed at this exhibit, boys and girls, used the *Turntable* (81% and 89%, respectively), indicating that there was no gender differences in children's use of it (Appendix C, Table C5). Children may have felt the *Turntable* stimulating due to the experimentation and 'excitement' provided by the experience (see Appendix C, Table C4, for sample and group composition of family groups at Launch Pad, and Tables C5 and C6 for behavioural findings).

'Splitting behaviour' within the family group did not occur often at this exhibit (14% of family groups), suggesting that adult relatives were interested in staying at the exhibit in order to see the children's performance. No joint-activity was noticed between *boy-boy* and *girl-girl*. Children were more likely to use this exhibit with adult relatives or gallery staff. The most frequent type of conversation from male adults, female adults, and boys was 'telling what to do', while girls were likely to 'chat' about the exhibit (see Appendix C, Table C6).

The most common 'proximity' measure between family members was 'more than one meter apart'. This was due to the fact that, at this exhibit, one person (usually a child) is normally on the turntable (in the centre) and another is watching from outside the protection bar. Sometimes adults may have stayed close to the child (inside the protection bar) if the child was small or if gallery staff were not there to help the children. The findings suggest that the design of

exhibits plays an important role in the proximity between family members at an exhibit. The *child's age* is also likely to influence adults' use of the exhibit with the child (see statistical findings from Chapter 7).

Although some children felt dizzy after using the *Turntable* exhibit, the observations suggest that the exhibit attributes related to the challenging and fun aspects of the experience were successful with children and in holding adult relatives attention (adult relatives were interested in watching the children's performance).

'SHADOW BOX' EXHIBIT

Description of the exhibit

Shadow Box is an exhibit which can *capture* the visitor's shadow. The visitor goes inside a dark space - a 'black box' (it can fit about six people) where there is a flash on one side and a large screen on the other side. The screen is made of a special light-sensitive material that can 'fix' the visitor's shadow for about ten seconds. The visitor has to position him/herself in front of the screen and press a green (fluorescent) button at the side of it to activate the flash. When the flash lights, the visitor's shadow remains on the screen for about ten seconds (see Figure 4.2.5).

Figure 4.2.5: Shadow Box, Launch Pad, Science Museum

(Source: © Science Museum, Launch Pad Cards)

The visitor can repeat the activity taking different positions and watching his/her shadows on the screen. The exhibit provides a label located *outside* the 'box' which explains how the shadow is fixed on the screen.

The main exhibit attributes are an element of surprise (see a result: the shadow) and an element of fun (playing with your own, and others, shadows).

Summary of profiles of behaviour at the Shadow Box exhibit

Families spent an *average time* of 1min.03sec. at the *Shadow Box* exhibit (see Appendix C, Table C5). The *Shadow Box* can be slightly embarrassing for shy or reserved people because they have to 'pose' to the flash in front of other people in order to make their shadow. The findings suggest that male adults and girls may have been more shy than female adults and boys to use the activity in front of other people, since female adults and boys were more active than male adults and girls at this exhibit.

'Splitting behaviour' within the family group was not frequent at this exhibit (occurring in 14% of family groups). There were a great number of joint activities between children, and between female adults and children, at the *Shadow Box*. The most frequent 'proximity' measure between family members was 'touching' (44% of families). It might be that the *Shadow Box*, with its dark environment, stimulated family members to stay close to each other. The exhibit elicited a lot of talking among family members (90% of the family groups observed). The commonest types of conversation from adults (male and female) were 'telling what to do' and 'chatting'. Children who engaged in talking were likely to 'chat' (see Appendix C, Table C6). Sample and group composition are described on Tables C4 and C5.

The element of surprise is a major feature of this exhibit and was likely to stimulate conversations among family members and to encourage them to stay together.

'SLOW BUBBLES' EXHIBIT

Description of the exhibit

Slow Bubbles is an exhibit which invites the visitor to pump air inside a cylindrical transparent container (about two-meters high), filled with a transparent liquid (silicone), in order to make bubbles. The 'silicone' gives the bubble a special 'texture' (it 'shines'). Due to the viscosity of the liquid, the bubble will go up slower if it is big or faster if it is small. If one bubble 'catches' the other while they go up, they combine into a bigger one (see Figure 4.2.6).

Figure 4.2.6: Slow Bubbles exhibit, Launch Pad, Science Museum

The exhibit provides a label located on the container (at adult eye-level) which 'asks questions' to the visitor and encourages him/her to think about the exhibit and to try it out.

The main attribute of this exhibit is its element of surprise (to see the formation of a bubble as a result of pumping air in the tube).

Summary of profiles of behaviour at the Slow Bubbles exhibit

The *average time* spent at this exhibit by family groups was 58 seconds (see Appendix C, Table C5). Since the *Slow Bubbles* exhibit allows families to see the outcome of the manipulation promptly, in general they do not stay long at it. The short average time spent at this exhibit made queuing less necessary than at the other two exhibits observed. Sample and group composition are described on Tables C4 and C5, Appendix C.

Most interactions at this exhibit were between an adult and a child. Males (both adults and children) were more active than females in manipulating the *Slow Bubbles* exhibit. The most frequent joint-activity compositions were between *male adult-boy* and *male adult-girl*. Interactions between children were very rare. At *Slow Bubbles*, adults were likely to stay close to the children in order to point out the bubbles to them and/or to help them to pump air into the tube, as indicated by the high frequency of the 'touching' proximity measure between family members.

Slow Bubbles elicited slightly more 'reading aloud' behaviour when compared to the other two exhibits at Launch Pad. This might be due because the label is located facing the visitor when s/he is manipulating it and is situated at adult eye-level. The language used in the label (a mixture of instructions and questioning) might have influenced 'reading aloud' behaviour. Male adults were likely to 'chat' and 'explain' the exhibit to the child, while female adults were more likely to 'chat' about the exhibit. The bubbles formed by the participants (outcome of interaction) were a frequent point of reference for conversations (see Appendix C, Table C6).

'Splitting behaviour' of family members while a member of the group was still using the exhibit was more frequent at the *Slow Bubbles* exhibit than at the other two exhibits at this site. This might be due to the fact that the exhibit can only be used by one person at a time.

The 'element of surprise' attribute of this exhibit was successful in attracting children's attention. The use of an informal language style in the label (with informal questions), and its placement at adult eye-level, seems to have stimulated adults' *reading aloud behaviour* to other members of the family group and the 'chatting' type of conversation.

LOCATION 3:
ME & MY BODY, EUREKA! THE MUSEUM FOR CHILDREN

'WHERE'S THE SKELETON?'

Description of the exhibit

'Where's the Skeleton' aims at giving children an idea of how the skeleton inside their body looks and how it moves. The child has to sit on a seat which has pedals (like a bicycle) and pedal it in order to activate the exhibit. There is a glass beside the seat which reflects the child's image. As the child stars to pedal, the lights go down and, *as if 'magic'*, the child's image appears in skeletal form (in the same positions as those of the child siting on the seat). As the child pedals, the skeleton shadows his/her movements (see Figure 4.2.7).

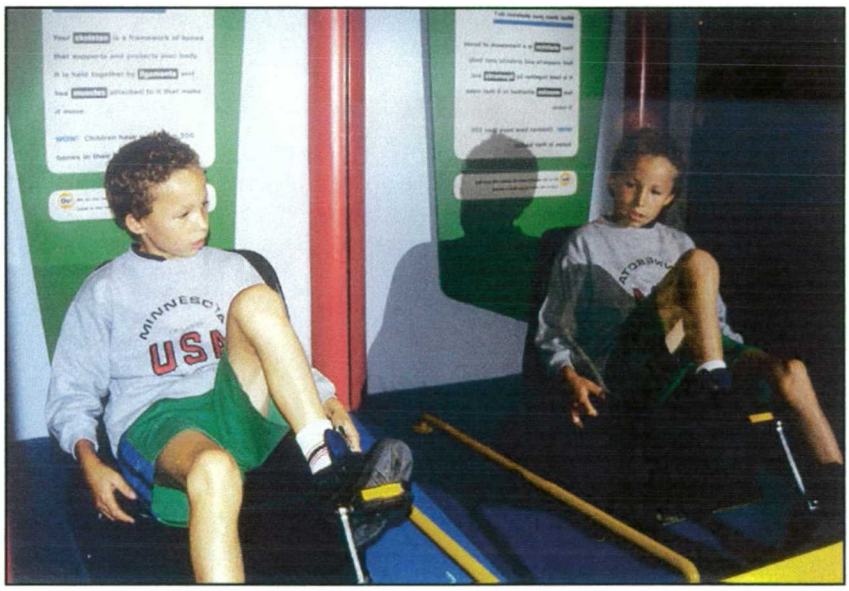


Figure 4.2.7: Skeleton exhibit, Me & My Body, Eureka! The Museum for Children

A label is provided, located close to the seat, explaining that the skeleton is a framework of bones held together by ligaments and has muscles attached to it that make it move.

The main attributes of this exhibit are its child-sized and imaginative design, and its elements of surprise (see a skeleton) and fun (see yourself as if you were the skeleton pedaling the bicycle).

Summary of profiles of behaviour at 'Where's the Skeleton ?'

Almost half of the family groups observed had to wait to use the exhibit, indicating that it was popular. The queuing was probably because the *Skeleton* exhibit can only be used by one child at a time. The *average time* spent at the *Skeleton* exhibit was 59 seconds (see Appendix C, Table C7, for sample and group composition of family groups at the Me & My Body exhibition, and Tables C8 and C9 for behavioural findings).

Very few adults (male or female) manipulated the *Skeleton* exhibit (8% and 4%, respectively) as its child-size prevented adults from using it (see Appendix C, Table C8). At this exhibit, the 'splitting' of family members was less frequent than at the other two exhibits observed in Me & My Body. Few children split from the exhibit. As the *Skeleton* exhibit encourages active physical engagement and 'motor skills' (since the child has to pedal it in an 'energetic' way in order to see the skeleton reflection) its dynamic nature may have stimulated children's interest. There were very few joint-activities between family members. As the exhibit is child sized, adults did not engage very often in joint activities, but stayed close to the child watching her/him. Also, the *Skeleton* exhibit allows only one child at a time to sit on the seat and pedal to see the 'outcome', so discouraging joint-use.

No 'reading aloud' behaviour was observed at this exhibit. Although explanatory labels are provided, and placed where the activity takes place, individuals may have been distracted by the 'skeleton reflection' of the child, which surprises visitors.

Comparing the three exhibits observed at Me & My Body, the *Skeleton* exhibit is that which elicited the least verbal interactions between family members. When conversations took place, the most frequent type of conversation among adults and among children from both genders was 'chatting' about the exhibit (Appendix C, Table C.9).

The *Skeleton* exhibit was successful with children, probably due to its exhibit attributes (element of surprise, imaginative design, element of fun, and child-sized exhibit). Although it did not elicit many joint-activities between family members, it certainly surprised and impressed children's and adults' minds, as the drawings (Chapter 5) and interview findings (Chapter 6) indicate.

'WHAT IF YOU COULDN'T'

Description of the exhibit

'*What if You Couldn't*' encourages children to experience how would it be if parts of their body did not work properly. Children are encouraged to *put themselves in the place* of a person with a physical or visual disability (they have to 'role play') (see Figure 4.2.8). A wheelchair, crutches, and walking

Figure 4.2.8: 'What if you couldn't?', Me & My Body, Eureka! The Museum for Children

sticks are available. A path with steps, slopes, and bumps is provided, so children can try walking to see how they would 'feel' if they had a disability. Labels are provided, but one of them is placed high, above children and adult eye-level, and the others are located far from where the action takes place.

The main attributes of this exhibit are its opportunity to role-play a physical or sight disabled person and experience how it is to be disabled. The exhibit tasks pose challenges to the child. The walking sticks and crutches are child-sized, so children connect immediately with it.

Summary of profiles of behaviour at ' What if you couldn't '

The *average time* spent by a family group at the *' What if you couldn't '* exhibit was 3min.16sec., which was greater than the average time spent by families at

the other two exhibits observed at the Me & My Body (see Appendix C, Table C8). This might be due because *'What if you couldn't'* allows plenty of space and time for children to use it. As this exhibit allows multiple use, queuing was rare.

Few adults (male or female) manipulated the exhibit and, overall, there were few joint-activities between family members. *'What if you couldn't'* (which is an exhibit about *Disability*) requires 'role-play', something that children appreciate doing, but adults might not be so willing to do. Another reason which would have restrained adults from using the exhibit is that the crutches and wheelchair provided were child-sized. This might also explain why the *Disability* exhibit had the highest percentage of adult 'splitting behaviour'. Half of the accompanying adults left their children at the *Disability* exhibit and split to see something else. On the other hand, very few children split from the exhibit, indicating that they did not mind staying on their own to use it.

No 'reading aloud' behaviour by family members occurred at this exhibit. This might be due to position of the labels, which are either placed high (above adult eye-level) or far away from where the action takes place. Adults' conversation with children mainly involved 'chatting', some 'telling what to do', and few 'explaining' conversations. Boys were more likely to 'tell what to do' to other children, while girls were more likely to 'chat' (see Table C9).

'What if you couldn't' demonstrated that its experiencing and role play attributes were successful elements since children engaged with the exhibit for a long time and in an autonomous manner.

'FEED ME!'

Description of the exhibit

'Feed Me!' is a 'dynamic' exhibit (parts of it move) which demonstrates the sequence of biting, chewing and swallowing. The one minute sequence is shown in three stages through a machine which shows what happens inside your mouth from when you bite until you swallow food. To start the sequence, the visitor has to throw 'food' (in a 'ball' form) into a big mouth which opens and

closes (it aims to demonstrate that digestion starts in your mouth, when you bite). Then the visitor has to go to the following stage, 'Bite', where s/he has to turn a wheel to squirt saliva in, in order to make the food soft. The next stage, 'Chew', shows what happens when you chew the food and swallow it (it shows the epiglottis opening and closing). The visitor is asked to 'flick the switch to send the taste message' (see Figure 4.2.9).

Labels are provided at each stage (close to the manipulative elements), encouraging visitors to interact and explaining what it is happening at each stage.

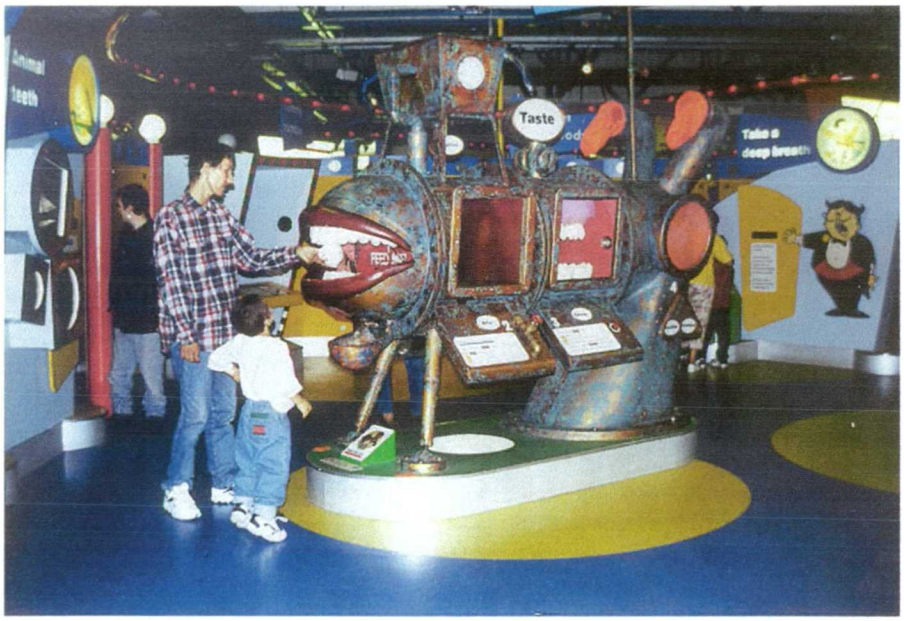


Figure 4.2.9: 'Feed Me!' exhibit, Me & My Body, Eureka! The Museum for Children

The main attributes of the exhibit are its imaginative design, the machine interactive nature, and its element of surprise (to see the machine in 'action').

Summary of profiles of behaviour at 'Feed Me!'

The *average time* spent at this exhibit was 1min.20sec., which indicates that, overall, families spent the amount of time necessary to see the whole exhibit sequence. No family group had to wait to use this exhibit, since families can approach the exhibit from different points. This exhibit encouraged more adult manipulation than the other two exhibits observed at Me & My Body (*Skeleton*

and *Disability* exhibits) (see Appendix C, Table C8). As *Feed Me!* is a machine at which the visitor has to follow a sequence step by step and interact with the machine, this might have required more adult orientation than at the other two exhibits observed.

More children split at the *Feed Me!* exhibit than at the *Skeleton* and *Disability* exhibits. The location of the exhibit close to other attractive displays may have caused children to split more frequently. It might also be that the *Feed Me!* exhibit did not manage to hold children's attention for the entire exhibit sequence.

Comparing the total of joint activities at the three exhibits observed at Me & My Body, the *Feed Me!* exhibit elicited more joint activities than the other two. This exhibit offers an opportunity for joint-activities between adults and children since visitors may follow the exhibit sequence together, exploring and talking about it. The fact that there is a 'sequence' to be followed is likely to require adults to explain it to their children. The most frequent joint-activity was between female adults and children.

At the *Feed Me!* exhibit, 19% of individuals read labels aloud to others. This percentage was the highest from all nine exhibits observed in the three galleries. This may due to the fact that the labels at the *Feed Me!* exhibit are integrated to the sequence the visitor has to follow. The labels explain what is happening at each stage and are placed close to the interactive devices which start each stage. Female adults were much more likely than males adults to read labels aloud to children (40% compared to 18%, respectively). Regarding talking, this exhibit elicited more 'explaining' conversation from adults than the other two. Female adults were more likely to 'tell' children 'what to do', while male adults were more likely to 'chat' (see Appendix C, Table C9).

The interactive attribute of the exhibit was successful in engaging adults in joint-activities with children. Its imaginative design was also an attractive element.

4.2.2. COMPARISON OF THE OVERALL FINDINGS IN EACH GALLERY

In section 4.2.1, the profiles of family behaviour at the nine observed exhibits were described and it was illustrated how design aspects may affect family dynamics.

In this section, the overall findings from children's and adults' behaviour at the three galleries are compared, indicating differences and similarities between the three sites investigated (see Chapter 3, research question n. 5).

THE OBSERVATION SAMPLE

The sample at the three locations (complete sample)

Number and gender of individuals

Four-hundred and fifty family groups, totaling 1377 individuals, were observed randomly at the three child-orientated exhibitions investigated (150 family groups were observed in each gallery): 483 individuals at the *All Hands Gallery*, National Maritime Museum; 436 at *Launch Pad*, Science Museum; and 458 at the *Me & My Body exhibition*, Eureka! The Museum for Children.

Overall, the percentage of female adults in this sample was slightly greater than that of male adults (26%, n=365, compared to 19%, n=261, respectively), while the overall percentages of male and female children was about the same (29%, n=395 boys compared to 26%, n=356 girls, respectively) (see Table 4.2.1.).

Table 4.2.1: Individuals observed at the three child-orientated galleries by gender of adults and children
Sample: 450 family groups (150 families observed at each gallery)

Galleries	ALL		ALL HANDS		LAUNCH PAD		ME & MY BODY	
No. of individuals:	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
female adults	365	26%	111	23%	116	27%	138	30%
male adults	261	19%	113	23%	83	18%	65	15%
boys	395	29%	154	32%	116	27%	125	27%
girls	356	26%	105	22%	121	28%	130	28%
Total of individuals	1377	100%	483	100%	436	100%	458	100%

(Note: 'n' refers to 'number of individuals'. Percentages refer to 'total of individuals'.)
Sites: All Hands Gallery (National Maritime Museum); Launch Pad (Science Museum); Me & My Body (Eureka!)

Comparing the overall percentages of adults observed at the three galleries, it can be seen that the *All Hands Gallery* had the same percentage of adults from both genders, while at *Launch Pad* and *Me & My Body* the percentage of female adults was greater than that of male adults (regarding the latter, much greater). Regarding children, the percentage of boys was greater than that of girls at the *All Hands Gallery* (see also Appendix C, Table C2), while at *Launch Pad* and *Me & My Body* the percentage of boys and girls was about the same.

These findings suggest that, at the *All Hands Gallery*, National Maritime Museum, boys are slightly more likely than girls to attend the exhibition, and at the *Me & My Body*, Eureka! The Museum for Children, female adults are more likely than male adults to attend the exhibition with their children. These gender effects might be related to the type of museum and its subject-matter.

Group composition

The group compositions attending the child-orientated exhibitions varied considerably. Table 4.1.2 shows the overall frequency of each group composition at the galleries.

Overall, the most frequent group composition was that of 'female adult and children' (n=194 out of 450). 'Couples with children' were also frequent (n=149 out of 450). The least frequent group composition was that of 'male adult and children' (n=107 out of 450).

Comparing the three galleries, 'female adult with children' group compositions were more frequent at *Me & My Body* (57%, compared to 46% at Launch Pad and 25% at All Hands), while 'male adult with children' group compositions were more numerous at the All Hands Gallery (32%, compared to 27% at Launch Pad and 13% at Me & My Body), suggesting possible gender preferences in adult attendance to child-orientated exhibitions according to the museum.

Table 4.1.2: Group composition at the three child-orientated exhibitions by gender
Sample: 450 family groups (150 families observed at each gallery)

Galleries	ALL		ALL HANDS		LAUNCH PAD		ME & MY BODY	
No. of group compositions:	n	%	n	%	n	%	n	%
Code: M= male adult; F= female adult; b= boy(s); g= girl(s)								
Female adults with children:								
Females w/ children total:	*194*	*43%*	*38*	*25%*	*70*	*46%*	*86*	*57%*
F-g	78	17%	16	10%	26	17%	36	24%
F-b	70	16%	17	11%	24	16%	29	19%
F-b-g	46	10%	5	4%	20	13%	21	14%
Couples with children:								
Couples w/ children total:	*149*	*33%*	*64*	*43%*	*40*	*27%*	*45*	*30%*
M-F-b-g	59	13%	21	14%	18	12%	20	13%
M-F-b	58	13%	34	23%	13	9%	11	7%
M-F-g	32	7%	9	6%	9	6%	14	10%
Male adults with children:								
Males w/ children total:	*107*	*24%*	*48*	*32%*	*40*	*27%*	*19*	*13%*
M-b	49	11%	22	15%	18	12%	9	6%
M-g	38	9%	17	11%	14	10%	7	5%
M-b-g	20	4%	9	6%	8	5%	3	2%
Total of groups	450	100%	150	100%	150	100%	150	100%

(Note: 'n' refers to 'group composition'. Percentages refer to 'total of groups.')
Sites: All Hands Gallery (National Maritime Museum); Launch Pad (Science Museum); Me & My Body (Eureka!)

USE OF EXHIBITS BY FAMILY MEMBERS

Average time spent by the family groups at the exhibits observed in the three galleries

The average time spent by family groups at the exhibits at the three galleries differed (see Table 4.2.3).

Family members spent more time at the exhibits at the *All Hands Gallery* than in the other two galleries' exhibits. For instance, at the *Cargo Handling* exhibit family members spent an average of **8min.24sec.**, which is very high for interactive exhibits. At *Launch Pad*, the average time spent by family members at the three exhibits observed was relatively short (between 58 seconds and 1min.48sec.). This might suggest that, as soon as the families saw the outcome of the experiments at Launch Pad, they moved to another exhibit, or that family members did not tend to repeat or explore the activities for long at the three

exhibits observed at this gallery. At *Me & My Body*, the average time spent by families at exhibits was similar to *Launch Pad*, except for the *Disability* exhibit, where children spent as along as **3min.16sec.**

Table 4.2.3: Average time spent by family groups at the three exhibits in each gallery
Sample: 450 family groups (150 families observed at each gallery)

Galleries	ALL HANDS	LAUNCH PAD	ME & MY BODY
	Average time spent at the exhibits		
Exhibits	CARGO	TURNTABLE	SKELETON
	8min.24sec.	1min.48sec.	- 59sec.
	GUNNERY	SHADOW BOX	DISABILITY
	4min.07sec.	1min.03sec.	3min.16sec.
	DIVING	SLOW BUBBLES	FEED ME!
	2min.28sec.	- 58sec.	1min.20sec.

Sites: All Hands Gallery (National Maritime Museum); Launch Pad (Science Museum); Me & My Body (Eureka!)

It might be that families tend to spend more time at exhibits in a small gallery than in a big one (if compared to the other to galleries, the *All Hands* is the smallest), or that the exhibit tasks in *All Hands* require a longer time to be performed if compared to the exhibit tasks in *Me & My Body* and *Launch Pad.*

The profiles of family behaviour (see section 4.2.1) suggest that the time spent at an interactive exhibit depends on the exhibit task, time to master it, and repeated use of it. Other factors which might influence the time spent is enjoyment in performing the activity or whether there are other people waiting to use the exhibit.

Manipulation of exhibits

Table 4.2.4 shows the overall number of individuals who manipulated the exhibits at the three galleries. From a total of 1377 individuals, 837 of them manipulated the exhibits (61%). From this total, 660 were children and 177 were adults, indicating that adults were less likely to engage 'physically' with the exhibits.

If we compare the three galleries, the findings indicate that *All Hands* was the exhibition which elicited most manipulation of exhibits by adults. It could be that the exhibit tasks there encouraged adults to assist their children to perform the activity.

The findings suggests a *gender effect* in the adults' manipulation of exhibits at the *All Hands Gallery*. Male adults seemed to be more active at this gallery than female adults (60% used it compared to 39%, respectively). It might be that the exhibit subjects or activity (such as Gunnery) or exhibits which require physical effort (such as Diving) might be more attractive and interesting to males than females, so that they are more active and dominate the activity.

No gender effect was found in the manipulation of exhibits by adults in the other two galleries.

Table 4.2.4: Individuals who manipulated the exhibits at the three galleries by gender of adults and children
Sample: 450 family groups (150 families observed at each gallery)

Galleries	ALL			ALL HANDS			LAUNCH PAD			ME & MY BODY		
No. of individuals:	all	n	%	all	n	%	all	n	%	all	n	%
males	261	98	38%	113	68	60%	83	19	23%	65	11	17%
females	365	79	22%	111	43	39%	116	21	18%	138	15	11%
boys	395	355	90%	154	140	91%	116	106	91%	125	109	87%
girls	356	305	86%	105	86	81%	121	102	84%	130	117	90%
Totals	1377	837	61%	483	337	70%	436	248	57%	458	252	55%

(Note: 'n' refers to individuals who 'manipulated the exhibits'. Percentages refer to 'all')
Sites: All Hands Gallery (National Maritime Museum); Launch Pad (Science Museum); Me & My Body (Eureka!)

Regarding the children's manipulation of exhibits at the three galleries, the percentage fractions were very similar and indicate that the majority of the children manipulated the exhibits observed at the three galleries (see Table 4.2.4). The overall percentage difference in exhibit manipulation by boys and girls at the three galleries was not great enough to suggest a gender effect in children's manipulation.

FAMILY DYNAMICS IN THE GALLERIES

Members of the family group who split from the group

Table 4.2.5 shows the overall number of individuals who split from the group at the three galleries. From a total of 1377 individuals, 16% of them (n=224) split from the group while other members were still using the exhibit indicating that, overall, groups tended to stay in groups.

Comparing the three galleries, there were more splitting behaviour at the *All Hands Gallery* than at the other two. Also, at the *All Hands Gallery*, female adults split from the group slightly more than male adults (32% compared to 26%), and girls more than boys (26% compared to 14%). Conversely, at the *Me & My Body*, male adults split from the group slightly more than female adults (32% compared to 25%).

At *Launch Pad*, 'splitting behaviour' from the group was infrequent and about the same between adults and children from both genders. It could be that, due to the short time spent on the exhibits and to their experimental nature, family members tended to stay together in order to see the outcome of their interaction with the exhibits.

Table 4.2.5: Individuals who split from the group at the galleries by gender of adults and children
Sample: 450 family groups (150 families observed at each gallery)

Galleries	ALL			ALL HANDS			LAUNCH PAD			ME & MY BODY		
No. of individuals:	all	n	%	all	n	%	all	n	%	all	n	%
males	261	61	23%	113	30	26%	83	10	12%	65	21	32%
females	365	83	23%	111	36	32%	116	12	10%	138	35	25%
girls	356	44	12%	105	27	26%	121	8	7%	130	9	7%
boys	395	36	9%	154	21	14%	116	10	9%	125	5	4%
Totals	1377	224	16%	483	114	24%	436	40	9%	458	70	15%

(Note: 'n' refers to individuals who 'split'. Percentages refer to 'all')
Sites: All Hands Gallery (National Maritime Museum); Launch Pad (Science Museum); Me & My Body (Eureka!)

Joint-activity compositions between family members and/or gallery staff in the three galleries

Table 4.2.6 shows the occurrence of joint activities at each gallery by group composition. 'Joint activity' was considered when at least two persons *did* an exhibit-related activity together (physically engaging with the exhibit). Joint activities between family members are likely to support joint learning.

Comparing the three galleries, the *All Hands Gallery* elicited much more joint-activities than the other two locations (n=155, compared to n=75 at *Launch Pad* and n=28 at *Me & My Body*). The *Me & My Body* exhibition was that which elicited the least joint-activities between family members, indicating that this exhibition might tend to encourage individual explorations from children. This aspect is supported by the statistical findings from the interviews (Chapter 7) which suggest that children tend to prefer to use exhibit in a more independent way at Eureka! (see section 7.2.3).

Table 4.2.6: Occurrence of joint activities by gender of group composition members at the three galleries
Sample: 450 family groups (150 families observed at each gallery)

Galleries	ALL		ALL HANDS		LAUNCH PAD		ME & MY BODY	
No. of joint activities: (in raking order)	n	%	n	%	n	%	n	%
Group composition								
1. male - boy	52	21%	38	24%	8	11%	6	21%
2. female - boy	36	14%	17	11%	12	17%	7	25%
3. female - girl	33	13%	18	12%	8	11%	7	25%
3. boy - boy	33	13%	25	16%	6	8%	2	7%
5. male - girl	30	12%	17	11%	10	13%	3	11%
6. boy - girl / girl-boy	27	10%	15	10%	10	13%	2	7%
7. gallery staff - boy	22	8%	12	8%	10	13%	-	-
8. gallery staff - girl	14	5%	10	6%	4	5%	-	-
9. girl - girl	11	4%	3	2%	7	9%	1	4%
Total of joint activities:	258	100%	155	100%	75	100%	28	100%

(Note: 'n' refers to 'number of joint activities'. Percentages were rounded.)
Sites: All Hands Gallery (National Maritime Museum); Launch Pad (Science Museum); Me & My Body (Eureka!)

The findings indicate that, at the *All Hands Gallery*'s observed exhibits, joint-activity compositions were more frequent between individuals from the same gender (specially males), such as '*male-boy*' and '*boy-boy*', while at the exhibits observed in *Launch Pad* a mixed composition for joint-activities

(opposite genders), such as *'female-boy'* and *'male-girl'*, were more likely to happen. At *Me & My Body*, more female adults than males tended to engage in joint-activities with children from both genders, such as *'female-boy'* and *'female-girl'*.

It could be that a tendency for *male* joint-activity composition is related to the type of activity and/or exhibit theme, as the findings described above might suggest. The findings described in the other previous behavioural categories in this study suggest that the *All Hands Gallery* appealed more to males than females, so it could be that male individuals (adults and children) preferred to try the activities out together in this gallery. On the other hand, the findings suggest that the more experimental type of exhibit observed at *Launch Pad* encouraged *mixed gender* joint-activity compositions.

Proximity

Table 4.2.7 shows the overall level of 'proximity' between family members in each gallery. The findings indicate that design decisions are likely to affect adult behaviour at child-orientated galleries.

At the *All Hands Gallery* and *Launch Pad*, the percentage of family members who were *'touching'* each other while attending the exhibit was almost the same (37% and 38%, respectively), and slightly greater than at the *Me & My Body* exhibition (27%). The 'touching' level of proximity indicates a tendency in adults to assist and help the child *directly* in using the exhibit (it can also be a sign of *affection*). The findings suggest that the *All Hands Gallery* and *Launch Pad* exhibits might require more assistance from adults to children in using the exhibits than is the case for the *Me & My Body* exhibits.

The *Me & My Body* exhibition had the highest percentage of family groups in the 'close' level of proximity. The 'close' level indicates a tendency in the adult to stay close to the child, perhaps watching over the child, talking or using the exhibit together, but not *interfering directly* in what the child is doing. It might be that the *Me & My Body* exhibits give the opportunity for children to be more *autonomous*, so they can use the exhibits without the direct help of an adult, although adults might stay close to the children and take an observer or caretaker role.

Table 4.2.7: Proximity between family members at each gallery
Sample: 450 family groups (150 families observed at each gallery)

Galleries	ALL HANDS		LAUNCH PAD		ME & MY BODY	
No. of families:	*n*	*%*	*n*	*%*	*n*	*%*
Proximity						
TOUCHING	55	37%	57	38%	41	27%
CLOSE	55	37%	51	34%	76	51%
+ THAN 1 METER	40	26%	42	28%	33	22%
Total of families per gallery:	150	100%	150	100%	150	100%

(Note: 'n' refers to 'family groups')
Sites: All Hands Gallery (National Maritime Museum); Launch Pad (Science Museum); Me & My Body (Eureka!)

The design of some of the exhibits observed, such as the *Cargo Handling* and the *Turntable*, required family members to work in association but at a distance while using the exhibit, so families might have to use the exhibit staying '*more than 1 meter apart*'. In other cases, this level of proximity might indicate a lack of interest by the adult in the exhibit or in what the child is doing. It might be a challenge for the design of child-orientated galleries to create exhibits which arise and hold adults' interest and to encourage them to work cohesively with the children.

Reading Aloud

The overall number of individuals who read labels or instructions aloud to other family members in the galleries was very small (7%, n=92), as illustrated in Table 4.2.8. Comparing the '*reading aloud*' behaviour in the three galleries, female adults were more likely than males to read labels aloud at the *All Hands Gallery* and *Me & My Body* exhibition. The percentage of adults (female and male) who read labels / instructions aloud to others was very small at *Launch Pad*.

These findings indicate that '*reading aloud*' behaviour is not a common behaviour in family groups when attending exhibits. It is more likely that labels are used as a reference for conversation between family members (see McManus, 1987, regarding 'text-echo').

Table 4.2.8: Individuals who 'read labels aloud' for others in the galleries by gender of adults and children
Sample: 450 family groups (150 families observed at each gallery)

Galleries	ALL			ALL HANDS			LAUNCH PAD			ME & MY BODY		
No. of individuals:	all	n	%	all	n	%	all	n	%	all	n	%
females	365	53	15%	111	23	21%	116	11	9%	138	19	14%
males	261	22	8%	113	14	12%	83	5	6%	65	3	5%
boys	395	12	3%	154	11	7%	116	-	-	125	1	1%
girls	356	5	1%	105	1	1%	121	1	1%	130	3	2%
Totals	1377	92	7%	483	49	10%	436	17	4%	458	26	6%

(Note: 'n' refers to individuals who 'read aloud' to others. Percentages refer to 'all' and values were rounded)
Sites: All Hands Gallery (National Maritime Museum); Launch Pad (Science Museum); Me & My Body (Eureka!)

As a whole, the findings indicate that children are not likely to read labels aloud to others. Borun and others also found that adults significant read labels 'aloud' to others more than children (PISEC, 1998: 49).

The profiles of family behaviour findings (see section 4.2.1) suggest that 'reading aloud' behaviour is likely to be related to the position of labels (at adults' and children's eye-level and close to the manipulative element), content of labels (explanatory and questioning), and whether or not visitors will be distracted by other factors or devices.

Talking and type of conversation

Three types of conversation categories were recorded while family groups were attending the exhibits: 'telling what to do', 'explaining', and 'chatting'.

Comparing the frequency of adults' use of the conversation categories at the three galleries, the *All Hands Gallery* and *Launch Pad* had similar patterns of '*telling what to do*' and '*chatting*' conversations from male and female adults (see Table 4.2.9 on page 162).

The '*explaining*' type of conversation was more frequently observed at *All Hands* than at *Launch Pad*, specially from female adults, where the difference was considerable: 7% from females at *Launch Pad* compared to 55% from females at *All Hands*. It might be that adults, specially females, did not feel

confident in giving explanations about the exhibits in *Launch Pad*. The few labels explaining the scientific laws exemplified by the exhibit experiments at the gallery might have discouraged adults from attempting to explain (it should be said that it was a deliberate choice of *Launch Pad* not to *explain* the exhibits in the labels). At the *All Hands Gallery*, a mixture of a more familiar subject, gallery staff at hand, and labels, might have encouraged adults to 'explain' the exhibits to their children. At the Me & My Body, '*chatting*' was the most frequent type of conversation from adults.

Between children, the most common type of conversation at exhibits at the three galleries was '*chatting*'. Regarding the gallery staff, they were observed talking to families at the *All Hands Gallery* and *Launch Pad*, but at the *Me & My Body* no gallery staff were noticed at the exhibits observed. At the *All Hands Gallery*, the most frequent type of conversation used by gallery staff was *'explaining'*, which is an instructive and informative approach to conversation. At *Launch Pad*, both '*explaining*' and '*chatting*' were used by gallery staff in their conversation with families.

The findings above suggest that different factors, such as the presence or absence of labels at the exhibit and whether individuals are relaxed and confident about the content of the exhibit, might influence the amount of talking and type of conversations between adults and children at an exhibit.

TABLE 4.2.9: Individuals who engaged in talking at the galleries according to the frequency of type of conversation

Sample: 450 family groups (150 at each gallery)

Individuals at each Gallery:
All Hands: males adults, n=113; females adults, n=111; boys, n=154; girls, n=105; gallery staff, n=42
Launch Pad: males adults, n= 83; females adults, n=116; boys, n=116; girls, n=121; gallery staff, n=16
Me & My Body: males adults, n= 65; females adults, n=138; boys, n=125; girls, n=130; gallery staff, n= 0

Galleries	**ALL HANDS**							**LAUNCH PAD**							**ME & MY BODY**						
Individuals who engaged in conversation:		Types of Conversation							Types of Conversation							Types of Conversation					
		Telling		***Explaining***		***Chatting***			***Telling***		***Explaining***		***Chatting***			***Telling***		***Explaining***		***Chatting***	
	Talked	n	%	n	%	n	%	Talked	n	%	n	%	n	%	Talked	n	%	n	%	n	%
male	(79)	44	56%	31	39%	42	53%	(48)	27	56%	10	21%	28	58%	(29)	10	34%	4	14%	20	69%
female	(60)	29	48%	33	55%	33	55%	(71)	35	49%	5	7%	39	55%	(78)	36	46%	17	22%	40	51%
boy	(58)	16	28%	4	7%	44	76%	(22)	4	18%	-	-	18	82%	(20)	6	30%	-	-	14	70%
girl	(30)	3	10%	2	7%	27	90%	(16)	1	6%	-	-	10	63%	(30)	4	13%	2	7%	24	80%
gallery staff	(38)	3	8%	35	92%	6	16%	(12)	-	-	7	58%	5	42%	(0)	-	-	-	-	-	-

Sites: *All Hands Gallery*, National Maritime Museum; *Launch Pad*, Science Museum; *Me & My Body*, Eureka! The Museum for Children
(Note: 'Talked' refers to the total of individuals who engaged in conversations; 'n' refers to individuals who engaged in each type of conversation; percentages refer to 'Talked'. More than one type of conversation was possible by same individual, so percentages add to more than 100.)

4.3. OVERVIEW OF THE FINDINGS RELATED TO FAMILY BEHAVIOUR AT THE THREE CHILD-ORIENTATED GALLERIES

The findings from the observation of family groups carried out at the three child-orientated galleries indicated how differences in design & interpretive decisions are likely to affect adults and children behaviour and family interactions at exhibits. Table 4.3.1 (on the next page) shows an overview of the most frequent behaviour findings from all three locations.

Gender effects in adult activity

If we compare the exhibits observed at all three locations, some of them clearly stimulated one gender more than the other. Males, for instance, were more active at the *Gunnery* exhibit (All Hands Gallery), and the *Slow Bubbles* exhibit (Launch Pad), while females were more active at the *Cargo Handling* (All Hands Gallery) and the *Shadow Box* (Launch Pad). The findings suggest that, generally, male adults and boys might be attracted to exhibits which offer a *challenge* to the participant (such as the *Gunnery*) and which might involve *physical activity* (such as the *Diving* and *Slow Bubbles*). Female adults and girls appear to be attracted to exhibits which offer opportunities for teamwork and cooperation (such as the *Cargo Handling*), or 'experiencing' something (such as the *Shadow Box*). This finding is supported by studies on gender attitudes to science which stress that girls prefer co-operative activities and perform better without competitive pressure (Baker, 1994:33).

These findings suggest that the *subject and design of exhibits* and the *nature of the activity* might attract one gender more than other. Exhibits which take in account *female interests* and *preferences* might enhance female activity in interactive exhibitions.

The findings also indicate a possible gender effect regarding male activity at the interactive exhibits observed at the *All Hands Gallery*. This is supported *in part* by Brown's study on family visits to a museum science centre.

TABLE 4.3.1: OVERVIEW OF THE OBSERVATION FINDINGS AT EACH GALLERY

Sample: 150 family groups in each gallery (483 individuals at the All Hands; 436 individuals at Launch Pad; 458 individuals at the Me & My Body)

MOST FREQUENT BEHAVIOUR FINDINGS	ALL HANDS GALLERY	LAUNCH PAD	ME & MY BODY
Attendance at exhibits	more **boys** attending the exhibits than girls; same percentage of male and female adults	more **female adults** attending the exhibits than males; about same percentage of boys and girls	more **female adults** attending the exhibits than males; about same percentage of boys and girls
'Group composition'	couples with children	female adults with children	female adults with children
Adult activity (exhibit manipulation) *(* there was a high percentage of exhibit manipulation by children in all three galleries)*	overall, *male adults* manipulated the exhibits *much* more than *female* adults *(gender effect)*. Also, adults were more active in this gallery than in the other two	overall, *male adults* manipulated the exhibits *slightly* more than *female* adults	overall, *male adults* manipulated the exhibits *slightly* more than *female* adults
'Splitting behaviour'	**more *female*** than *male* adults split from the group; more ***girls*** than boys split from the group.	**Few** splitting behaviour among **adults** and among **children** from both genders (about same percentage)	**more *male*** than *female* adults split from the group; **few children** split from the group.
'Joint-activity compositions'	**male-boy; boy-boy** Higher number of joint activities between family members, and more staff engagement, in this gallery than in the other two.	**female-boy; male-girl** Gallery staff engagement observed at the Turntable exhibit only.	**female-boy; female-girl** Smaller number of joint activities in this gallery than in the other two. No gallery staff engagement at the exhibits observed.
'Proximity measure'	'touching' *(most frequent)*	'touching' *(most frequent)*	'close' *(most frequent)*
'Reading aloud' behaviour	overall, **more *female*** than *male* adults read labels aloud; (more males and boys at the Cargo Handling)	'reading aloud' behaviour was **not frequent** among adults and was **rare** among children.	**more *female*** than *male* adults read labels aloud; 'reading aloud' behaviour among **children** was rare.
Adults' 'Type of conversation'	1. 'telling what to do' and 'chatting' 2. 'explaining'	1. 'chatting' 2. 'telling what to do' (Few 'explaining' conversations)	1. 'chatting' 2. 'telling what to do' (Few 'explaining' conversations)

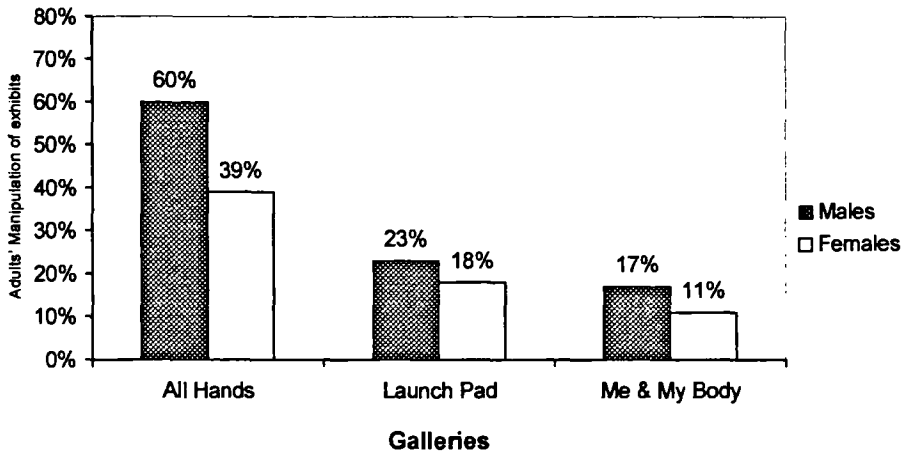
Brown stresses that men tend to be more 'active' participants than women at interactive exhibits, and that women are much more likely to take an active role when they are with girls (Brown, 1995:69). This finding might be applied to the *All Hands Gallery*, but the findings from *Launch Pad* and *Me & My Body* show that there was a small difference in the percentage of male and female adult manipulation of exhibits at those galleries (23% compared to 18% at Launch Pad and 17% compared to 11% at the Me & My Body, respectively), indicating no gender effect at these two galleries.

Also, joint-activity compositions between *'female and boy'* were the most frequent at *Launch Pad* and *Me & My Body*, indicating that female adults had an active role in those exhibitions and engaged with boys (as well as with girls). In a recent study regarding family learning at exhibits, Borun and others found that female adults facilitate learning in the group (PISEC, 1998).

Exhibit manipulation by adults according to the gallery

Regarding the 'manipulation of exhibits' by adults at the child-orientated exhibitions investigated, there were some relevant differences according to the type of gallery. Overall, adults (males and females) were most active at the *All Hands Gallery*, less active at *Launch Pad* and even less active at the *Me & My Body* exhibition (see Figure 4.3.1).

Figure 4.3.1: Adult manipulation of exhibits according to the gallery



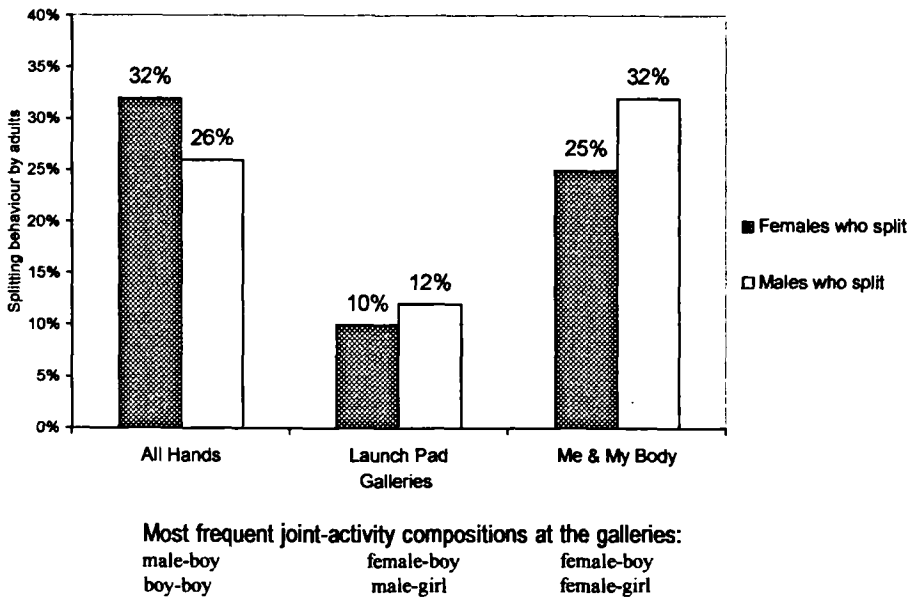
These findings suggest that the design and interpretive approaches used in child-orientated galleries, the characteristics of the environment, and

whether the gallery is targeted specifically to children or to a broad audience age range, may influence the physical engagement of adults with child-orientated exhibits.

Gender effects in splitting behaviour

The analysis of the results indicates that 'splitting behaviour' from the group may be related to the 'joint-activity compositions' of family members (see Figure 4.3.2). Female adults tended to split more often in the gallery in which the most frequent joint activity compositions were between *male-boy* and *boy-boy* (All Hands Gallery). Conversely, male adults were more likely to split in the gallery in which the most frequent joint activity compositions were between *female-boy* and *female-girl* (Me & My Body). At Launch Pad, where mixed join-activity compositions were more frequent (*female-boy* and *male-girl*), there was about the same percentage of 'splitting behaviour' between male and female adults.

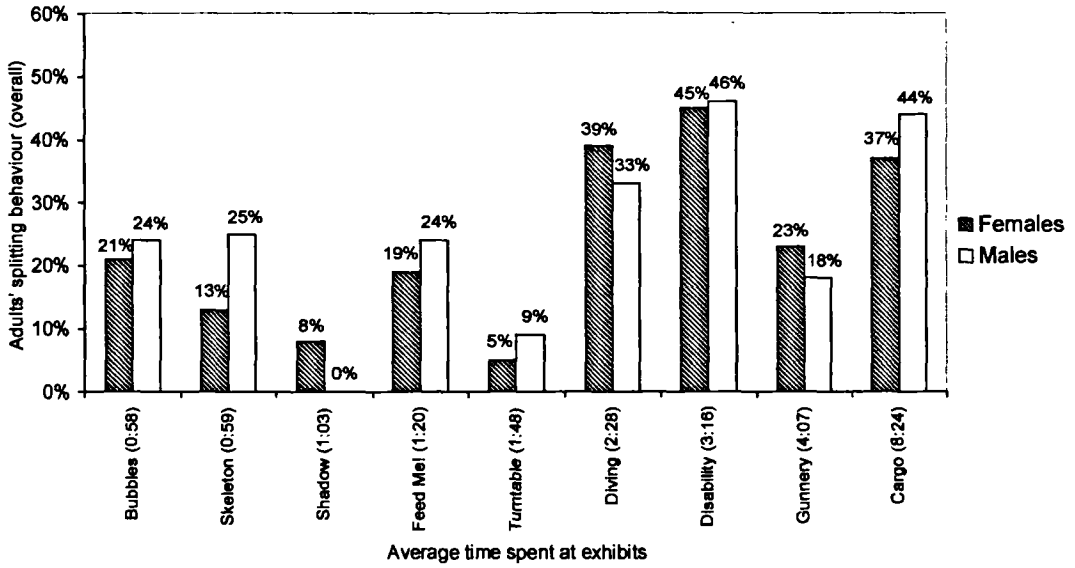
Figure 4.3.2: Gender effects in adult 'splitting behaviour' according to the most frequent joint-activity compositions in each gallery



Time spent by family members at exhibits and splitting behaviour

Moreover, Figure 4.3.3 suggests that there were more splitting behaviour within a family group in exhibits where the average time spent by family members was more than 2 minutes than in those exhibits where the average time spent was less (with exception of the *Gunnery* exhibit, which seems to have kept adults' interest, probably due to its interactive game nature and outcome of the activity).

Figure 4.3.3: Adult 'splitting behaviour' according to the average time spent at exhibits



Joint activities between family members

The findings indicate that the exhibits from the *All Hands Gallery* elicited more joint-activities than the other two galleries. It might be that the design of exhibits at the *All Hands Gallery* and the co-operative nature of the tasks allow more joint-activities between family members and encourage adults to use the exhibits with their children. Conversely, the findings indicate that the exhibits from *Me & My Body* were those which elicited less joint-activities when compared to the other two locations. It might be that the exhibits observed there (the ones chosen as 'favourite' by children) were ergonomically designed to be used mainly by children (the *Skeleton* and the *Disability*, for instance), so giving the adults a more passive role. Also, the *exhibits tasks* and *content* at

the children's museum (*Me & My Body*) might be more *easy* for children than the *All Hands Gallery*'s ones, therefore adults were less likely to interfere in what the child was doing.

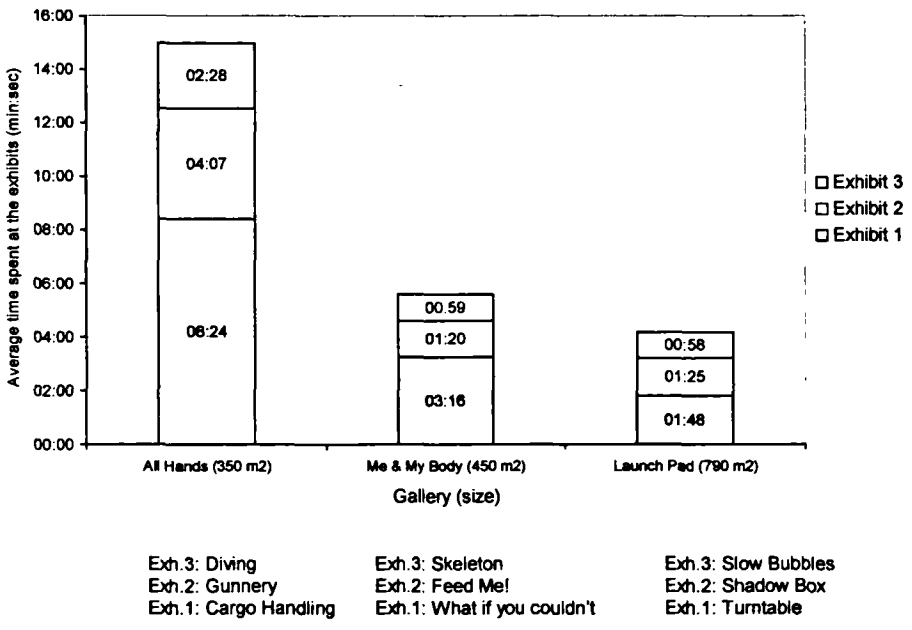
Proximity between family members

The findings suggest that the 'level of proximity' between family members (*'touching each other', 'close',* or *'more than one meter apart'*) in an interactive exhibit is likely to be affected by the *design of the exhibit* (whether the exhibit allows or encourages proximity between individuals) and/or to the *exhibit level of difficulty to the child* (whether the child needs the support of adult to do/understand it). Since proximity might indicate cohesion between family members, it is important to consider ways of encouraging it in child-orientated exhibits.

Time spent at exhibits and size of the galleries

The findings indicate that family groups tended to spend more time *at exhibits* in the smallest gallery, which has fewer hands-on exhibits (*All Hands Gallery*), and less time *at exhibits* in the largest gallery, which has lots of hands-on exhibits (*Launch Pad*) (see Figure 4.3.4).

Figure 4.3.4: Average time spent at exhibits according to the size of the gallery



It may be the case that, in the larger galleries, with lots of interactives (*Launch Pad* and *Me & My Body*), family members tended to spend less time *at exhibits* in order to see/try out everything within an average gallery visiting time, while in the smallest gallery (*All Hands Gallery*) family members might have felt more relaxed about using the exhibits for longer.

Also, it might be that the nature of the exhibit tasks at the *All Hands Gallery* requires more time to be performed than the tasks from the observed exhibits at the other two galleries, suggesting that the 'average time spent at exhibits' might be affected not only by the size of the gallery, but also by the exhibit task and time taken by the child to master it, and whether or not there were people queuing to use the exhibit.

'Reading aloud' behaviour

The findings indicate that 'reading aloud' behaviour was not common in the family groups observed at the three galleries. Overall, female adults seem to have taken this role more often than male adults. This finding is supported by Diamond's study on family behaviour in science centres which states that 'reading aloud' by family members occurred at only 6% of the exhibits (Diamond, 1986:150). The finding regarding adult female 'reading aloud' behaviour is in line with a recent study carried out by Borun and others which found that adult females had a higher 'reading aloud' performance indicator than adult males (PISEC, 1998:49).

It may be the case that adults do not read labels aloud often to other family members because they glanced at them and the content of labels is then paraphrased in their conversations, as shown by McManus (McManus, 1987). In order to explore whether labels are being used in the family encounter with an exhibit, an approach using recording and analysis of family conversations would be more appropriate than the observation of 'reading aloud' behaviour.

Type of conversation between family members at exhibits

The findings indicates that the most frequent 'type of conversation' used by adults at child-orientated exhibitions was '*chatting*' and '*telling what to do*'. '*Chatting*' is an informal way in which families keep in social context, explore, and exchange information about the exhibit. The '*telling what to do*' type of conversation is a one-way form of talking and can be authoritarian at times. Adults might also use the '*tell what to do*' type of conversation to *guide* children in what they are doing. The '*tell what to do*' type of conversation used in this research is different from the '*tell*' category used by Diamond in her study of family behaviour in science centres which encompassed all verbal interactions between family members (Diamond, 1986: 145,148), while this study focused on the occurrence (or not) of three types of conversation.

The '*explaining*' type of conversation, which is 'teaching' and informative in its approach, was found less frequently in all three galleries than the other two types of conversation (it was more frequent at the *All Hands Gallery* and less frequent at *Launch Pad*). It would seem that, in order for 'explaining conversation' happen, the exhibit subject must be familiar to adults (they need to feel confident about it) or explanatory labels offering easy access to information should be provided and located close to the manipulative elements of the exhibit and at child and adult eye-level.

The exhibit design and the nature of the activity/task, as well as a friendly and relaxed environment, might also contribute to encouraging verbal interactions between family members.

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In the next chapter, children's interaction with exhibits will be analysed from the perspective of the children's drawings. This method may provide useful insights to museum educators and exhibition planners into children's perceptions and understanding of their interaction with exhibits.

CHAPTER 5:
ANALYSIS OF CHILDREN'S DRAWINGS OF EXHIBITS AT THE THREE CHILD-ORIENTATED GALLERIES

5.1. INTRODUCTORY SECTION

5.1.1. INTRODUCTION

It is currently accepted that children's drawings are a relevant source of information and a significant way of gaining insights into the child's mind (Thomas & Silk, 1990; Gardner, 1980; Goodnow, 1977; Piaget & Inhelder, 1965). Different approaches have been taken to the study of children's drawings according to the field of study, for example, psychology, education, or art. Many scholars agree that drawings are a means by which children express naturally their inner self, thoughts, feelings, and view of the world around them. Another quality of drawings is that they are considered to be a free play activity and therefore, a self-motivated expression. Drawings are seen as a significant source of information about child development and considered to be of importance in the child's process of making sense of his/her environment.

The growing interest of researchers in children's drawings is due to recognition of the complexity of the process of executing a drawing. The richness of detail found in children's drawings also opens new lines of investigation. For example, there are very few studies which have attempted to investigate the representation of actions, activities, and experiences in children's drawings (Thomas & Silk, 1990:154). The present research is a contribution towards filling this gap.

The act of drawing is considered to be beneficial for children in different ways: it may have a positive effect on the child's general cognitive development and personal growth; it stimulates self-expression; it allows children to express emotions in a safe way; and it may help children in problem-solving situations and facilitate their thinking.

It is important to acknowledge that children's drawings involve many decision-making processes. They require the child to put a great deal of planning into the drawing 'task' (Freeman, 1980). Researchers should give careful consideration to these decision-making and planning processes.

In the present study, children's drawings were used as a qualitative research method and additional research tool which could give insights into children's experience of interaction with exhibits and into how different exhibit design elements may affect the child's perception and recollection of the exhibit (see research question no. 5, Chapter 3, page 113). As drawings have rarely been used as an evaluation tool of the museum experience of interacting with exhibits, some time will now be spent on outlining approaches taken in the study of children's drawings.

Drawing as a Play Activity

Several authors agree that the act of drawing is seen by the child as a kind of play (Piaget and Inhelder, 1969; Thomas & Silk, 1990; Yavuzer, 1995). Psychologists consider 'play' to be an important factor in child development. According to Piaget's developmental theory, play is one of the main activities involving assimilation. In assimilation, "the developing child tries to make sense of the environment using existing cognitive structures and ideas" (Thomas & Silk, 1990:62). Therefore, the act of drawing, seen as a play and spontaneous activity, can have an important assimilative function so contributing to the child's cognitive development.

Another quality of play is that it allows symbolic activities in which the child can re-act out situations and express their emotions. Yavuzer believes that when children are drawing, they feel themselves in a free play environment, so children feel at ease to express their 'true feelings' (Yavuzer, 1995:11). In psychoanalysis and other related therapies (such as art therapy), drawing is seen as an avenue in which individuals can project their emotions and, therefore, drawings are used to assess feelings.

Children's drawings, as a play activity, also have the quality of being self-motivating. This motivation stimulates children to concentrate on their drawing task.

Approaches Taken in the Study of Children's Drawings

Psychologists from different streams have assessed diverse aspects of children's drawings. The most common approaches they have taken are: developmental, clinical-projective, artistic, and process (Thomas & Silk, 1990).

The Developmental Approach

The developmental approach has been influenced by Piagetian theory and a view of children's drawings as an effort to represent the world and, therefore, as a means of revealing 'mental images' as well as the child's developmental stage. In their book *'The Child's Conception of Space'*, Piaget and Inhelder distinguished between three types of space relationships and ways in which figures and objects relate to one another in a drawing. The space relations defined by Piaget are: topological, projective, and eucledian structures. The topological space is characterised by relations of proximity, separation, order, enclosure and continuity. In this type of space, each figural object or pattern is considered in isolation in the drawing. The projective and eucledian spaces are more complex in organisation and are developed in a later stage of child development (Piaget & Inhelder, 1965:153). These latter types of spacial relationships are seen by Piaget as 'comprehensive systems', since in such spaces all figures are co-ordinated within a whole. Also, the child begins to express objects and patterns from his/her own point of view.

One of the main ideas developed by Piaget is that spatial concepts represent internalised actions (Piaget & Inhelder, 1965:454). Piaget argues that, in the early stages, thought reproduces the action. As children grow, the coordination of physical actions is accompanied by an internal coordination of schemata. In the concrete operational stage, enclosing the age period from 7-8 to 11-12 (the age period considered in the present study), *"schemata are coordinated sufficiently to be combined and [...] mentally explored in alternate directions".* Piaget talks about 'the formation of trains of ideas'. This stage represents a truly operational system (Piaget & Inhelder, 1965:455) and is the basis which is needed for later abstract thinking.

The view that spatial concepts represent internalised actions which give rise to internal schemata are of particular interest to those museums which use an interactive approach. The drawings collected in the present study can be seen as a representation of schemata arisen from the child's experience in exhibits designed for interaction, expressed visually rather than linguistically.

The Clinical-projective approach

The direction taken by the clinical-projective approach has been to use drawings as a means to assess emotion and personality. This approach is influenced by psychoanalytic theory originating in the work of Sigmund Freud (Thomas & Silk, 1990:64). The Freudian point of view suggests both that children's drawings are greatly influenced by subconscious desires and fears and, also, are a safe way to express 'hidden' emotions (Yavuzer, 1995:25-26). Psychologists believe that the act of drawing can have a beneficial and satisfying effect on the child as it can provide children with the opportunity to express feelings and instinctive impulses as well as giving them a sense of mastery over situations (Thomas & Silk, 1990:65). The clinical-projective approach is also applied in other psychoanalytic approaches, such as art therapy. An important element in art therapy is the encouragement of self-expression.

The Artistic Approach

The artistic approach has been mainly influenced by the work on visual perception and visual thought of Rudolf Arnheim (Arnheim, 1969, 1956). Arnheim believes that the elements or units which individuals choose to represent in a drawing are based on the perceived 'structure' of the original. So, the drawing is not a replica of the original but, rather, an arrangement based on the set of concepts one has available and the visual vocabulary at one's disposal (Goodnow, 1977:33,35). He considers visual balance and the search of order to be a chief principle in composition.

Educationalists such as Michaela Strauss and Viktor Lowenfeld stressed that the opportunity for spontaneous self-expression in art promotes personal growth (Thomas & Silk, 1990: 31) and stimulates creative expression.

The Process Approach

According to Thomas, one of the main recent developments in the study of children's drawings is "the shift from viewing drawings as a 'print-out' of mental contents to considering them as constructions whose final form depends crucially on the procedures used to produce them" (Thomas & Silk, 1990:32). He argues that a 'surface' approach to a child's graphic representation may lead to misleading interpretations.

Cultural and Social Influences

Some authors have discussed the influence of cultural and social factors on children's drawings.

Howard Gardner stressed that is important to take the cultural dimension into consideration in the interpretation of children's drawings, since the world is 'enwrapped in meanings' (Gardner, 1983:299; Moussouri, 1997:43).

Arnheim stressed that Western culture is preoccupied mainly with words, and that little attention is paid to visual perception and visual thought (Goodnow, 1977:11). Yavuzer also points out that, in general, in Western countries, drawing does not have a special importance in school programmes. As a result, older children finish up prioritising language as a way of expressing themselves (Yavuzer, p.63).

Religion, traditions, and economic situations may influence the themes depicted by children. Gender differences have been noticed in the choice of subject matter and representation of the human figure and sex (Thomas & Silk, 1990:68). Regarding social influences on children's drawings, these can be promoted, for example, by the encouragement or example (or not) of parents and school teachers.

Developmental Stages in Children's Drawings

Although the discussion about developmental stages is always a controversial one, different authors agree that, as children grow older, there are common changes and developments in their graphic representation according to age or age ranges.

Jean Piaget analysed children's drawings according to the developmental stages developed in his theory (Sensory-motor stage, Pre-Operational Stage, Concrete Operational Stage, and Formal Operational Stage).

In his book, Thomas and Silk described four developmental stages in children's drawings (18 months to 2.5 years; 2.5 to 5 years; 5 to 8 years; and 8 to adolescence) and their general characteristics (Thomas & Silk, 1990:34). They describe the concepts of '*symbolic realism*', '*intellectual realism*', and '*visual realism*', which are used by them to classify drawings. In '*symbolic realism*', found in the stage between 2.5 to 5 years, the representation of a topic functions as a symbol and does not attempt to represent the reality accurately. In '*intellectual realism*', found in the stage between 5 to 8 years, the 'transparence' phenomenon appears in children's drawings. In this type of drawing, children show the content of things that in general would be hidden and not seen, such as a baby in a mother's tummy or the interior of a house seen from outside it. In '*visual realism*', found in children aged 8 and older (the age range used in this study), children attempt to depict depth, proportions and relationships between objects.

Another categorisation of developmental stages in drawings was used by Yavuzer in his book '*Children Draw and Tell*' (see also Yavuzer, 1994). His classification is relevant to the present study since the two later age ranges he uses (7-9 and 9-12) can be compared directly to those used in this study. He distinguishes five stages of development in children's drawings: Scribbling Stage (age 2-4), Pre-schematic Stage (age 4-7), Schematic Stage (age 7-9), Realistic Stage (age 9-12), and Visually Naturalistic Stage (age 12-14).

The main aspects of Yavuzer's description of drawing developmental stages are reported below (Yavuzer, [s.l.]: 31-67). This description presents a general view of the most common characteristics of each stage, according to age range:

. In the *Scribbling Stage (age 2-4)*, the child draws randomly on paper. In general, children do not use a baseline in the picture, nor calculate distance. In these first years, the act of drawing is seen as one more way in which children develop their 'motor skills' (this viewpoint is supported by Piaget's studies and by Arnheim), so it is considered to be a reflection of the child's physical and intellectual development .

. In the *Pre-schematic Stage (age 4-7)*, children start to develop a relationship with the object, with colours, and attempt to expose emotions and thoughts. They do not draw bodily proportions realistically, but may exaggerate aspects in the drawing which have an important significance for them.

. In the *Schematic Stage (age 7-9)*, according to Yavuzer, children will have developed opinions about their environment. These opinions will appear in children's drawings as a kind of schema. A *'schema of an object'*, states Yavuzer, *'is represented with a resulting concept formed by the knowledge the child possesses about the object'* (Yavuzer, p.56). At this stage, the most important achievement is the development of the organisation of relationships in space. Items are not drawn individually, but in relationship with other things. Children now begin to draw from a particular point of view. The notion of depth and proportion develops, as well as the realistic use of colours.

. In the *Realistic Stage (age 9-12)*, children adopt a more realistic approach to drawing. They are interested in details and use colours in a realistic manner. A difference in the choice of subjects between boys and girls starts to appear.

. In the *Visually Naturalistic or Logical Stage (age 12-14)*, which corresponds to early adolescence, children are conscious of their environment and gender characteristics. Space relations between proportions, sizes, depths tend to be realistic, as does the representation of the human figure, colours and the environment. Social relationships are depicted with more frequency.

5.1.2. USING DRAWING AS A RESEARCH AND EVALUATION TOOL

Children's drawings have been used by researchers from the psychological and educational fields in an attempt to assess different aspects, such as children's emotions, thoughts, personality, interpersonal relationships, child development stage, environmental perceptions, and learning.

In museum education and visitor studies, researchers have used drawings as an attempt to evaluate educational programmes and exhibitions, learning outcomes (McClafferty, 1995), how children structure information (Diamantopoulou, 1997), spatial skills (Moussouri, 1993) and children's understanding and perceptions of the exhibit (as in the present study). Some evaluation studies using children's drawings aim at testing exhibit design goals (Coe, 1988).

The data collection methods used in these studies vary, as well as the purpose of the enquiry. Some researchers may ask children to make a drawing immediately after the visit; others may ask children to make a drawing a week later. For instance, in his study McClafferty asked children to make a drawing of what they best liked about their visit immediately after their return to school (on the same day of the visit); Mossouri visited the school group in their classroom one week after the school visit to the museum and asked the children to draw a museum object of their choice and to depict it in its original context (e.g. the historical context to which the object belonged). In the present study, children were asked to make a drawing immediately after their visit to the gallery, while their parents were being interviewed (families were assembled around a table close to the gallery exit. See also Chapter 3, 'Data Collection Procedures').

Although nowadays children's drawings are widely accepted as a revealing representation of children's thoughts, there are no set ways to analyse their drawings. Analytic approaches depend on the purpose of the research enquiry.

5.1.3. DESCRIPTION OF THE SAMPLE OF DRAWINGS & ANALYTIC METHOD EMPLOYED IN THE ANALYSIS OF CHILDREN'S DRAWINGS

Sample of Drawings

A hundred and twenty drawings were collected from a total of 150 children interviewed in the three museums. Since children were free to choose if they wanted to draw or not, some of them preferred not to draw. Each drawing represents one child, so the total of drawings represents the number of children who made drawings. Since drawing was a free choice activity, the number of drawings differs between the sites. The Science Museum accounted for a total of 46 drawings, the National Maritime Museum for 36 drawings and Eureka! for 38 drawings. Table 5.1 shows the distribution of drawings in each museum and age group.

As the years covered by each age range differ (3:2), there is a greater number of drawings from age group 7-9 (which covers three years) than from age group 10-11 (which covers two years). As shown in Table 5.1, the age group 7-9 accounted for 75 drawings (31 at the Science Museum, 21 at the National Maritime Museum, and 23 at Eureka!), and age group 10-11 accounted for 45 drawings (15 at the Science Museum, 15 at the National Maritime Museum, and 15 at Eureka!).

Table 5.1.1: Sample of children's drawings per museum and age group

Sites:	Science M.	Nat. Maritime	Eureka!	ALL
No. of drawings:	*n*	*n*	*n*	*n*
Children's age groups				
Ages 7-8-9	31	21	23	75
Ages 10-11	15	15	15	45
Total drawings	46	36	38	120

(Note: 'n' refers to the number of drawings per child)
Sites: Science Museum; National Maritime Museum; and Eureka! The Museum for Children

Analytic Method

In the present study, the drawings were analysed using criteria based on the presence or absence of elements in the picture which would indicate a child's understanding and perceptions of the exhibit, as well as the child's feelings about and experience of using it. A similar approach has been taken previously by Terence McClafferty in his doctoral research on examining the learning outcomes in science centres exhibits (McClafferty, 1995). Aesthetic criteria were not used in this study.

In addition to the analysis of the entire sample of drawings from children aged 7 to 11 in the three sites investigated, the drawings were further divided for analysis into two age groups: 7-9 and 10-11, in order to accommodate an expected difference in representation according to stage of development (Thomas & Silk, 1990; Yavuzer, [s.l]).

The analytic method applied was 'bottom-up' in nature as categories were derived from the data. Elements from the individual drawings which presented the same characteristics were grouped and listed and categories were drawn; the records for all drawings were then sorted into the categories specified and quantified.

Prior to categorisation, the researcher prepared a description of the main exhibit elements of the displays depicted in the children's drawings summarising the following aspects: manipulative elements, main elements, colours of the exhibit, and outcome or purpose of it. This description was used as a reference during the analysis of each drawing (see Appendix D).

Twelve categories were derived from the children's drawings (definitions are presented below) according to elements present in the drawings and areas of interest defined by the researcher, with the aim of building a framework to support understanding of the children's drawings and their depiction of their experiences at the exhibits. The drawing categories are related to the exhibit, the child, and the use of language and colour in the drawing. Areas of interest defined by the researcher are related to the cognitive and affective aspects of the children's museum experience, such as their understanding of the exhibits, feelings and the social context of the visit. In the drawings, such areas are

represented by: understanding and recall of the exhibit (depiction of exhibit characteristics and outcomes); the child's interaction with the exhibit; representation of manipulative elements of the exhibit; realistic use of colours; use of language as text within the drawing to clarify or reinforce ideas; and representation of social interactions and feelings.

The categories used to analyse the drawings are described below. They are ranked according to the frequency of drawings in each category in all three sites together (see Table 5.2 below). As several elements of interest could be represented in a single drawing, a drawing could be placed in several categories at the same time.

Table 5.1.2:
Categories used in the analysis of children's drawings and their representation
N= 120 drawings (from 120 children)

		Drawings per category:	
		n	***%***
Rank	Categories		
1	**Main exhibit elements represented**	91	76%
2	**Manipulative elements of exhibit emphasised**	89	74%
3	**Outcome / purpose of manipulation**	68	57%
4	**Realistic use of colour**	47	39%
5	**Child represented in drawing**	32	27%
6	**Labels / instructions indicated**	27	23%
6	**Titled drawing / elements of drawing labeled**	27	23%
8	**Enjoyment**	22	18%
9	**Generalised museum subject**	18	15%
10	**Mixed exhibits from children's and other galleries**	17	14%
11	**Exhibit elements missing / partially represented**	12	10%
12	**Social interaction**	4	3%

(Note: 'n' refers to number of drawings in a particular category. A drawing can be placed in several categories at the same time. Percentages were rounded)

The categories drawn from the analysis of children's drawings are described below:

1. Main exhibit elements represented: the main elements of an exhibit were considered the ones which *characterise* the exhibit. When the main exhibit elements were represented in the drawing, they may indicate that the child perceived the exhibit in its integrity.
(Note: the presence of the main exhibit elements in the drawing were looked for - not the 'aesthetic' or 'nice' representation of them.)

2. Manipulative/interactive elements of exhibit emphasised: the manipulative elements of an exhibit were considered the ones which the child has to touch in order to use the exhibit. When these elements were represented in the drawing, they might indicate that the concrete experience of manipulating an exhibit remained impressed in the child's mind.

3. Outcome/purpose of manipulation/interaction illustrated: when the child depicted in his or her drawing the outcome of the exhibit, it indicates that the child got a message from the exhibit. The outcome of the exhibit illustrates *what* the child understood from his or her encounter with the exhibit.
(Note: the drawing may have details which show evidence of dynamism, movement, or action, such as speed, sound, voice, air, wind, etc, as 'outcomes'.)

4. Realistic use of colour: the 'realistic use of colour' category was defined when at least one of the main colours of the exhibit was used to represent it. Since children made their drawings outside the gallery (and not in front of the exhibits), it means that they draw the exhibit 'by memory', and that colour might be part of the episodic memory of the child's experience with the exhibit. It also indicate the child's desire to represent the reality, which shows that the child is actively interacting with it.

5. Child represented in the drawing: the representation of the child him/herself in the drawing is a sign that the exhibit had a personal impact on the child. It might also indicate that the child valued the concrete experience provided by the exhibit. The child may have depicted him/herself in the drawing interacting with the exhibit or observing it.

6. Labels / instructions indicated: children may have represented exhibit labels or instructions in their drawings. Since labels are an integrated part of the exhibit, their presence in children's drawings is an indication that children in the age range 7 to 11 took notice of labels and found them relevant for representation.

7. Titled drawing / elements of drawing labeled: the child may have given a title to the drawing and/or labeled part of its elements. Doing so, the child is aiming at explaining parts of the drawing or clarifying the exhibit thematic and is expressing his/her ideas through written language. For this reason, this type of expression is important in the understanding of the child's thoughts about it.

8. Enjoyment: children may have expressed feelings of enjoyment in their drawings by writing or by face expressions (e.g. smile). These expressions are a clear evidence of the child's emotional state about his or her experience of interacting with the exhibit. Enjoyment is considered to be an important element of the child's experience in a child-orientated exhibit because it creates a *state of mind* in which the individual is more open to new experiences.

9. Generalised museum subject: in this case, the child's drawing does not relate to the children's gallery specifically, but represents something related to the general museum subject (such as maritime things, at the National Maritime Museum and space crafts, at the Science Museum). It might indicate that the child got interested in other things from the museum other than the children's gallery or that the child-orientated .gallery did not have a strong impact on the child.

10. Exhibit elements missing or partially represented: sometimes an incomplete version of the exhibit was drawn by the child, portraying only a few elements of it, so giving a partial view of the exhibit. This might indicate that the child had a partial view of the exhibit and might not get the full meaning of it.

11. Mixed exhibits from children's and/or other galleries: some children may have depicted mixed objects or exhibits seen in the museum from the children's and/or other galleries. Those depictions might give an insight on the things that were more memorable for the child during him or her visit to the museum and might express his or her varied perception of the visit.

12. Social interaction: social interaction is an important aspect of a child-orientated exhibition due to the opportunity for socially-shared learning. Therefore, it should be taken into account in studying children's experience in museums. This category refers to drawings in which the child have depicted him/herself using the exhibit together with someone else, indicating that s/he valued the social interaction experience offered by the exhibit.

5.2. EXAMPLES OF CHILDREN'S DRAWINGS FROM THE SITES INVESTIGATED AND RESPECTIVE DRAWING CATEGORIES

The drawings presented in this section as examples were collected in the three child-orientated exhibitions investigated: the *All Hands Gallery*, National Maritime Museum, London; *Launch Pad*, Science Museum, London; and *Me & My Body*, Eureka! The Museum for Children, Halifax.

Each of the twelve categories derived from the children's drawings and used in the analysis is illustrated by a pair of examples (or more), giving a total twenty-seven illustrative drawings. The categories are presented according to their ranking. Most drawings portray more than one category of analysis (the categories are indicated in the text to each drawing).

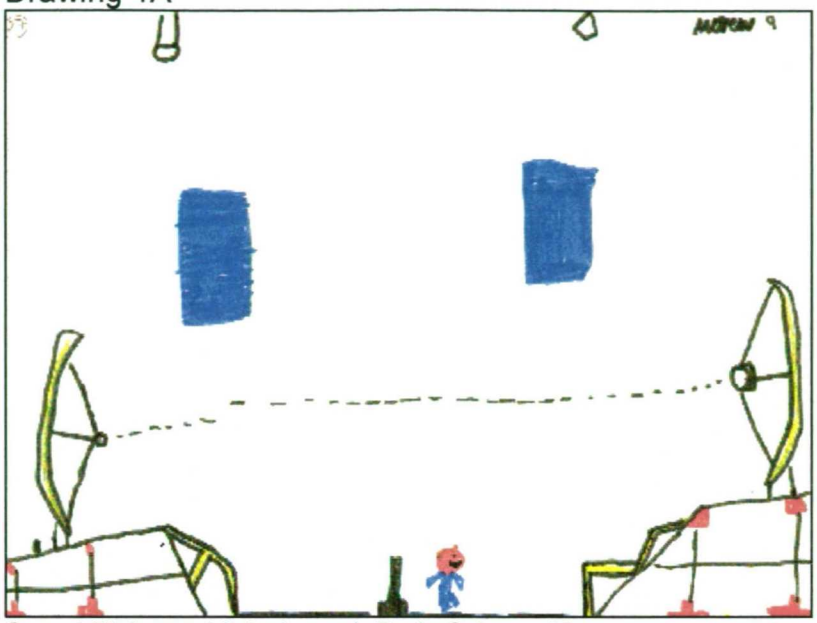
The examples are used in order to illustrate the categorical criteria employed. Each drawing is followed by an explanation and comment. The child's age, the exhibit and the site are indicated on each drawing.

The children's drawings shown here exemplify encounters with the exhibit(s) in the three sites investigated. They represent, therefore, children's experience and actions with such displays as well as their feelings and ideas.

CATEGORY 1 (example I):
MAIN EXHIBIT ELEMENTS REPRESENTED

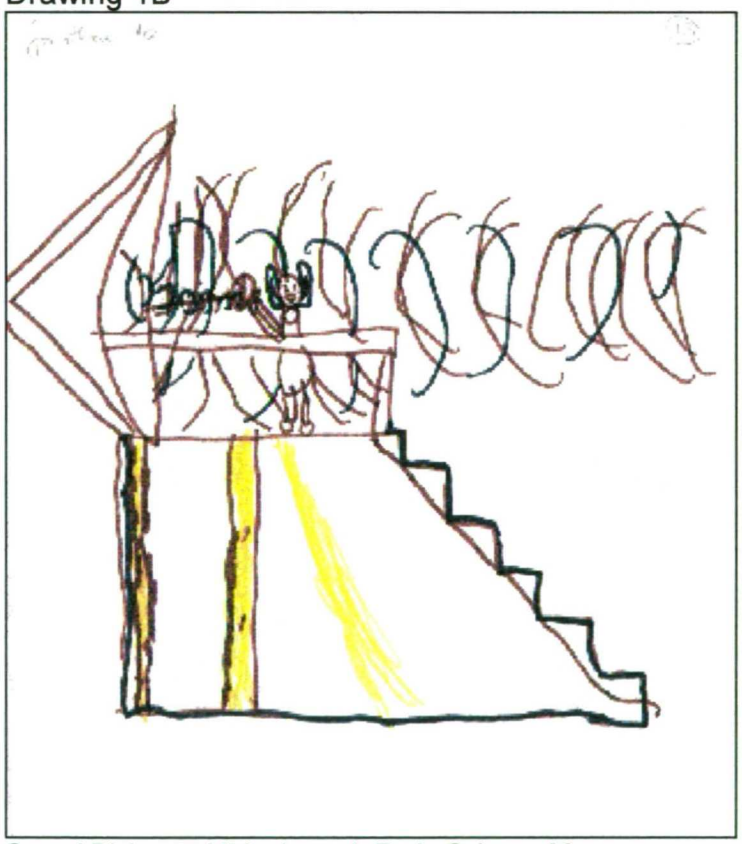
(see comments on the next page)

Drawing 1A



Sound Dishes exhibit, Launch Pad, Science Museum
by Mathew, age 9

Drawing 1B



Sound Dishes exhibit, Launch Pad, Science Museum
by Johnattan, age 10

CATEGORY 1 (example I):
'MAIN EXHIBIT ELEMENTS REPRESENTED'

'Sound Dishes' exhibit, Launch Pad, Science Museum

Drawing 1A:
Representation of the Sound Dishes exhibit by a boy aged 9. He attempted to represent the exhibit and the environment (physical context), with windows, lighting, the true colours of the exhibit (basically yellow) and the Turntable exhibit which is in between the two sound dishes. He also represented the educational outcome of the exhibit in a dynamic way (showing sound being sent between the 'satellite dishes' in a straight line). He drew himself with an expression of enjoyment in that environment.

Categories in Drawing 1A (ScM, 27):
child represented in drawing; main exhibit elements represented; manipulative/interactive element(s) included; outcome of interaction illustrated (sound); realistic use of colour; enjoyment; mixed exhibits from the children's gallery (sound dishes, turntable).

Drawing 1B:
Representation of the Sound Dishes exhibit by a boy aged 10. He represented himself in the centre of the action and the outcome of the interaction (sound traveling in waves and being bounced on to and off the 'satellite' dishes). He exaggerated elements of the outcome of the interaction, such as big waves (sound traveling) and big ears on himself (to listen the sound). He is looking outside the drawing and shows enjoyment.

Categories in Drawing 1B (ScM, 13):
child represented in the drawing; main exhibit elements represented; manipulative/interactive elements included; outcome of interaction illustrated (sound); enjoyment.

Comment:

Both children depicted the exhibits in detail and represented the outcome of the interaction (sound), suggesting that these two children got the *main idea* of the exhibit. Sound was represented in a dynamic way traveling in space. The Sound Dishes exhibit is a good example of an exhibit which supports different levels/degrees of understanding and depth of response. Drawing 2B, from a boy aged 10, clearly shows a deep understanding of the exhibit purpose and functioning.

CATEGORY 1 (example II): MAIN EXHIBIT ELEMENTS REPRESENTED

(see comments on the next page)

Drawing 1C

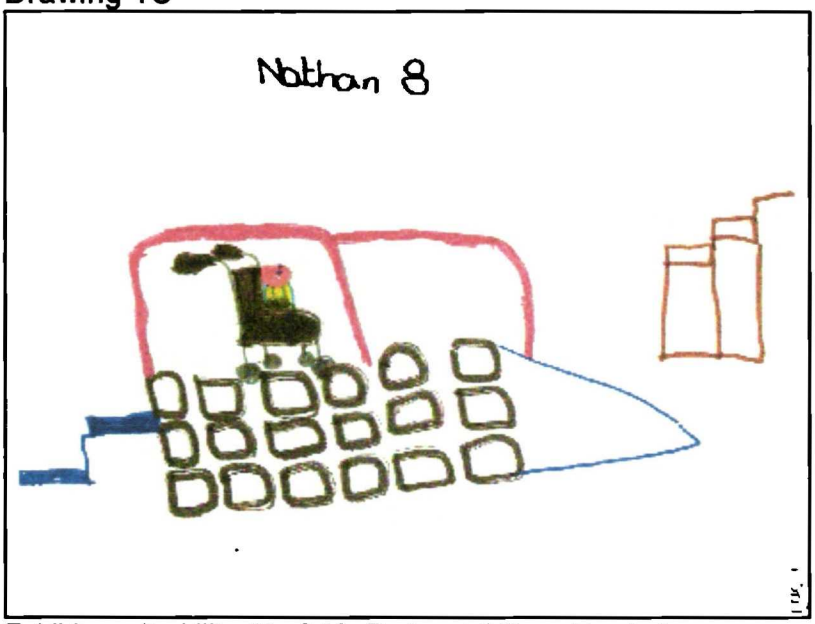


Exhibit on disability, Me & My Body exhibition, Eureka!
by Nathan, age 8

Drawing 1D

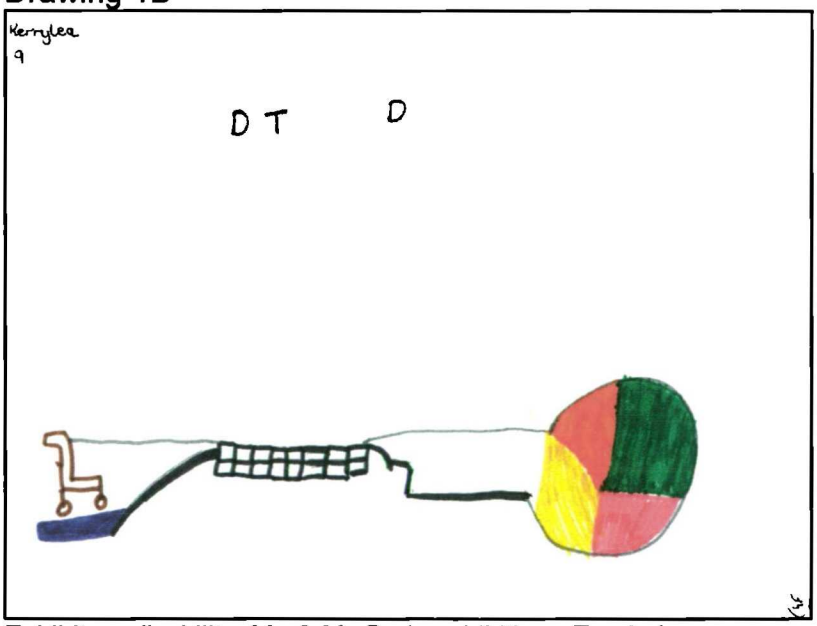


Exhibit on disability, Me & My Body exhibition, Eureka!
by Kerrylea, age 9

CATEGORY 1 (example II):
'MAIN EXHIBIT ELEMENTS REPRESENTED'

'Exhibit on Disability', Me & My Body exhibition, Eureka!

Drawing 1C:
A boy aged 8 (who was not disabled) represented himself on a wheelchair exhibit at the Disabled exhibit. The paving stone path was drawn in an unrealistically large size, pointing out the difficulty in riding in a wheelchair in this type of surface.

Categories in Drawing 1C (Euk, 50):
child represented in the drawing; main exhibit elements represented; manipulative/interactive element(s) included (wheelchair); outcome of interaction illustrated (experience of being a disabled person).

Drawing 1D:
Representation of the Disabled exhibit by a girl aged 9. She drew in detail the path in which she had to go with the wheelchair, with many irregularities in the path surface, the paving stones, and some slopes. She had to pass all these obstacles in order to arrive at a more 'safe' area (coloured circle area). She expressed her enjoyment in writing.

Categories in Drawing 1D (Euk, 34):
main exhibit elements represented; manipulative/interactive element(s) included (wheelchair); purpose of interaction illustrated (a difficult path you have to negotiate in a wheelchair); enjoyment (in writing).

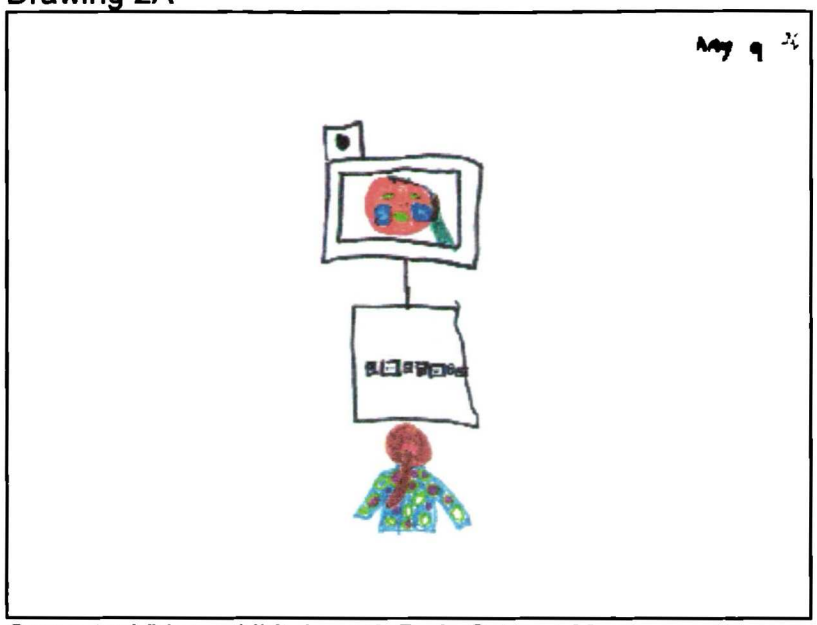
Comment:

This exhibit on disability aims to show children, through role-play, how difficult it can be for a person with a physical disability to walk or move in places that are not suitable or properly planned for them. Both children gave in their drawings a strong importance to the main exhibit elements, such as the 'path' they had to cross as a disabled person in the exhibit. They also represented manipulative/interactive elements of the exhibit such as the wheelchair. They both attempted to show how difficult it can be to use a wheelchair on an irregular, rough/paving stone surface, suggesting that they understood the educational purpose of the exhibit.

CATEGORY 2:
MANIPULATIVE ELEMENTS OF EXHIBIT EMPHASISED

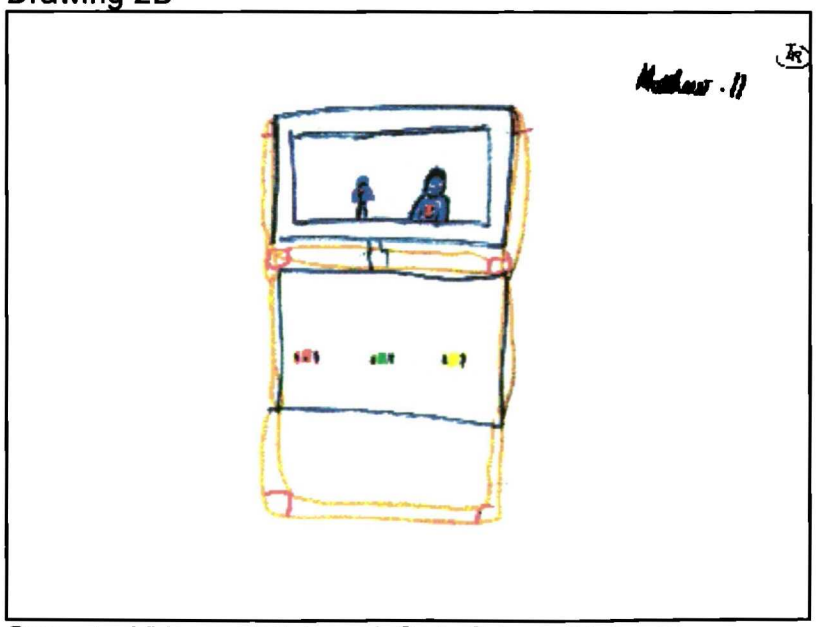
(see comments on the next page)

Drawing 2A



Computer Video exhibit, Launch Pad, Science Museum
by Amy, age 9

Drawing 2B



Computer Video exhibit, Launch Pad, Science Museum
by Mathew, age 11

CATEGORY 2:
'MANIPULATIVE ELEMENTS OF EXHIBIT EMPHASISED'

'Computer Video' exhibit, Launch Pad, Science Museum

Drawing 2A:
Representation of the Computer Video exhibit by a girl aged 9. She attempted to represent herself in realistic colours (the way she was dressed) and her digitalised image (exhibit outcome) in the monitor screen. The manipulative elements of exhibit (buttons) are represented clearly.

Categories in Drawing 2A (ScM, 26):
child represented in drawing; main exhibit elements represented; manipulative element(s) included; outcome of interaction (digitalised image); realistic use of colour.

Drawing 2B:
Representation of the Computer Video exhibit by a boy aged 11. He attempted to represent realistically the exhibit colour (yellow), the manipulative elements of exhibit (coloured buttons), as well as the digitalised image of himself in the monitor screen. He is outside the drawing, but represented in it through his image.

Categories in Drawing 2B (ScM, 48):
child represented in the drawing (his image in the computer); main exhibit elements represented; manipulative elements included; outcome of interaction (digitalised image); realistic use of colour.

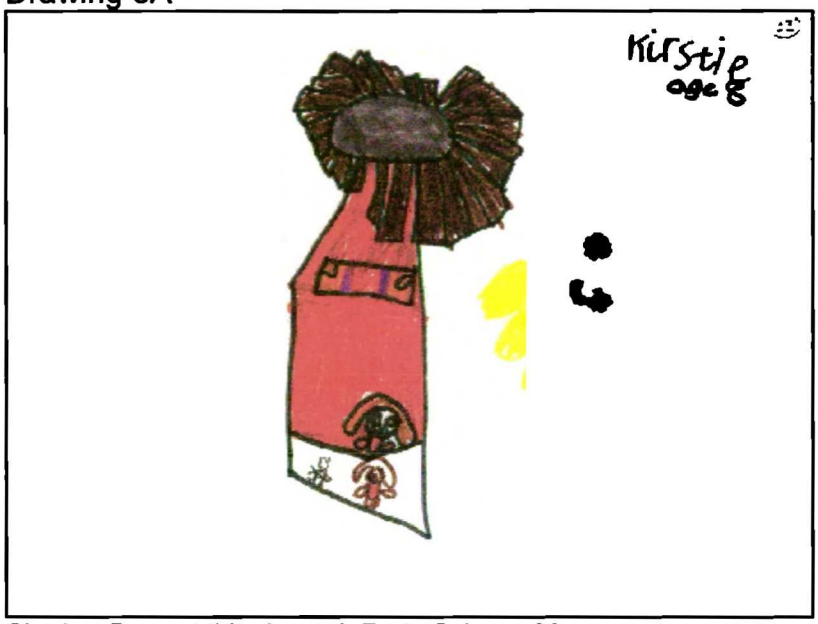
Comment:

Both children represented the manipulative elements of exhibit clearly (buttons) and the exhibit outcome (their own image digitalised in the monitor screen), and aimed at representing the outcome image realistically, with colours and size changes in their image giving different patterns. The girl aged 9 drew herself in the drawing, showing that there is a connection between the outcome (image) and the object of the outcome (herself). The boy aged 11 abstracted himself from the drawing, showing his 'transformed' image on the screen (he is outside the drawing). These two representations illustrate how concrete experiences can shape the child's perception of the exhibit experience.

CATEGORY 3:
OUTCOME OF MANIPULATION

(see comments on the next page)

Drawing 3A



Shadow Box exhibit, Launch Pad, Science Museum
by Kirstie, age 8

Drawing 3B

Shadow Box exhibit, Launch Pad, Science Museum
by Dora, age 11

CATEGORY 3:
'OUTCOME OF MANIPULATION / INTERACTION ILLUSTRATED'

'Shadow Box', Launch Pad, Science Museum

Drawing 3A:
Representation of the Shadow Box exhibit done by a girl aged 8, describing the 'process' of forming a shadow on a screen and its fading after a few seconds (process and outcome of exhibit). Although the perspective is not realistic, the girl represented all the main exhibit elements: the box (house), the light reflector (flash) on the back, herself, her shadow on the screen, the shadow fading. The child also drew another exhibit from the gallery (the Turntable).

Categories in Drawing 3A (ScM, 33):
child represented in the drawing (in the centre of action); main exhibit elements represented; manipulative/interactive element(s) included; outcome of interaction illustrated (shadow); enjoyment (smile); mixed exhibits from the children's gallery (shadow box, turntable).

Drawing 3B:
Representation of the Shadow Box exhibit done by a girl aged 11, describing her shadow on the screen (outcome of exhibit). She is outside the drawing, but represented in it through her shadow.

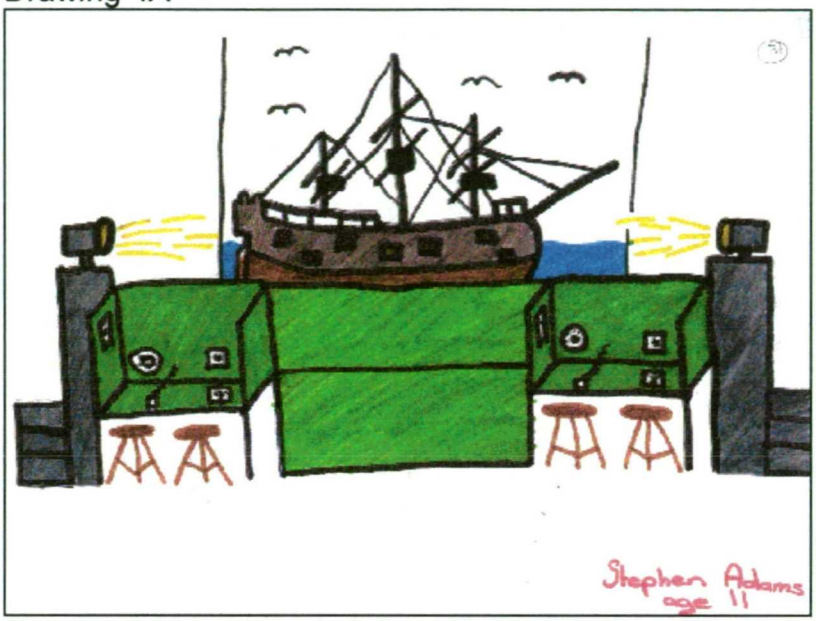
Categories in Drawing 3B (ScM, 19):
child represented in the drawing (her shadow); main exhibit elements represented (screen, button, shadow); manipulative elements included (button); outcome of interaction illustrated (shadow).

Comment:

Both children showed in their drawings an understanding of the exhibit through the representation of the outcome of the interaction. The depiction also illustrate two different developmental stages. The girl aged 11 was able of abstract thinking about 'shadows'. She drew her shadow only (not herself). The drawing of the girl aged 8 is a representative of a concrete operational stage thinking, since she is at the centre of the experience.
These two depictions of the outcome of the Shadow exhibit indicate that it is possible to use drawings as a research tool into children's understanding of museum exhibits, since the drawing can clearly represent the child's perception of her experience with the exhibit and indicate what the child might have learned from the encounter with it.

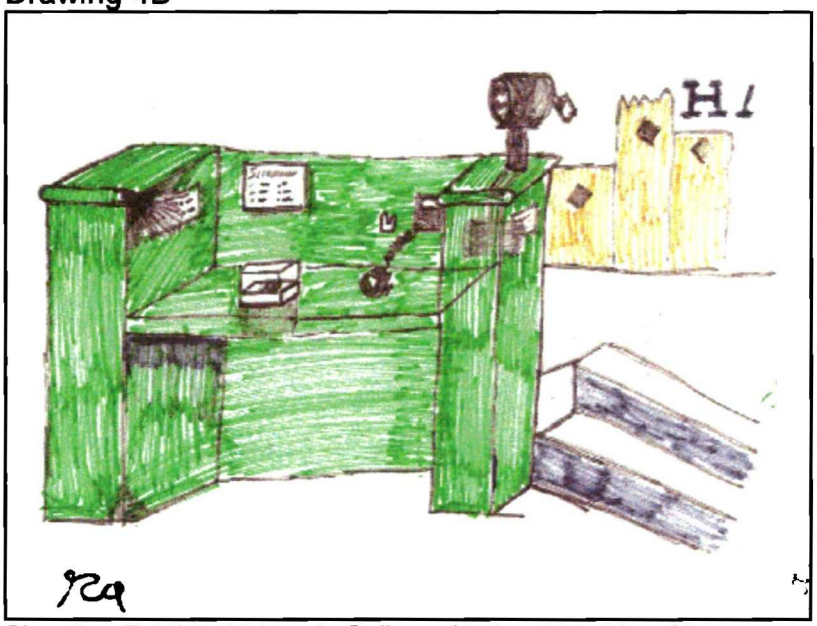
CATEGORY 4:
REALISITIC USE OF COLOUR
(see comments on the next page)

Drawing 4A



Signaling Exhibit, All Hands Gallery, National Maritime Museum
by Stephen, age 11

Drawing 4B



Signaling Exhibit, All Hands Gallery, National Maritime Museum
by Robert, age 11

CATEGORY 4:
'REALISTIC USE OF COLOUR'

Signaling exhibit, All Hands Gallery, National Maritime Museum

Drawing 4A:
Representation of the Signaling exhibit (includes Morse Code, Flags, and Flash Lights), All Hands Gallery, National Maritime Museum, by a boy aged 11. The exhibit is represented with many details and in a realistic way. It gives a complete birds-eye view of the exhibit, its background setting, and its two-sided nature designed in order to allow social interaction (sending messages from one side to another). The use of perspective shows that the boy is advanced in his drawing style.

Categories in Drawing 4A (NNM, 31):
main exhibit element(s) represented; manipulative element(s) included; outcome (flash lights); labels indicated; realistic use of colour.

Drawing 4B:
Representation of the Signaling (Morse Code) exhibit, All Hands Gallery, National Maritime Museum, by a boy aged 11. The child drew a realistic representation of the exhibit, making use of perspective and the actual colours. Similarly to the above boy, also aged 11, he did a realistic representation with many details. However, he represented one side of the exhibit only, not showing the possibility of social use of the exhibit.

Categories in Drawing 4B (NMM, 23):
main exhibit element(s) represented; manipulative element(s) included; labels indicated; realistic use of colour.

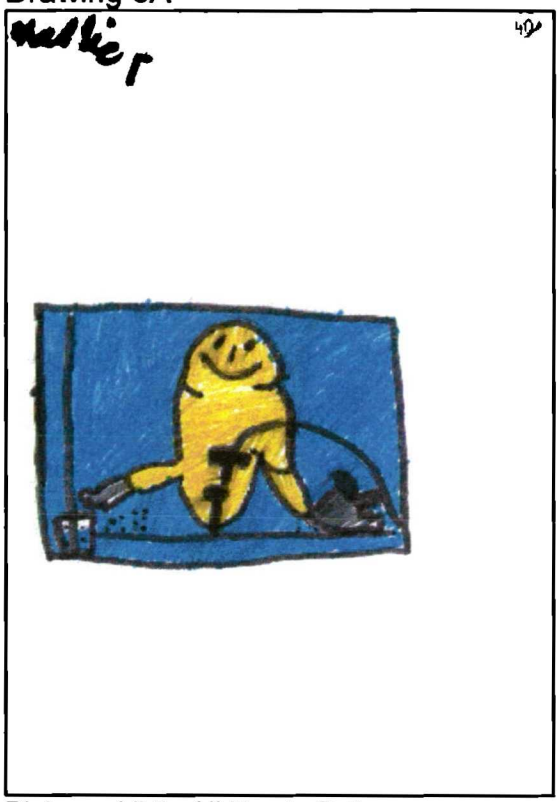
Comment:

These two drawings from children aged 11 are a good example of children's abilities to draw realistically and proportionately as they approach adolescence. Both eleven year-old boys attempted to use colours realistically and neither represented himself in the drawing.
These two depictions of the Signalling exhibit are rich in details, indicating good observation skills. Since the children in the sample made their drawings of the exhibit 'by memory', outside the gallery, it indicates that colour is part of the child's memory of the exhibit, suggesting that colour is an important element to be considered in the design of a child-orientated exhibit.

CATEGORY 5:
CHILD REPRESENTED IN THE DRAWING

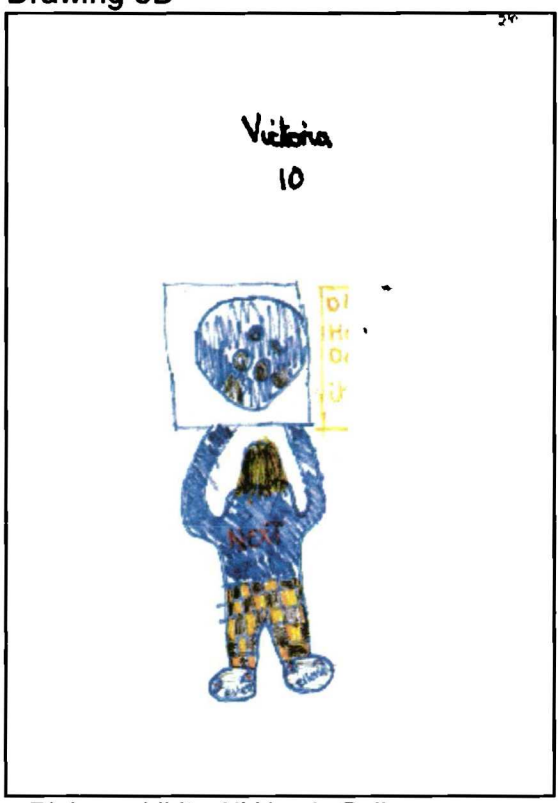
(see comments on the next page)

Drawing 5A



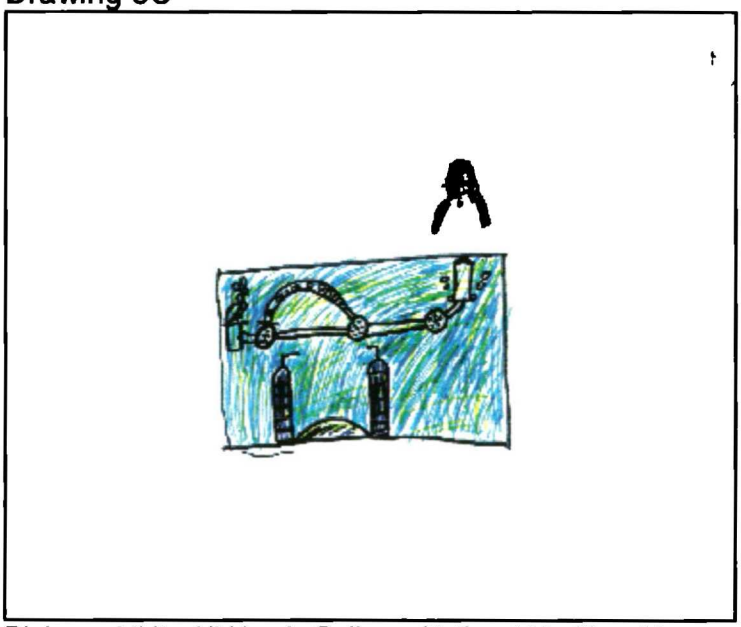
Diving exhibit, All Hands Gallery
National Maritime Museum
by Charlie, age 7

Drawing 5B



Diving exhibit, All Hands Gallery
National Maritime Museum
by Victoria, age 10

Drawing 5C



Diving exhibit, All Hands Gallery, National Maritime Museum
by Richard, age 11

CATEGORY 5:
'CHILD REPRESENTED IN THE DRAWING'

Diving exhibit, All Hands Gallery, National Maritime Museum

Drawing 5A:
Representation of the Diving exhibit, All Hands Gallery, National Maritime Museum, by a boy aged 7. He represented himself 'melted' into the exhibit (he IS the exhibit). He showed an understanding of what he was supposed to do with the exhibit: he had to work with the valves in order to stop the bubbles going out of the tubes (the purpose of the exhibit is to give an idea of how it feels working underwater). He also represented his enjoyment from the interaction (smile).

Categories in Drawing 5A (NNM, 40):
child represented in the drawing (in the centre of action); main exhibit element(s) represented; manipulative element(s) included (gloves); outcome of interaction illustrated (bubbles); enjoyment (smile).

Drawing 5B:
A girl aged 10 represented herself interacting with the exhibit and involved with the activity. She drew the label which says 'Diving: how does it feel?', indicating that she was investigating the 'feeling' of working underwater.

Categories in Drawing 5B (NMM, 24):
child represented in the drawing (in the centre of action); main exhibit element(s) represented; manipulative element(s) included (gloves); labels indicated; elements of the drawing labeled (she labeled her clothes with their trademark); realistic use of colours (her clothes).

Drawing 5C:
A boy aged 11 drew the Diving exhibit in detail. He showed a high level of abstract and spatial thinking, since he represented the exhibit as if he was watching it from above. Another characteristic is that he depicted himself outside the action, as an observer.

Categories in Drawing 5C (NMM, 45):
child represented in the drawing (outside the action); main exhibit element(s) represented; manipulative element(s) included (gloves); outcome of interaction illustrated (bubbles).

Comment:

Three examples of depictions where children represented themselves in the drawing. In the first drawing (5A), the child *integrated* himself with the exhibit; in the second one (5B), the child depicted herself in the centre of the action; and in the third drawing (5C), the child depicted himself outside the action.
These drawings present a richness of details: manipulative and main elements of the exhibit, its outcome, its colours, among other things. Those drawings indicate that the children observed the exhibit in detail and that they were able to remember its form and purpose. It might mean that, when the child represents his or herself in the drawing, the child feels that the experience had a personal meaning to him/her (this should be further investigated). These drawings indicate that these children valued the opportunity of the concrete experience provided by the exhibit.

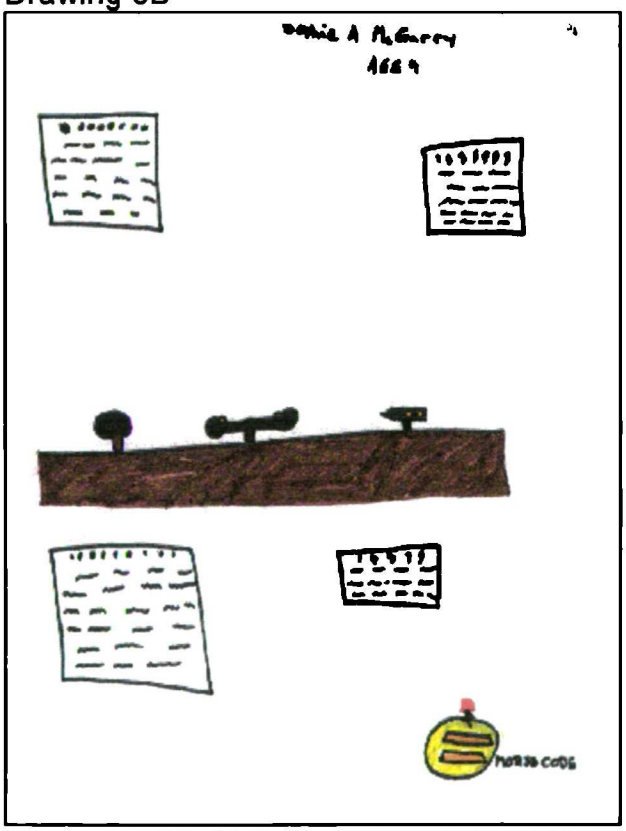
CATEGORY 6:
LABELS / INSTRUCTION INDICATED

(see comments on the next page)

Drawing 6A

Signaling exhibit (Morse Code), All Hands Gallery, National Maritime Museum
by Ranulf, age 9

Drawing 6B



Gunnery exhibit, All Hands Gallery, National Maritime Museum
by Sophie, age 9

CATEGORY 6:
'LABELS / INSTRUCTIONS INDICATED'

Drawing 6A:
Representation of the Morse Code exhibit, All Hands Gallery, National Maritime Museum, by a boy aged 9. He represented the information about how to use the morse code and the outcome of the interaction (sound) in speech bubbles. He also used green, which is the colour of the exhibit. He drew the main elements of the exhibit but did not attempt to draw it realistically as an object. He focused his attention on the information provided and manipulative elements of the exhibit.

Categories in Drawing 6A (NNM, 29):
main exhibit element(s) represented; manipulative element(s) included; outcome of interaction illustrated (sounds); labels indicated; realistic use of colour (green).

Drawing 6B:
Representation of the Gunnery exhibit, All Hands Gallery, National Maritime Museum, by a girl aged 9. This exhibit displays real objects (a cannon ball, a bar shot, and a pound shell) which children can touch and move to feel form and weight. The exhibit is represented in a realistic way, showing good observational skills. Awareness of labeling is demonstrated.

Categories in Drawing 6B (NMM, 46):
main exhibit element(s) represented; manipulative element(s) included; labels indicated; realistic use of colour; mixed exhibits (gunnery, morse code detail).

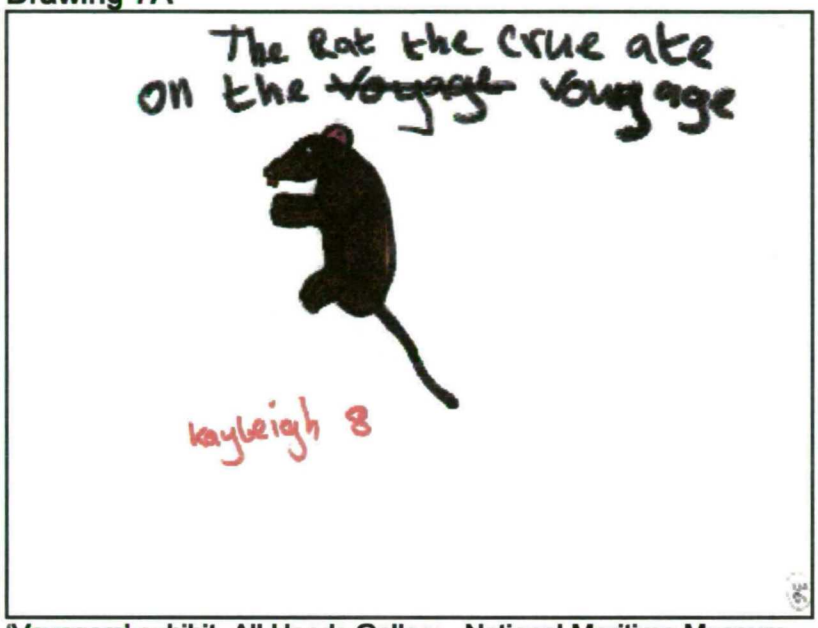
Comment:

In these two drawings, the representation of exhibit labels takes up the greater part of the drawings, indicating that the children noticed the labels and the information conveyed in them, and found it relevant for representation.

Regarding the ongoing museological discussion of whether visitors read labels, and children in particular, almost a quarter of the sample of children who made drawings depicted exhibit labels in their drawings, so indicating a sense of the relevance and importance of language and text in the exhibition. This observation supports discussions about variation in learning styles which indicate that people may prefer verbal, visual or enactive approaches to subject matter (Hein, 1998). It also points out the importance of museums providing differing avenues and intellectual access to content which are appropriate to different age groups.

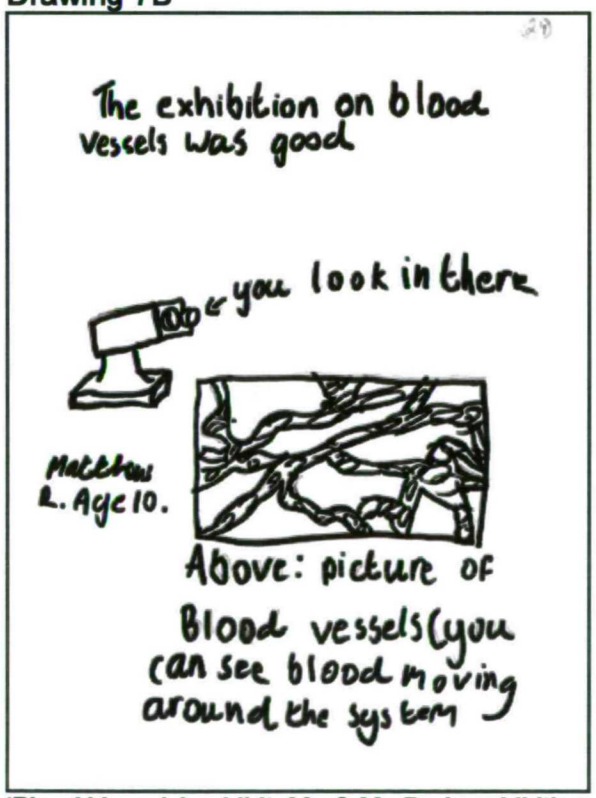
CATEGORY 7:
TITLED DRAWING and/or ELEMENTS OF DRAWING LABELED
(see comments on the next page)

Drawing 7A



'Voyagers' exhibit, All Hands Gallery, National Maritime Museum
by Kayleigh, age 8

Drawing 7B



'Blood Vessels' exhibit, Me & My Body exhibition, Eureka!
by Mathew, age 10

CATEGORY 7:
'TITLED DRAWING and/or ELEMENTS OF DRAWING LABELED'

Children's interpretation of exhibits using words and images - two examples

Drawing 7A:
At the All Hands Gallery, National Maritime Museum, there is an interactive section (boxes to open) about the exploration voyages to the 'new world' in the 15th century. A girl aged 8 was impressed to know, opening one of the boxes, that when the crew ran out of food they might eat rats to survive (it is possible to touch a stuffed rat displayed inside the box). She only represented the rat (in a realistic way) and wrote down her interpretation of the label which accompanies the exhibit.

Categories in Drawing 7A (NNM, 36):
exhibit element(s) partially represented; manipulative element(s) included (stuffed rat); purpose of exhibit illustrated (explanation in words); titled drawing; realistic use of colour.

Drawing 7B:
Representation of exhibit on 'blood vessels', Me & My Body exhibition, Eureka!. The exhibit consists of a microscope where you can look inside to see blood running inside the vessels (film). A boy aged 10 represented it as a story (narrative) - in writing and images - explaining the exhibit, how it functions and its content. He also expressed his appreciation of it.

Categories in Drawing 7B (Euk, 24):
main exhibit element(s) represented; manipulative element(s) included (microscope); outcome of interaction illustrated (representation of blood moving in the vessels); titled drawing/elements of drawing labeled by the child; enjoyment (expressed in writing).

Comment:

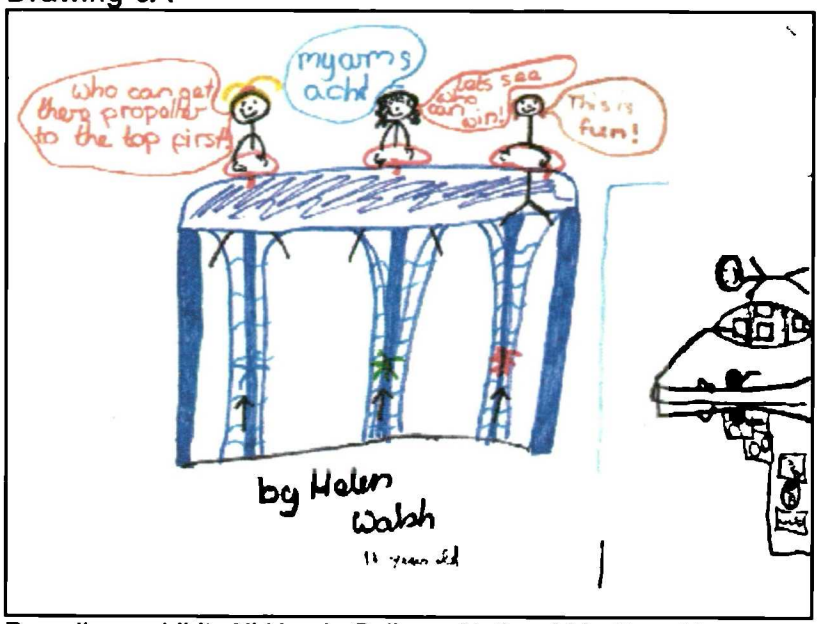
Two different styles of interpretation of exhibit information done by children in their drawings - one more 'concrete' (child aged 8) and the other more 'analytical' (child aged 10); however, both children used words to explain the images and to convey the exhibit content message. They both titled their drawings to make them more explicit. The girl aged 8 gave a partial explanation based on the information presented in the exhibit label which accompanied the rat (the element that impressed her most from a group including an old biscuit and a glass of dirty water), and the boy aged 10 gave a clear explanation of how the 'blood vessels' exhibit works and its content, showing a deep level of understanding.

The use of title in the drawing or labelling of its elements is an important way in which children clarify or explain the exhibit, therefore showing their understanding of it.

CATEGORY 8: ENJOYMENT

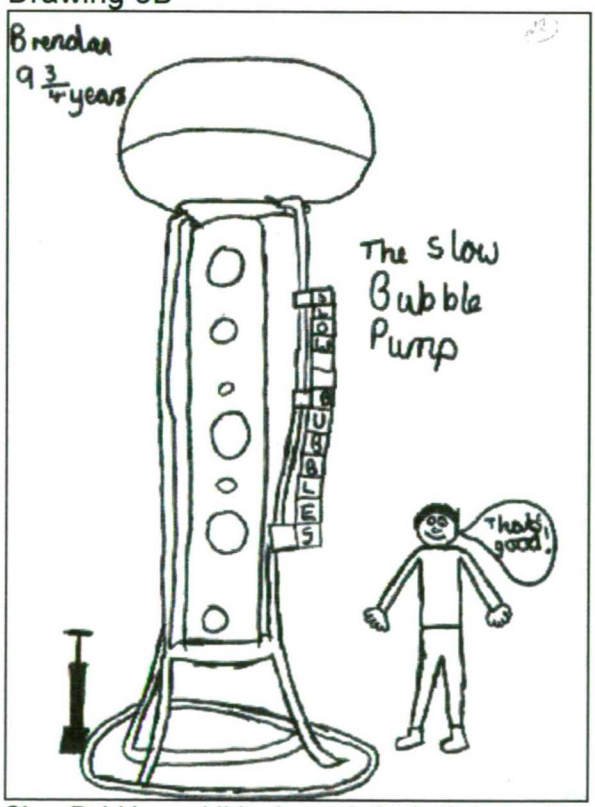
(see comments on the next page)

Drawing 8A



Propellers exhibit, All Hands Gallery, National Maritime Museum
by Helen, age 11

Drawing 8B



Slow Bubbles exhibit, Launch Pad, Science Museum
by Brendan, age 9

CATEGORY 8: 'ENJOYMENT'

Drawing 8A:
Representation of the Propeller exhibit, All Hands Gallery, National Maritime Museum, by a girl aged 11. Her drawing is a narrative of the experience and an example of the social use of the exhibit. Her enjoyment was expressed in writing ('This is fun!'). The 'game' nature of the exhibit was represented as a speech bubble story, a conversation between three children.

Categories in Drawing 8A (NMM, 11):
child represented in the drawing; main exhibit element(s) are represented; manipulative element(s) are included (wheels); outcome of interaction illustrated (propellers' speed); elements of the drawing are labeled (speech bubbles); expression of enjoyment (smile, speech bubble); mixed exhibits from children's gallery (propeller, cargo handling).

Drawing 8B:
Representation of the Slow Bubbles exhibit, Launch Pad, Science Museum, by a boy aged 9. He drew himself outside the action reporting his enjoyment of the exhibit.

Categories in Drawing 8B (ScM, 22):
child represented in the drawing; main exhibit element(s) represented; manipulative element(s) included (pump); outcome of interaction illustrated (bubbles); labels indicated; titled drawing; enjoyment (smile, speech bubble).

Comment:

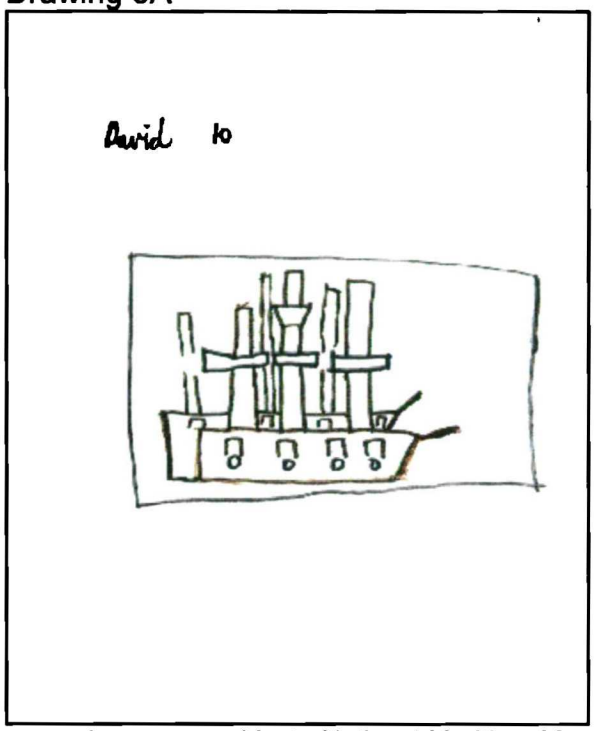
Both children made drawings which expressed their feelings and/or their experience of interacting with the exhibit through speech bubbles, one set of which used a narrative style. The use of written language in the drawing, together with face expressions, is a clear way in which children expressed their feelings about the exhibit.

Enjoyment is considered to be an important element in a child-orientated exhibit, because it can lead to further exploration of the activity and might facilitate the conditions for learning to happen.

CATEGORY 9:
GENERALISED MUSEUM SUBJECT

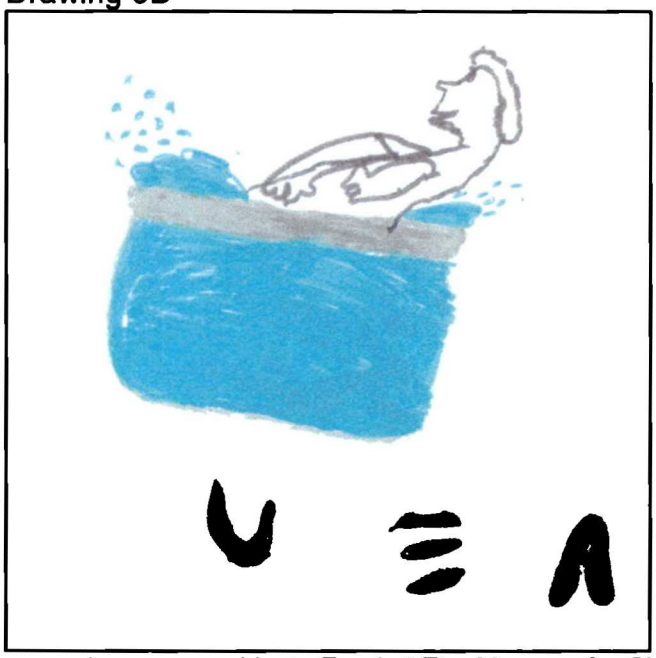
(see comments on the next page)

Drawing 9A



general museum subject, National Maritime Museum
by David, age 10

Drawing 9B



general museum subject, Eureka! The Museum for Children
by Peter, age 7

CATEGORY 9:
'GENERALISED MUSEUM SUBJECT'

Drawing 9A:
Drawing from a boy aged 10 depicting a picture of a battle ship he saw in another gallery (a temporary exhibition about 'Nelson', the picture depicted the 'Trafalgar Battle'). We might say that for this boy aged 10, the Nelson exhibition interested and perhaps impressed him more than the exhibits at the children's gallery.

Categories in Drawing 9A (NMM, 7):
generalised museum subject; main elements represented.

Drawing 9B:
In this drawing, from a boy aged 7, the dynamic sculpture of 'Archimedes in his bath' was the museum feature/object which drew his attention (the 'sculpture' is the symbol of the museum, since it was him who said the Greek word 'Eureka!').
(Note: This exhibit is a dynamic one: every hour (when the bath is full of water) the statue of Archimedes goes inside the bath and the water overflows.)

Categories in Drawing 9B (Euk, 17):
generalised museum subject; titled drawing; outcome (water overflowing from bath); main elements represented.

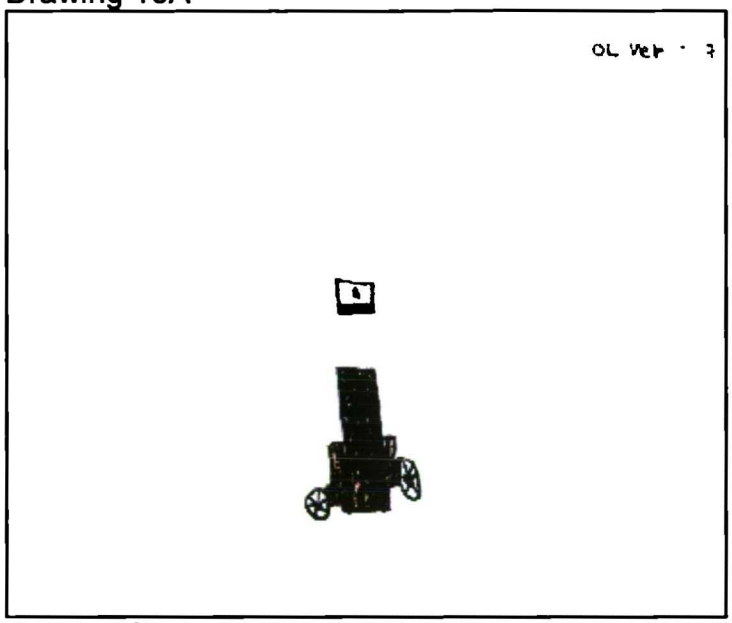
Comment:

Depictions about a generalised museum subject accounted for 13% of the drawings. This finding may indicate that, for some children, other exhibits they encountered in the building (rather than the children's gallery) dominated the 'perception' of their museum visit experience. Their depictions represent a 'general view' of the museum collection or subject. In studying children's museum visit experience, it is important to explore what things have impressed them and why. This category is an indication of the variety of interests and perceptions children might have in their visit to a museum.

CATEGORY 10:
EXHIBIT ELEMENTS MISSING or PARTIALLY REPRESENTED

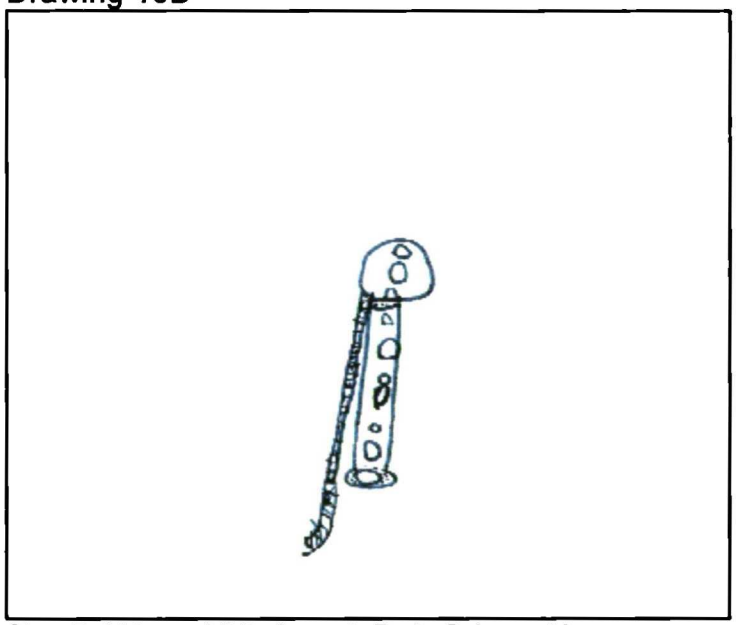
(see comments on the next page)

Drawing 10A



Gunnery (Cannon) exhibit, All Hands Gallery, National Maritime Museum
by Oliver, age 7

Drawing 10B



Slow Bubbles exhibit, Launch Pad, Science Museum
by Nicolas, age 8

CATEGORY 10:
'EXHIBIT ELEMENTS MISSING or PARTIALLY REPRESENTED'

Drawing 10A:
A boy aged 7 made a careful but incomplete depiction the Gunnery (Cannon) exhibit, All Hands Gallery, National Maritime Museum. This exhibit is composed of a cannon and two screens - one screen shows the target and the other shows the trajectory of the shot. Although the boy's drawing presents an observant depiction of some of the exhibit elements, his depiction of the exhibit is incomplete (the 'trajectory screen' is not depicted. If this screen is missed, it is not possible to understand how the exhibit works as a whole).

Categories in Drawing 10A (NMM,9):
manipulative elements included (wheels, fire button); exhibit elements partially represented (trajectory screen is missing); outcome of manipulation illustrated (target); realistic use of colours.

Drawing 10B:
This drawing from a boy aged 8 is a partial representation of the Slow Bubbles exhibit, Launch Pad, Science Museum. He did not depict the manipulative element (the pump), the structure of the exhibit is incomplete, and he did not use colours in a realistic way. However, he depicted the outcome of the interaction (the air bubbles formed inside the liquid).

Categories in Drawing 10B (ScM,18):
exhibit elements partially represented; outcome of interaction illustrated (bubbles).

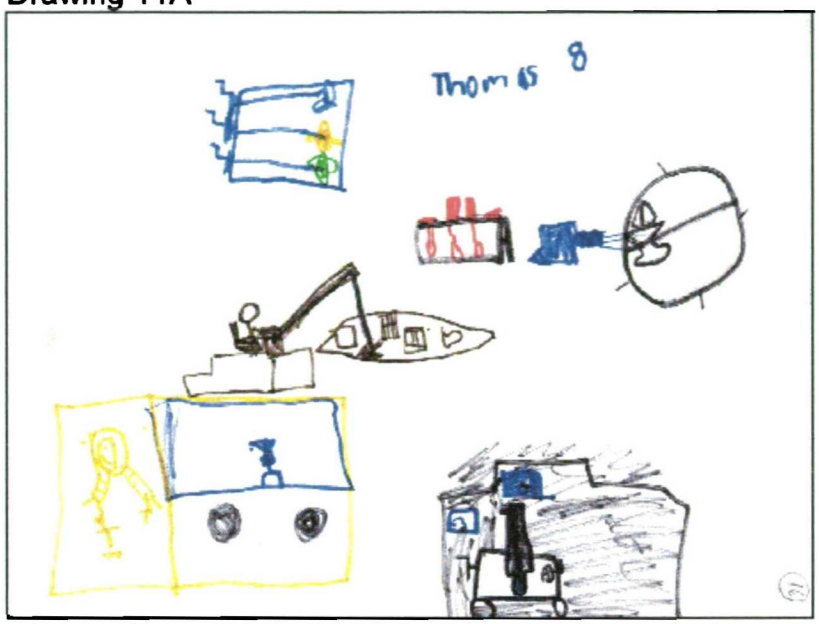
Comment:

Exhibit elements missing or partially represented accounted for 17% of drawings from the entire sample. Plenty of time was given by the researcher to the child to finish his/her drawing (the child gave his/her drawing to the researcher when s/he considered it was ready), so if the exhibit elements are missing in the drawing is probably due to limited observation or understanding of the exhibit. Also, as the researcher did not look for aesthetic representation, but for the presence or absence of exhibit elements, lack of drawing skills was not an issue. In the examples showed here, the children demonstrated some understanding of the exhibits, but they were not able to describe *all* their elements. Therefore, these two drawings show a partial view, and hence a partial understanding, of the exhibits.

CATEGORY 11:
MIXED EXHIBITS FROM CHILDREN'S AND OTHER GALLERIES

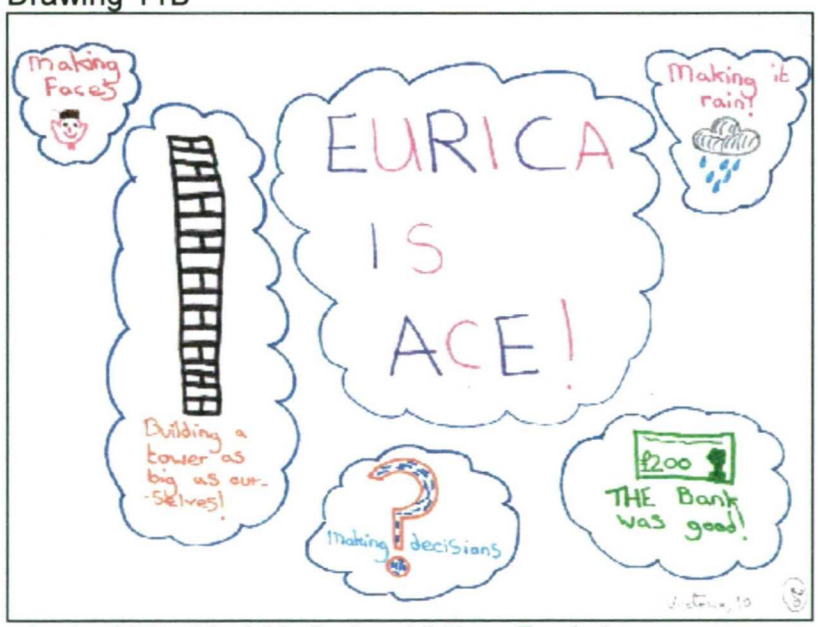
(see comments on the next page)

Drawing 11A



mixed exhibits *(Propellers 1, Propellers 2, Propulsion with wind, Cargo Handling, Diving, Gunnery)*
All Hands Gallery, National Maritime Museum
by Thomas, age 8

Drawing 11B



mixed exhibits, Me & My Body exhibition, Eureka!
by Victoria, age 10

CATEGORY 11:
'MIXED EXHIBITS FROM CHILDREN'S AND/OR OTHER GALLERIES'

Drawing 11A:
A boy aged 8 represented six interactive exhibits from the All Hands Gallery, National Maritime Museum: the propellers, the wind propulsion exhibit, the cargo handling exhibit, the diving exhibit, and the gunnery (cannon) exhibit. He showed a good understanding of the exhibits, good observation skills, and memory of his experiences. Manipulative elements of the exhibits were represented throughout. He represented himself interacting with two of the exhibits depicted in the drawing, and in one of them he was expressing enjoyment. Through the drawings, he showed an active memory of the gallery and of his engagement with the exhibits.

Categories in Drawing 11A (NNM, 16):
child represented in the drawing; main exhibit element(s) represented; manipulative/interactive element(s) included; outcome of interaction (wind blowing the yacht, balancing cargo in the boat), enjoyment (smile), mixed exhibits from children's galleries (propellers 1, propellers 2, propulsion with wind, cargo handling, diving, gunnery).

Drawing 11B:
A girl aged 10 represented five exhibits from Eureka!: three from the museum as a whole (Making it rain, the Bank, Building a tower) and two from the Me & My Body exhibition (making faces and making decisions). She named the exhibits and represented them inside 'thought bubbles'. In the centre of the drawing there is big 'speech bubble' expressing her feelings towards the museum experience: 'Ace!'. Her drawing is an example of a collection of the exhibits she liked most, showing the 'affective' side of the museum experience.

Categories in Drawing 11B (Euk, 20):
elements of drawing labeled by the child; enjoyment (expressed in writing); mixed exhibit from children's and other galleries.

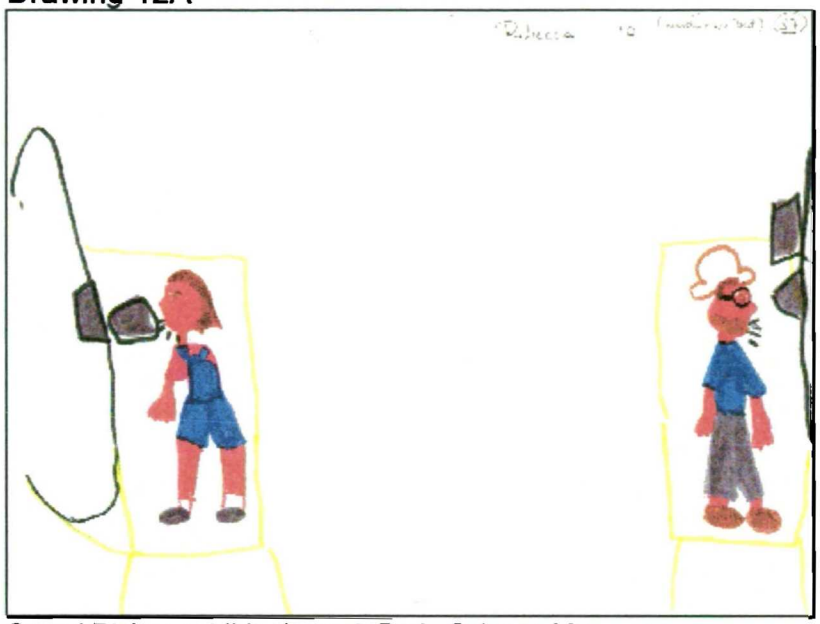
Comment:

Two representations of mixed exhibit drawings from the children's and other museum galleries, from a boy aged 8 and a girl aged 10. In the first drawing, the boy aged 8 depicted different exhibits from the children's gallery in a 'concrete' way, interacting with them or depicting the outcome of the interaction. In the second drawing, the girl aged 10 depicted different exhibits from the entire museum (not only from the gallery investigated), using images and language to describe the exhibits and how she related to them.
These types of representation can offer insights on things that were memorable and meaningful for the child during his or her visit to the museum.

CATEGORY 12:
SOCIAL INTERACTION

(see comments on the next page)

Drawing 12A



Sound Dishes exhibit, Launch Pad, Science Museum
by Rebecca, age 10

Drawing 12B

'Tongue' exhibit, Me & My Body exhibition, Eureka!
by Lee, age 7

CATEGORY 12:
'SOCIAL INTERACTION'

Drawing 12A:
Interaction between a girl aged 10 and her Dad at the Sound Dishes exhibit, Launch Pad, Science Museum. The girl depicted herself and his Dad talking at the Sound dishes (one at each of the two dishes) and draw signs which represent the 'sound' of their voice at the particular device they had to speak. The drawing indicates that the father was her *mate* in using the exhibit, and that she wished to acknowledge that interaction in her drawing.

Categories in Drawing 12A (ScM, 37):
social interaction; child represented in the drawing; exhibit elements partially represented; interactive elements included; outcome of interaction illustrated (sound).

Drawing 12B:
Interaction between a boy aged 7 and his Dad at the Tongue exhibit in the Me & My Body exhibition, Eureka! (if you press the buttons, different coloured lights shine representing where the taste buds are in the tongue).
The boy aged 7 is hand-in-hand with his father exploring the exhibit. The drawing is an indication that the father was very close to his son exploring the Tongue exhibit, and that the boy valued this closeness.

Categories in Drawing 12B (Euk, 48):
social interaction; child represented in the drawing; main elements represented (tongue, lights representing areas where tasted are felt, letters related to buttons representing the tastes: (B) bitter, (S) sweet, (S) sour); manipulative elements included (buttons); outcome of manipulation illustrated (coloured lights); labels / information indicated (letters).

Comment:

Social interactions were infrequent in the present sample of children's drawings (3% of drawings). These two drawings, however, are fine examples of representations of social interactions at exhibits. Both children depicted themselves using the exhibits with their Dads. These two drawings indicate that these children valued the interaction with their fathers at the exhibits, and they wanted to acknowledge that in their drawings (see also the findings from Chapter 7, page 302, which indicate that children were likely to say that they prefer to visit museums with 'family' when they were with *fathers*).

Although in this sample of drawings children did not represent social interactions very often, in the face-to-face interviews carried out most children said they prefer to use exhibits with someone else rather than on their own (65%), and that they prefer to visit museums with their families rather than with school (61%) (see Chapter 6).

The low percentage of depiction of social interactions in the children's drawings might suggest that parents and carers should perhaps be more genuinely involved in the exploration of exhibits together with their children, something that museums could encourage through parental information, through exhibits which are designed for social interaction and take into account not only children's but also adults' needs, and through an inviting and relaxed atmosphere of the gallery.

5.3. FINDINGS FROM THE ANALYSIS OF CHILDREN'S DRAWINGS

The findings regarding children's drawings from the three sites and from the age groups are described in this section. They are related to the children's experience of interaction with the exhibits and indicate how their experience and perceptions of it vary according to each gallery approach. The findings also reveals implications for the design of child-orientated galleries.

Several analyses of children's drawings were carried out: an analysis of all drawings in the three sites (complete sample); a comparison between sites; and a comparison between age groups. Percentages were calculated in relation to the number of drawings in each site or age group and used in order to compare the findings across sites and age groups. An overview of the findings is carried out at the end of the chapter.

5.3.1. FINDINGS FROM THE ANALYSIS OF CHILDREN'S DRAWINGS IN THE THREE SITES

The total of drawings collected in the three sites investigated was 120 and there was a total of 454 records distributed in the 12 categories of analysis. Table 5.3.1 (on the next page) shows the distribution of records/drawing per category in each site and at all sites together.

OVERALL FINDINGS

Categories in which more than half of the drawings were represented

The most frequent representations in the categories of children's drawings were related to the exhibit itself: *main exhibit elements represented* (76% of all drawings) and *manipulative elements of exhibit emphasised* (74% of all drawings).

TABLE 5.3.1:
Frequency of drawings per category at 'all' sites and at each site
N= 120 drawings

Sites: *Launch Pad*, Science Museum (ScM), *All Hands Gallery*, National Maritime Museum (NMM), and *Me & My Body*, Eureka! The Museum for Children

Sites:		**ALL**		**ScM**		**NMM**		**Eureka!**	
Children's drawings per site:		**N=120**		N=46		N =36		N =38	
Rank (All)	**Drawings per category:**	%	n	%	n	%	n	%	n
	CATEGORIES								
1.	**Main exhibit elements represented**	**76%**	91	**89%**	41	**64%**	23	**71%**	27
2.	**Manipulative elements of exhibit emphasised**	**74%**	89	**91%**	42	**67%**	24	**61%**	23
3.	**Outcome / purpose of manipulation**	**57%**	68	**78%**	36	**39%**	14	**47%**	18
4.	**Realistic use of colour**	**39%**	47	**57%**	26	**39%**	14	**18%**	7
5.	**Child represented in drawing**	**27%**	32	**30%**	14	**25%**	9	**19%**	9
6.	**Labels / instructions indicated**	**23%**	27	**30%**	14	**19%**	7	**15%**	6
6.	**Titled drawing / elements of drawing labeled**	**23%**	27	**11%**	5	**19%**	7	**39%**	15
8.	**Enjoyment**	**18%**	22	**15%**	7	**11%**	4	**29%**	11
9.	**Generalised museum subject**	**15%**	12	**4%**	2	**28%**	10	**16%**	6
10.	**Mixed exhibits from children's and other galleries**	**14%**	17	**11%**	5	**11%**	4	**21%**	8
11.	**Exhibit elements missing / partially represented**	**10%**	12	**4%**	2	**19%**	7	**8%**	3
12.	**Social interaction**	**3%**	4	**7%**	3	-	-	**3%**	1
Total records:			*(454)*		*(197)*		*(123)*		*(134)*

(Note: a drawing may be placed in several categories at the same time, so percentages add to more than 100; percentages refer to 'N'; 'n' refers to number of drawings in a particular category)

These findings suggest that the concrete experience provided by the manipulation of the exhibits might have stimulated children's attention, so leading to accurate memory formation.

In more than a half of the children's drawings (57% of all drawings), the category *outcome/purpose of manipulation* was represented, indicating that half of the children who made a drawing demonstrated an understanding of how the exhibit worked and its purpose. This finding indicates that those children were able to express through drawing the outcome of the exhibit, indicating that the exhibit experience was meaningful to them. It is possible to say that, with those children, the exhibit learning goals were met, and the drawings are a clear illustration of it.

Categories in which between a fifth and a half of the drawings were represented

This percentage range includes four drawing categories, which were related to aspects of the drawings such as the use of the actual colours of the exhibits, the depiction of the child her/himself in the drawing, the representation of labels, and the use of title in the drawing. In four out of ten drawings (39% of all drawings) children represented the *colours of the exhibit realistically*. The category *child represented in the drawing* was present in around a quarter of them (27% of all drawings). *Labels / instructions indicated* and *titled drawing / elements of drawing labeled* were displayed in slightly less than a quarter of them (23% and 23% of all drawings, respectively).

The depiction of the actual colours of the exhibits by over a third of the children suggests that they aimed to draw the exhibits in a realistic way and in detail. The representation of labels by a quarter of them might indicate that those children perceived the labels as an integrated part of the exhibits. One-quarter of the children who made a drawing expressed clearly that they valued the experience provided by the exhibit through the depiction of themselves interacting with it. The use of written language in the drawings by a quarter of the children indicates that they liked to illustrate the meaning of their drawings through writing in order to make their ideas more explicit.

Categories with less than one-fifth of the drawings represented

The remaining percentage range (below 20%) includes five drawing categories. They are related to the affective side of the experience, such as enjoyment and the social interaction, to a general view of the visit rather than the children's gallery itself, or to incomplete or partial representations of the exhibits.

The category *enjoyment* was depicted in 18% of all drawings. *Social interaction* was depicted in only 3% of them. These findings indicate that the expression of feelings in the drawings was not represented often, suggesting that children might have given priority to the representation of an *objective* depiction of the exhibit rather than to their emotional state or social encounters. Other less frequent categories represented were: *generalised museum subject* (15% of all drawings), *mixed exhibits from children's and/or other galleries* (14% of all drawings), and *exhibit elements missing or partially represented* (10% of all drawings), all of which could be said to indicate a varied impression of the museum visit itself and/or an unfocused or mixed perception of the visit to the child-orientated galleries.

COMPARISON OF FINDINGS ACROSS THE THREE SITES

Table 5.3.1, on page 212, also shows the distribution of children's drawings per site. The Science Museum accounted for 46 drawings, the National Maritime Museum for 36 and Eureka! the Museum for Children for 38 drawings.

Categories in which 'Launch Pad, Science Museum' had the highest frequencies of drawings

Launch Pad had the highest frequencies of drawings in six categories: *manipulative elements of exhibit emphasised* (91%, compared to 67% at the All Hands, NMM, and 61% at the Me & My Body, Eureka!), *main exhibit elements represented* (89%, compared to 64% and 71%, respectively), *outcome/purpose of manipulation* (78%, compared to 39% and 47%, respectively), *realistic use of colours* (57%, compared to 39% and 18%, respectively), *child represented in the drawing* (30%, compared to 25% and 29%, respectively), *labels / instructions indicated* (30% compared to 19% and 15%, respectively). Launch Pad also had the lowest frequency of drawings in the category *exhibit elements missing or partially represented* (4%, compared to 19% and 8%, respectively). *Social interaction* was not represented often in the total sample of drawings but, compared to the other two locations, Launch Pad had the highest frequency of drawings in this category (7% compared to no occurrence at the All Hands and 3% at the Me & My Body).

These findings suggest that the science 'experiment' type of exhibit used in Launch Pad was successful in focusing children's attention to the functioning of exhibits (their main elements, colours, outcome) and in engaging them in social interactions and/or active encounters with the exhibits.

Categories in which 'Me & My Body exhibition, Eureka! The Museum for Children' had the highest frequencies of drawings

The Me & My Body exhibition had the highest frequencies of drawings in the categories: *enjoyment* (29%, compared to 13% at Launch Pad and 11% at All Hands), *titled drawing* (39%, compared to 11% and 19% respectively), and *mixed exhibits from children's and/or other galleries* (21%, compared to 11% and 11% respectively).

The depiction of 'enjoyment' is related to the affective side of the experience and may indicate that, at Eureka!, the child-friendly environment of the museum might have influenced the expression of enjoyment in the drawings and a sense of belonging to the space. The higher representation of the category *mixed exhibits from children's and/or other galleries* at Me & My Body suggests that the children at Eureka! were slightly more willing to express their varied perception of the museum.

The more frequent use of a *title* in the drawings at Eureka! might be related to the fact that the Me & My Body exhibition is dedicated totally to one main theme, provides a lot of information on the theme-related topics, and gives a particular attention to the style and colours of words and texts. Also, the language and content used in the labels has been designed specially for children. All these aspects might have stimulated a child's desire to explain the exhibits and to make his or her ideas more explicit in the drawings through words.

Categories in which 'All Hands Gallery, National Maritime Museum', had the highest frequencies of drawings

The All Hands Gallery had the highest frequencies of drawings in the category *generalised museum subject* (28%, compared to 4% at Launch Pad and 16% at Me & My Body) and *exhibit elements missing or partially represented* (19%, compared to 4% and 8% respectively).

These findings may indicate that, for these children, other exhibits they encountered in the building (rather than the All Hands Gallery) dominated the impression of their museum visit experience and they had difficulties in perceiving all the exhibit elements, perhaps due to the complex design and nature of the tasks at the All Hands Gallery.

5.3.2. FINDINGS FROM THE ANALYSIS OF CHILDREN'S DRAWINGS BY AGE GROUPS

An analysis of the drawings across the age groups 7-9 and 10-11 was carried out in order to explore whether any difference in the representation of the categories was present in the drawings from these two age groups. The overall findings related to the two age groups are compared in this section.

The total number of drawings from the combined age groups (age group 7-9 plus age group 10-11) from the three sites investigated was 120. Table 5.3.2 (on the next page) shows the distribution of records/drawings per category in age group 7-9 (n=75) and 10-11 (n=45) at 'all sites' and at each site. The number of drawings differs in a ratio of 1.6:1, since age group 7-9 covers three years while age group 10-11 covers two years.

THE TWO AGE GROUPS COMPARED

Overall, the percentage differences between the representation of categories in the drawings from children aged 7-9 and 10-11, although small (between 1 to 10 percentage points), may suggest aspects which could be further investigated concerning children's representations in their drawings of the perceptions, understanding, and feelings of their encounter with the exhibits according to the child's age group.

TABLE 5.3.2:
Frequency of drawings per category from age groups 7-9 and 10-11 at 'all' sites and at the three individual sites

N= 120 drawings

Sites: *Launch Pad*, Science Museum (ScM), *All Hands Gallery*, National Maritime Museum (NMM), and *Me & My Body*, Eureka! The Museum for Children

	AGES 7-9	AGES 10-11	AGE GROUP 7- 9			AGE GROUP 10-11		
	All sites	All sites	ScM	NMM	Euk	ScM	NMM	Euk
	N=75	N=45	N=31	N=21	N=23	N=15	N=15	N=15
Drawings per category	% n	% n	% n	% n	% n	% n	% n	% n
CATEGORIES								
Main exhibit elements represented	**73%** 55	**80%** 36	**87%** 27	**57%** 12	**70%** 16	**93%** 14	**73%** 11	**73%** 11
Manipulative elements of exhibit	**71%** 53	**80%** 36	**90%** 28	**57%** 13	**57%** 12	**93%** 14	**80%** 12	**67%** 10
Outcome / purpose of manipulation	**57%** 43	**56%** 25	**74%** 23	**48%** 10	**43%** 10	**87%** 13	**27%** 4	**53%** 8
Realistic use of colour	**41%** 31	**36%** 16	**55%** 17	**43%** 9	**21%** 5	**60%** 9	**33%** 5	**13%** 2
Child represented in drawing	**24%** 18	**31%** 14	**26%** 8	**19%** 4	**26%** 6	**40%** 6	**33%** 5	**20%** 3
Labels / instructions indicated	**24%** 18	**20%** 9	**39%** 12	**14%** 3	**13%** 3	**13%** 2	**27%** 4	**20%** 3
Titled drawing / elements labeled	**19%** 14	**29%** 13	**10%** 3	**14%** 3	**35%** 8	**13%** 2	**27%** 4	**47%** 7
Enjoyment	**15%** 11	**24%** 11	**16%** 5	**5%** 1	**21%** 5	**13%** 2	**20%** 3	**40%** 6
Generalised museum subject	**17%** 13	**11%** 5	**3%** 1	**38%** 8	**17%** 4	**7%** 1	**13%** 2	**13%** 2
Mixed exhibits	**12%** 9	**18%** 8	**13%** 4	**10%** 2	**13%** 3	**7%** 1	**13%** 2	**33%** 5
Exhibit elements partially represented	**12%** 9	**7%** 3	**6%** 2	**19%** 4	**13%** 3	**0%** 0	**20%** 3	**0%** 0
Social interaction	**1%** 1	**7%** 3	**0%** 0	**0%** 0	**4%** 1	**20%** 3	**0%** 0	**0%** 0
Total records:	*(275)*	*(179)*	*(130)*	*(68)*	*(77)*	*(67)*	*(55)*	*(57)*

(Note: a drawing may be placed in several categories at the same time, so percentages add to more than 100; percentages refer to 'N'; 'n' refers to number of drawings in a particular category)

Categories in which age groups 7-9 and 10-11 had similar percentages of representation in the drawings

Children's drawings from age group 7-9 and 10-11 had similar proportions of drawings in two categories: *outcome / purpose of manipulation* (57% in age group 7-9 and 56% in age group 10-11) and *labels / instructions indicated* (24% in age group 7-9 and 20% in age group 10-11) (Table 5.4).

These findings suggest that labels did not go unnoticed by the younger children and that exhibition designers and communicators should give attention to this aspect when designing exhibitions in which this age range is included. Also, the findings indicate that children from both age groups perceived the outcomes or purpose of the exhibits in a similar proportion, suggesting that exhibit learning goals in child-orientated exhibitions can be of a similar kind for children aged between 7 to 11.

Categories in which age group 10-11 showed a higher percentage of representation in the drawings

There was a higher proportion of children's drawings from age group 10-11 in seven categories: *main exhibit elements represented* (80% in age group 10-11 compared to 73% in age group 7-9); *manipulative elements of exhibit emphasised* (80% compared to 71%, respectively); *child represented in the drawing* (31% compared to 24%, respectively); *titled drawing* (29% compared to 19%, respectively); *enjoyment* (24% compared to 15%, respectively); *mixed exhibits from children's and other galleries* (18% compared to 12%, respectively); and *social interaction* (7% compared to 1%, respectively) (see Table 5.4).

The first two findings suggest that the concrete nature of the experience provided by the exhibits impressed children from both age groups, but children aged 10-11 were slightly more able than children aged 7-9 to represent the exhibits in its integrity, since they had a higher frequency of representation of the manipulative and main elements of the exhibits in their drawings.

The frequency in which children aged 10-11 expressed their enjoyment, social interactions, and the direct experience with the exhibits in their drawings

was higher in this age group than in age group 7-9 (31% compared to 24%, respectively, in the category *child represented in the drawing*; 24% compared to 15% in the category *enjoyment*; and 7% compared to 1% in the category *social interaction*), suggesting that the affective side of the exhibit experience was expressed more frequently by children aged 10 and 11. Although the number of children who represented social interaction in their drawings was very low, we see that 7% of a sample of 45 children aged 10-11 expressed social interaction in their drawings, while only 1% of a sample of 75 children aged 7-9 did so, suggesting that social interaction was more likely to be acknowledged by the older than the younger children in the sample of drawings.

Since older children are likely to be more confident writers, it is not surprising that the percentage frequency of *titled drawing* was larger in the age group 10-11 (29% compared to 19%). As they are considered to be more capable of abstract thought, since they are approaching adolescence (view supported by developmental theories), children aged 10-11 might also have been more willing to express their ideas through language in the drawings.

The slightly higher proportion of representation of the category *mixed exhibits from the children's and/or other museum galleries* from children aged 10-11 (18% compared to 12%) may acknowledge a more *varied perception* of the visit to the museum and to the children's gallery in this age group.

Categories in which age group 7-9 showed a higher percentage of representation in the drawings

There was a slightly higher proportion of children's drawings from age group 7-9 in three categories: *realistic use of colours* (41% in age group 7-9 compared to 36% in age group 10-11); *generalised museum subject* (17% compared to 11%, respectively); and *exhibit elements missing or partially represented subject* (12% compared to 7%, respectively) (see Table 5.4).

These findings suggest that the children in the sample aged 7-9 paid particular attention to the physical characteristics of the exhibits (such as their actual colours) and aimed at representing them realistically. The implication of this finding for the design of exhibitions aimed at children at this age range is that colours should be carefully considered for this age group. The later

findings indicate that slightly more children in age group 7-9 depicted a generalised museum subject, suggesting that a more general perception of the museum visit is held by a small proportion of children aged 7-9. Twelve per cent of them also represented an incomplete depiction of the exhibit in their drawings, indicating that a small proportion of children aged 7-9 were less able than children aged 10-11 to represent all the exhibit components.

5.4. OVERVIEW OF THE FINDINGS RELATED TO THE ANALYSIS OF THE CHILDREN'S DRAWINGS OF EXHIBITS

The analysis of the children's drawings in this study has shown that drawings are a valuable research tool and an important source of information about the child's thought and the manner in which s/he relates to the hands-on exhibition environment. Drawings can be used successfully in the museum environment to assess both children's experience and their perceptions and understanding of exhibits.

The present research has shown that drawings from children aged between 7 and 11 can be very accurate and rich in detail, suggesting that physical interaction with exhibits is a great aid to memory formation, and consequently, a support for understanding.

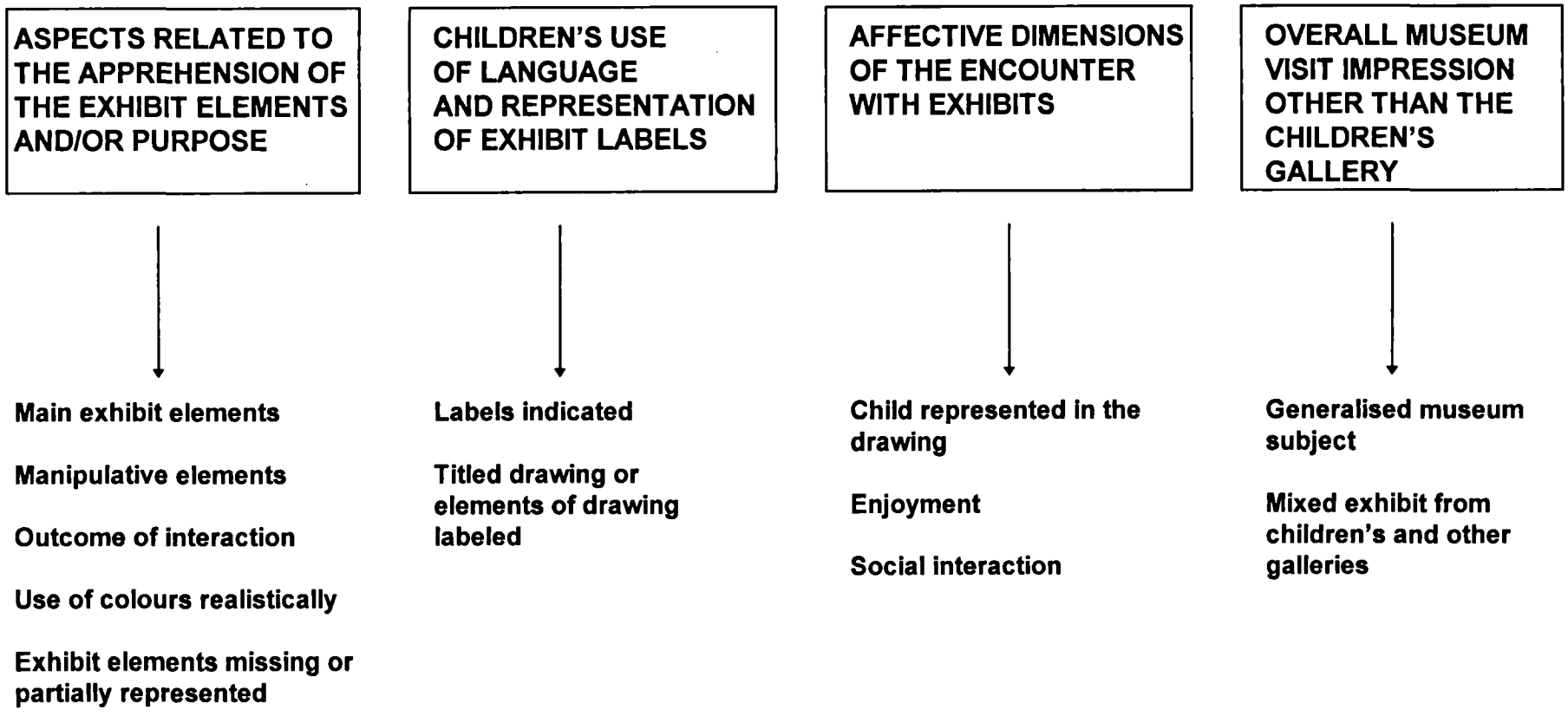
Figure 5.4.1 (on the next page) illustrates the four domains of categories represented in the children's drawings collected: aspects related to the apprehension of the exhibit elements / purpose; affective dimensions of the encounters with exhibits; children's use of language in the drawings and perceptions of exhibit interpretation approach; and impressions of the visit other than to the children's gallery.

Aspects related to the apprehension of the exhibit elements / purpose

The drawings collected indicate that children used the drawings to 'explain' the exhibit, therefore indicating a desire to show *what* they remembered and/or understood from their encounter with the exhibit(s). It would seem that on a cognitive level, both age groups achieved an understanding of the exhibit they chose to depict, due to the high frequencies of drawings in the categories which relate to the main elements of the exhibit and its outcome.

The findings suggest that the concrete and experiential nature of the experience in a hands-on exhibit influences the formation of a mental schema of the exhibit and its representation in the drawing.

FIGURE 5.4.1: THE FOUR CATEGORY DOMAINS REPRESENTED IN THE CHILDREN'S DRAWINGS



The children who made drawings aimed at representing the museum exhibits in a realistic way. In a realistic depiction, the child demonstrates a desire to represent reality in detail, showing what s/he has assimilated from it. This may be one of the reasons why the children's drawings collected presented a great level of detail regarding the physical aspects of the exhibit. Colour is one of the aspects of a realistic depiction. This concrete, physical aspect of reality was particularly relevant to the children in the age range 7-9 in the sample (this may be related to the fact that children in this age range are considered to be, according to Piaget's view, in the initial years of the concrete operational stage, so very interested in all the aspects of their concrete experiences).

Children's use of language in the drawings and their perceptions of exhibit labels

Labels and instructions were depicted in a quarter of the children's drawings. This finding has an important implication particularly regarding the ongoing museological discussion of whether visitors, and children in particular, read labels. The finding indicates that labels were perceived by one-quarter of the children in the sample as a part of the exhibit and so considered relevant of representation. This discussion also points to the importance of museums providing differing avenues and intellectual access to content which are appropriate to different age groups, not only to children but also to their accompanying adults.

Affective dimensions of the encounters with exhibits

Regarding the affective side, *feelings* were not expressed very often in the drawings from children in both age groups. There was a tendency for the children to focus more on the physical characteristics of the exhibit as they experienced it than on the affective side of their experience. The findings suggest that the emotional side of the experience was not considered by those children as the *main* aspect for representation, perhaps due to the complexity of a hands-on interaction which involves the individual's senses, intellect, and emotions. It might also be the case that feelings other than 'enjoyment' (or 'sadness') are difficult to represent visually.

The depiction of social interaction in the drawings was rare. Most of the few cases occurred in the drawings from older children (age group 10-11) and were from Launch Pad. The participative and socially-shared nature of the exhibits in Launch Pad, and its inviting atmosphere for active experimentation, might have influenced the depiction of social interactions by older children at this site (the observation findings have also indicated that Launch Pad had the lowest number of *splitting behaviour* from adults; see page 164 and 166).

Overall museum visit impression other than the children's gallery

A few children depicted *mixed exhibits* from the children's and other galleries in their drawings, suggesting that those children had a varied perception of their visit. A small number of children represented a *generalised view* of museum exhibits, indicating that, for those children, other exhibits they encountered in the museum were more memorable for them than the exhibits at the children's gallery.

Summary

The study of children's drawings presented in this chapter have shown that:

. this methodological approach can be used by museum researchers as a research/evaluative tool, specially regarding children's perceptions and understanding of exhibits and the depiction of their experience. It may help assessing if exhibit educational goals are being met through the depiction of exhibit outcomes. The drawings reveal that they can be a valuable source of information about children's experience and/or understanding of exhibits.

. The high frequency of representation of exhibit outcomes (specially at Launch Pad) indicates that those children had an understanding of the exhibit purpose or process depicted in their drawings.

. Children demonstrated a great deal of accuracy and attention to detail when depicting the exhibits. This finding is in line with Coe's study on children's drawings (Coe, 1988) which suggests that children may show in their drawings impressive observational skills and memory of an experience which they may not necessarily be able to express verbally.

. The categories which arose from the drawings showed that depictions of the characteristics of the exhibits were prevalent. This finding suggests that the interactive experience stayed impressed on the child's memory.

. The representation in the categories related to the use of written language and colours in the drawings from children aged 7 to 11 demonstrates that it is important that exhibition developers pay attention to these aspects when designing exhibits for this age group, especially regarding the language used, the design, style and the location of labels that accompany interactive exhibits.

. In the sample of children's drawings presented in this study, the findings showed that depiction of the affective side of the experience in a museum exhibit was not considered a main issue for representation by the children. This finding could be further investigated. In this sample of drawings, the few children who expressed the affective dimensions of the experience did it spontaneously, since the 'invitation to draw' made by the researcher to the child was 'open'. The invitation to draw used in the questionnaire was as follows (see Appendix A, 'Adults' Interview Questionnaire'):

> To the accompanying adult(s): *'We are making a collection of children's drawings about this gallery. Perhaps your child(ren) might like to do a drawing of his/her favourite exhibit here in the gallery while we are talking'.* To the child: *'Hello. Would you like to make a drawing about your favourite exhibit at the ...(name of gallery) ?'.*

It is recommended that an approach aiming specifically to address the affective side of children's experience when assessing 'feelings' in their drawings is used by the researcher, specially in the way the researcher 'asks' the child to make a drawing, since this may influence the focus of the drawing.

****

The present findings indicate that different aspects of the child's experience in a child-orientated gallery (including cognitive, affective and social aspects) can be explored in children's drawings and can offer relevant insights into issues related to museum education and exhibit planning.

The next two chapters analyse the experiences and perceptions of children and their relatives in the child-orientated galleries investigated based on their responses to the interviews.

CHAPTER 6:
ANALYSIS OF ADULTS' AND CHILDREN'S RESPONSES TO THE OPEN-ENDED INTERVIEW QUESTIONS

6.1. INTRODUCTORY SECTION

Adults' and children's responses to the interviews were analysed using two different approaches: responses to the open-ended questions were analysed using a combination of qualitative and quantitative approaches (Chapter 6), and the responses to the closed questions were analysed statistically (Chapter 7).

The analysis of the open-ended interview questions aims to explore which aspects of the visit to the three child-orientated galleries investigated children and adults valued, their perceptions, feelings and attitudes about their experience in such spaces. The study also investigates similarities and differences in perceptions regarding the three galleries (see research questions nos.1, 2, 3 and 5 in Chapter 3, page 113).

The findings from Chapter 6 offers useful insights into children's and their adult relatives' perceptions of their experience in the galleries and provide a contextual perspective in which to situate the findings from Chapter 7.

This chapter initiates with a brief description of the interview sample, followed by a list of the open-ended categories of responses from the interview questions (pages 230-31), a description of the *response sets* in each category (pages 232-43), and an analysis of adults' and children's open-ended interview responses (pages 244-83). An overview of the findings is given at the end of the chapter (pages 284-86).

6.1.1. INTERVIEW SAMPLE

The interview sample was 300 individuals made up of 150 adults and 150 children (50 adults and 50 children at each site). One adult and one child from a family group were interviewed as they were leaving the gallery (see Chapter 3, section 3.3), so in total 150 families were represented in the

interviews at the three museums (50 family groups at each location). Children's and adults' *demographics* are presented in Appendix E.

6.1.2. ANALYTIC METHOD

The open-ended responses were analysed in the following way: an inductive content analysis of responses was undertaken, progressively amalgamating comments of the same nature into more generic *response sets* (this technique is known as 'bottom-up' analysis). The *response sets* were not designed in advance by the researcher as they arose from close scrutiny of the data. The *response sets* in each category raised through the 'bottom-up' analysis method embrace all the comments from the interviewees in the three galleries investigated.

Categories / response sets were exhaustive and mutually exclusive. No comment was excluded and no comment fell between two *response sets* (Krippendorff, 1980:75). The comments within the categories were then quantified in order to determine which *types of response* were most frequent (interviewees may have made comments in more than one response set).

The analysis was inductive and descriptive in nature. The findings offer a broad picture of adults' and children's perceptions, attitudes and opinions regarding child-orientated galleries.

Examples of children's and their relatives' comments are reported *verbatim* in order to illustrate relevant aspects. Tables and graphs are used to illustrate the findings.

6.1.3. LIST OF OPEN-ENDED CATEGORIES OF RESPONSES FROM INTERVIEW QUESTIONS

A list of eight categories of interview questions is presented below, followed by a description of each from page 232 to 243.

Categories related to adults' responses to the interview:

CATEGORY 1: REASONS FOR TAKING THE CHILD TO VISIT MUSEUMS

Response sets:

educational

interest & liking

family outing & entertainment

word of mouth

CATEGORY 2: ADULTS' VIEWS OF CHILDREN'S GAINS FROM THE VISIT

Response sets:

learning & new experiences

enjoyment & entertainment

don't know, difficult to say

nothing, not a lot

CATEGORY 3: ADULTS' ATTITUDES TOWARDS CHILD-ORIENTATED EXHIBITS

Response sets:

positive & enthusiastic

encourages learning

motivating to the child

static exhibits: not child-friendly

reservations

Categories related to children's responses to the interview:

CATEGORY 4: CHILDREN'S FEELINGS WHILE USING THEIR FAVOURITE EXHIBIT

Response sets:

positive feelings

experiential feelings

fun

negative / uncomfortable feelings ; difficulties

neutral

don't know

CATEGORY 5: CHILDREN'S PERCEPTIONS OF THEIR LEARNING IN THE GALLERIES

Response sets:

learning & experiences

about another exhibition

don't know

nothing, not a lot

CATEGORY 6: CHILDREN'S PREFERENCES FOR VISITING MUSEUMS WITH 'FAMILY' RATHER THAN WITH SCHOOL

Response sets:

help, assistance, attention

more freedom, independence

more relaxed, too busy with school

more time

more fun

opportunity to socialise with family members

don't know

Categories shared by adults and children related to similar interview questions:

CATEGORY 7: ADULTS' & CHILDREN'S DESCRIPTIONS OF THE GALLERIES

Response sets:

learning

forms of praise

hands-on activities

child-friendly

fun, entertaining

exhibitions characteristics (content/design/staff) *[adults only]*

exhibits *[children only]*

reservations

CATEGORY 8: ADULTS' & CHILDREN'S IMPRESSIONS OF GALLERY ATMOSPHERE

Response sets:

forms of praise

positive feelings

positive social aspects

negative social aspects

positive environmental aspects

negative environmental aspects

fun

educational atmosphere

don't know *[children only]*

6.2. DESCRIPTION OF THE OPEN-ENDED CATEGORIES OF RESPONSES

As the descriptions of categories are based on the *original* responses from interviewees (adults and children), they can also be considered as findings.

CATEGORIES RELATED TO ADULTS' RESPONSES

The descriptions of adults' responses to open-ended interview questions are presented in the following order (categories 1, 2 and 3, respectively): *'Reasons for taking the child to visit museums'; 'Adults' views of children's gains from the visit';* and *'Adults' attitudes towards child-orientated exhibits'*. Categories 7 and 8 (*'Adults' & children's descriptions of the galleries'* and *'Adults' & children's impressions of the gallery atmosphere'*) are described on pages 239 and 242.

CATEGORY 1: REASONS FOR TAKING THE CHILD TO VISIT MUSEUMS

Responses sets:

EDUCATIONAL REASONS

Parents and relatives gave different educational reasons for taking their children to visit a museum *(from the most quoted comments to the least)* :

- to learn
- to expose the children to culture, to new experiences; to broaden their view of the world, to inform them; for knowledge; for the historical side
- for education; because it is educational
- for fun and education; education and entertainment; for enjoyment and to learn (*edutainment*)
- as a complement to formal education (in connection to school projects)

INTEREST & LIKING

This response set puts together the comments from adults who said they bring their children to visit museums because they find it interesting (or for general interest) and because they (or the child) like, enjoy, wanted to visit.

FAMILY OUTING

This response set groups the comments from adults who said that they bring their children to visit museums for a day out; to fill the time; to entertain children; because it is an opportunity for the family to socialise together.

WORD OF MOUTH

This response set brings together the comments from adults who said they bring their children to visit museums because someone recommended that it would be good for the children.

CATEGORY 2: ADULTS' VIEWS OF CHILDREN'S GAINS FROM THE VISIT

Response sets:

LEARNING GAINS

This response set groups adults' comments related to learning gains. The comments show that parents and relatives think their children gained education, some learning or some kind of knowledge; gained an insight, an awareness, a historical perspective, an appreciation of a matter; gained more understanding, reinforcement of principles, things that the child will be able to connect with; or things the child will remember later.

ENJOYMENT & ENTERTAINMENT

This response set includes gains related to opportunities for enjoyment, fun, recreation, and socialization with other children during the visit to the gallery. Some adults also mentioned that it was a 'relief' for the children during the visit to the museum to be able to go to a children's gallery, and that they (the children) learned that museums are not boring through going to a children's exhibition.

NEW EXPERIENCES

This response set groups comments from adults who mentioned that their children gained a chance to experience things, gained a new experience, or had the opportunity to see how things work, operate.

DON'T KNOW, DIFFICULT TO SAY

This response set groups adults' comments such as 'don't know' and 'difficult to say' regarding what the child has learned during the visit.

NOT A LOT, NOTHING

This response set includes comments in which adults expressed some uncertainty about children's learning gains during the visit to the gallery. The comments include 'not a lot' and 'nothing'.

CATEGORY 3: ADULTS' ATTITUDES TOWARDS CHILD-ORIENTATED EXHIBITS

Response sets:

POSITIVE & ENTHUSIASTIC

Comments in this response set include enthusiastic and positive opinions from adults about the opportunity for children to interact with exhibits in museums, such as: 'wonderful', 'excellent', 'great', 'brilliant', and 'there should be more hands-on/interactive exhibits in museums'. Other positive comments include the view that interactive exhibits in museums are 'essential for children', 'vital', 'very important'.

Some adults also mentioned that interactive exhibits have dramatically improved in recent years.

IT ENCOURAGES LEARNING

This response set groups adults' ideas that hands-on is good for learning, understanding, remembering, that children learn more from it, that they benefited from touching the exhibits, that when using hands-on exhibits they are learning through play, learning by doing.

MOTIVATING TO THE CHILD

This response set encompasses adults' comments which stress that interactive exhibits motivate the child in different ways, such as : it encourages children's involvement/interest; it encourages children to visit museums; it provides enjoyment / fun.

Adults also mentioned that hands-on exhibits make museums more interesting for children, that children benefit, and that children *need* to interact with exhibits.

STATIC DISPLAYS: NOT CHILD-FRIENDLY

This response set groups adults' comments about the 'non-friendly for children' nature of static displays. It incorporate statements that 'static exhibits are boring / not interesting for children'; parents recollections of museums as a child that exhibits were not child-friendly; and a recognition of a change of museum attitude towards interactive exhibits and provision of exhibitions for children & families.

RESERVATIONS

This response set includes adults' comments which express some reservations about interactive exhibits. The two main reservations were: some adults were not sure about the learning outcome of interactive exhibits for children and others expressed a concern about transforming the whole museum in a hands-on environment.

Other reservations mentioned were that 'it can be frustrating when hands-on exhibits are not working' and that there is a need to have an adult to facilitate the interaction with the exhibits (Science Museum).

CATEGORIES RELATED TO CHILDREN's RESPONSES

The descriptions of children's responses to open-ended interview questions are presented in the following order (categories 4, 5 and 6, respectively): *'Children's feelings while using their favourite exhibit'; 'Children's perceptions of their learning in the galleries';* and *'Children's preferences for visiting museums with family rather than with school'.*

Categories 7 and 8 (*'Adults' & children's descriptions of the galleries'* and *'Adults' & children's impressions of the gallery atmosphere'*) are described on pages 239 and 242.

CATEGORY 4: CHILDREN'S FEELINGS WHILE USING THEIR FAVOURITE EXHIBIT

Response sets:

POSITIVE FEELINGS

This response set includes positive feelings expressed by children when interacting with their favourite exhibit. These feelings include (from the most to the least quoted):

- 'happy', 'cheerful', 'glad', 'enjoyable', 'pleased', 'great', 'really good' 'very excited', 'excited'
- 'involved', 'concentrated', 'confident', 'fascinated', 'surprised', 'interested', 'curious', 'creative'
- 'good', 'fine'

'EXPERIENTIAL' FEELINGS

This response set encompass feelings where the children said they 'felt as if' they were someone or they were in another time or place. In this category children usually took a role or felt as being part of the experience. The sentences usually includes expressions like:

- 'I felt as if I was...'
- 'Like I was...'

HAVING FUN

This response set includes reports of fun. Children said they were 'having fun' or that was 'good fun' while they were interacting with the exhibit.

CHALLENGE, HARD WORK

In this response set children expressed that they felt it was 'hard work' to master the interactive exhibit. In general they felt that the exhibit represented a challenge for them (they were engaged with the exhibit, trying to master it).

NEGATIVE FEELINGS

This response set includes negative reactions / feelings expressed by children when interacting with the exhibit. These feelings include:

- 'nervous', 'annoyed', 'worried', 'embarrassed'
- 'strange', 'funny', 'stupid'
- 'scared', 'tired', 'hurt', 'dizzy'

NEUTRAL

This response set includes neutral feelings expressed by children while interacting with their favourite exhibit such as: 'normal', 'something to do', 'I just did it'.

DON'T KNOW

Children didn't know how to express their feelings.

CATEGORY 5: CHILDREN'S PERCEPTIONS OF LEARNING IN THE GALLERIES

Response sets:

LEARNING & NEW EXPERIENCES

Acquisition of new information (general and specific) and experiences

- This response set encompasses the acquisition of information related to the museum exhibition, some more general (involving ideas of culture, social history or general information related to the exhibition topics, e.g. science and the human body) and some more specific, related to specific information conveyed by the exhibits (e.g. number of rivets needed to build a ship, explorers ate rats [during their long trips], that the veins of grown-ups can be 2.5 inches, etc.)
- This response set also includes learning of basic principles (e.g. to balance a ship, wind propulsion, sound travels by vibration, the ears help you to balance) and applications (e.g. communications - morse code, using the power of an engine you can make things move, where you taste things on your tongue)
- At Eureka, children were able to relate information to themselves and others (e.g. how much water they have in their bodies, how much their bones weigh, how a baby feels when he is in his mother's tummy, being a blind person)
- Some children were able to get the intended message of the exhibition (e.g. at Eureka!, one child said 'that your body is important and that you have to look after it.').
- Some children also said they learned 'a lot' and 'new things'.

How things work

Children mentioned they learned about 'how things work', 'how to do things'. The learning aspect is related to the mastering of the task required by the exhibit.

'Particular' view

This response set includes children's responses in which they stated a particular view of the exhibition message, not directly related to the information conveyed by the exhibition. This happened only at Launch Pad, Science Museum. A few children said that *'science can be fun'* and one child said that *'eletricity can be used for fun things'.*

ABOUT ANOTHER MUSEUM EXHIBITION

This response set includes children who mentioned that they learned something in another gallery of the museum (and not at the children's gallery) *(At Eureka! this did not happen).*

At the National Maritime Museum children mentioned the Nelson's temporary exhibition (things they have learned about Nelson's life). At the Science Museum children said they learned about planets and airplanes (on other floors).

DON'T KNOW

This response set includes children who said they couldn't remember anything or they didn't know.

DID NOT THINK THEY LEARNED SOMETHING

This response set includes children who said they learned 'nothing' in the gallery *(this did not happen at Eureka! The Museum for Children).*

CATEGORY 6: CHILDREN'S PREFERENCES FOR VISITING MUSEUMS WITH *FAMILY* RATHER THAN WITH SCHOOL

Response sets:

HELP, ASSISTANCE, ATTENTION

Children prefer to visit museums with their family rather than with school because:

- They can get more help and attention from family (assistance)
- Family explains things to them.
- Children can ask questions to their family straightway.
- They feel it is more comforting, more secure to be with their family.

MORE FREEDOM, INDEPENDENCE

Children prefer to visit museums with their family rather than with school because they have more freedom, autonomy, independence. Children said:

- Teachers tell you what to do, where to go.

MORE RELAXED, TOO BUSY WITH SCHOOL

Children prefer to visit museums with their family rather than with school because:

- It is too busy with school.
- You have to stay in groups
- You have to queue, to wait for your turn
- You have to do worksheets
- You don't get as much attention.

MORE TIME

Children prefer to visit museums with their family rather than with school because they have more time to see things with their family. They said:

- With school you have to hurry up, you have to rush
- With school you go too quickly

MORE FUN

Children prefer to visit museums with their family rather than with school because it is more fun.

OPPORTUNITY TO SOCIALISE WITH FAMILY MEMBERS

This category appeared **only** at *Eureka! The Museum for Children* (10% of children). Children said they prefer to visit museum with their family rather than with school because they could do things together with their family and because their parents are usually working so it is an opportunity to be together.

DON'T KNOW

Children didn't know how to explain why they prefer to visit museums with family rather than with school.

RESPONSE CATEGORIES SHARED BY ADULTS AND CHILDREN RELATED TO SIMILAR OPEN-ENDED INTERVIEW QUESTIONS

Categories 7 & 8, from similar interview questions, are shared by adults and children: *'Adults' & children's descriptions of the galleries'* and *'Adults' & children's impressions of the gallery atmosphere'.*

CATEGORY 7: ADULTS' & CHILDREN'S DESCRIPTIONS OF THE GALLERIES

Response sets:

LEARNING

Adults' comments

This response set encompasses multiple ideas related to thinking and learning aspects:
(from the most quoted comments to the least)

- Parents and relatives believe that the exhibition is educational and that it is a learning experience; that the children learn a lot, understand more, that they get the message across; that it teaches them things. It is hands-on learning.
- The exhibition encourages children's involvement and active engagement, participation, discovery. It stimulates them. It makes children inquisitive, it captures their imagination, it keeps their attention and keeps them interested. Children can find things out for themselves.
- The exhibition brings things to life for the children. It gives an insight, a feeling, an experience of how things operate. It makes things clear for them. It gives them a sense of control.
- The exhibition is very informative, easy to understand. Lots of information in a simplified way.
- Children learn and enjoy, it is educational and fun. It is a play way to learn. It is a play area with educational activities.
- They will remember longer.

Children's comments

Children expressed views about the educational side of the exhibition and learning opportunities with expressions such as: 'you learn a lot', 'it teaches you', 'you can find out about things', 'discover', 'figure out', 'understand', 'educational'.

continued...

(...) CATEGORY 7: ADULTS' & CHILDREN'S DESCRIPTIONS OF THE GALLERIES

FORMS OF PRAISE

Adults' comments

Forms of praise used by adults to describe the exhibition *(from the most quoted comments to the least)* :

- 'Wonderful', 'very good', 'brilliant', 'fantastic', 'fascinating', 'terrific', 'great'
- 'Very interesting', 'quite interesting', 'interesting things'
- 'Well worth a visit'
- 'Good'

Children's comments

Forms of praise:

Forms of praise used by children to describe the exhibition, such as:
'excellent', 'brilliant', 'very good', 'well worth the visit', 'great', 'cool', 'good' as well as 'quite/very interesting', 'surprising', 'interesting things'.

Positive feelings expressed as praise:

This response set encompasses positive feelings expressed by children to describe the gallery, such as 'exciting'.

HANDS-ON ACTIVITIES

Adults' comments

Adults pointing out the interactive/hands-on nature of the exhibition and opportunities for participation, such as: 'lots of hands-on experiences', 'interactive', 'a variety of things to do', 'things for children to try out', 'children can participate'.

Children's comments

This response set includes expressions such as: 'hands-on', 'lot to do', 'lots of activities', 'things to do', 'things to play with'.

CHILD-FRIENDLY

Adults' comments

Mentions of the child-friendly nature of the exhibition *(from the most quoted comments to the least)* :

- 'Interesting / marvelous / good for children', 'great for kids', 'children can benefit'
- 'Children enjoy', 'kids love'
- 'Child-friendly', 'made for children', 'speaks child's language', 'makes child feel special'

Children's comments

Expressions stating that the exhibition is 'good / interesting for children'.

continued...

(...) CATEGORY 7: ADULTS' & CHILDREN'S DESCRIPTIONS OF THE GALLERIES

FUN , ENTERTAINING

Adults' comments

Expressions used connoting amusement:
'Fun', 'entertaining', 'good fun for everybody', and 'edutainment'

Children's comments

Children used different expressions to convey the same message:
'fun', 'very fun', 'you won't get bored', 'really good fun', 'a non boring activity'.

EXHIBITION CHARACTERISTICS ***(CONTENT, DESIGN, EXHIBITION STAFF)***

[adults were the only ones to respond in this response set]

This response set encompasses comments regarding different aspects of the exhibition, such as its content, variety, its design, lay out, the space (safe, colourful, well organised), and guidance provided by exhibition staff (*interpreters, explainers, enablers*).

EXHIBITS

[children were the only ones to respond in this response set]

This response set includes exhibits spontaneously named by children; exhibits they liked.

RESERVATIONS

Adults' comments

Some adults had reservations or criticisms regarding the exhibition, such as wondering what the purpose of hands-on exhibits is, saying that children flip around and don't read labels, exhibits are gender biased (better for boys than for girls), confusing.

Children's comments

A small number of children had reservations. They mentioned that when the gallery was busy they could not try all exhibits or that the gallery could have more variety (All Hands), that exhibits can be difficult for the young children and that information is not very clear (Launch Pad). No *reserved comments* were made by children about the 'Me and My Body' exhibition at Eureka!.

CATEGORY 8: ADULTS' & CHILDREN'S IMPRESSIONS OF THE GALLERY ATMOSPHERE

Response sets:

FORMS OF PRAISE & POSITIVE FEELINGS

Adults' comments

Forms of Praise:

This response set embodies expressions used by adults to express their liking and enjoyment of the atmosphere of the gallery. Most of them were very positive or enthusiastic about it. Adults used expressions such as: 'very good', 'very nice', 'wonderful', 'nice'; and a few of them used less enthusiastic expressions such as: 'good', 'fine', 'all right'.

Positive feelings:

This response set encompasses affective expressions about the atmosphere of the gallery which express a receptive mood and *emotional involvement*. Expression used by adults included: 'pleasant', 'enjoyable', 'lovely'; 'happy', 'lively', 'jolly'; 'exciting', 'stimulating'; 'positive atmosphere'; 'welcoming', 'inviting'; 'relaxed'.

Children's comments

Forms of praise:

This response set embodies expressions used by children to express their liking and enjoyment of the atmosphere of the gallery.

Children used expressions such as: 'brilliant', 'really nice'; 'good'; 'interesting'.

Positive feelings:

Affective expressions about the atmosphere of the gallery which express an *emotional involvement.*

Expressions used by children included: 'exciting', 'amazing', 'happy', 'cheerful'

SOCIAL ASPECTS

Adults' comments

Adults mentioned positive and negative social aspects of the atmosphere of the gallery. This response set includes adjectives that have a 'social' connotation.

Positive social aspects:

Expressions used by adults: 'friendly atmosphere'; 'staff is helpful'; 'children get along well with other children'; 'international' atmosphere; 'family' atmosphere; 'not busy'

Negative social aspects:

Expressions used by adults: 'busy' and 'crowded'

Children's comments

Children mentioned positive and negative social aspects of the atmosphere of the gallery. This response set includes adjectives that have a 'social' connotation.

Positive social aspects:

Expressions most used by children: 'friendly' atmosphere.

Negative social aspects:

Expressions used by children: 'busy', 'crowded'.

continued...

(...) CATEGORY 8: ADULTS' & CHILDREN'S IMPRESSIONS OF THE GALLERY ATMOSPHERE

ENVIRONMENTAL ASPECTS

Adults' comments

This response set includes adjectives that have an 'environmental' connotation. Positive environmental aspects are related to different aspects of the space (temperature of the gallery, light, colour, lay out, and safety). Negative environmental aspects are mainly related to level of sound, temperature inside the gallery, lack of comfort inside the gallery, and confusion, i.e. lack of structure of exhibition).

Positive environmental aspects:

Expressions used by adults: 'airy', 'spacious', 'open', 'colourful', 'bright', 'well laid out', 'safe for children'.

Negative environmental aspects:

Expressions used by adults: noisy; warm, hot, a bit cool; no chairs, floor should have carpet (more comfortable and less tiring); unstructured and confusing.

Children's comments

This response set includes adjectives that have an 'environmental' connotation. Positive environmental aspects are related to different aspects of the space (comfort, light, colour). Negative environmental aspects are mainly related to level of sound, and temperature inside the gallery.

Positive environmental aspects:

Expressions used by children: 'clean', 'at home', 'comfortable', 'colourful'.

Negative environmental aspects:

Expressions used by children: 'noisy'; 'hot'.

FUN

Adults' comments

Use of expression 'fun'.

Children's comments

Use of the expression 'fun'.

EDUCATIONAL ATMOSPHERE

Adults' comments

Adults' comments which express the view that the gallery atmosphere is educational, such as that the children were learning without realising.

Children's comments

Children' comments which express the view that the gallery atmosphere is educational.

DON'T KNOW, COULDN'T EXPLAIN

[children were the only ones to respond in this response set]

Children who didn't know or couldn't express themselves about the atmosphere of the gallery.

6.3. FINDINGS FROM ADULTS' AND CHILDREN'S RESPONSES TO THE OPEN-ENDED INTERVIEW QUESTIONS

The findings from the open-ended interview questions are presented in the following order: adults' responses to the open-ended interview questions, children's responses, and adults' & children's responses to similar interview questions (in order to allow for comparison). Two levels of analysis were carried out for each response category: the *combined findings* from all interviewees' responses at all sites and a *comparison of the findings* at each of the three galleries.

6.3.1. CATEGORIES RELATED TO ADULTS' RESPONSES

CATEGORY 1:
REASONS FOR TAKING THE CHILD TO VISIT MUSEUMS

1a) Combined findings from all interviewed adults at the three galleries

The most frequent motivation given by parents/relatives for taking their child(ren) to visit a museum were **educational reasons** (71% of individuals). Other reasons mentioned by adults were: **family outing & entertainment** (38% of relatives), **interest & liking** (37% of individuals), and **word of mouth** (3% of adults) (see Table 6.3.1 and Figure 6.3.1a).

The majority of adults who gave educational reasons mentioned one or more educational aspects for taking their child(ren) to visit a museum. Examples of adults' educational reasons for visiting include:

"We think it [the visit] helps them [the children] to understand things. Also, they learn more. They learn more than on books." (mother, secretary, NMM, n.36)

"For educational reasons. Usually linked to a school project. My youngest daughter has a project at school, so we came for her." (mother, school nurse, NMM, n.37)

"To stimulate them [the children]. To make them think about the world around them. I like art galleries, but the children prefer hands-on things." (mother, home duties, Science Museum, n.10)

"To broaden her [the child's] horizons and her experience. To complete the picture for her, things I can't reproduce at home." (mother, hospital manager, Science Museum, n.14)

"She [the child] enjoys the stimulation. She enjoys being in an environment where she can learn. It is a nice way of educating - out of the classroom. You can have a lot of new experiences by going to different places." (mother, fashion buyer, Science Museum, n.29)

"To have new experiences, to see new technologies. I like to show him [the child] something from my generation, I want him to have these experiences."
(grandfather, retired, former headteacher primary school, Science Museum, n.40)

"The educational aspect, really. It helps them [the children] to learn about life, growing up, about the environment." (father, retail management, Eureka!, n.23)

"They are very interested in Eureka!. When it is practical hands-on, the children learn a lot more. They ask more questions. It is easier for adults. The information is at a child's level, it is related to the children, and you understand." (mother, non-teaching assistant, Eureka!, n.21)

1b) Comparing adults' reasons for taking the child to visit museums at the three galleries

The proportion of adults who gave **educational reasons** for taking their children to visit museums was about the same at the three sites investigated (74% at Eureka!, 72% at the National Maritime Museum, and 66% at the Science Museum), indicating a consistence among adult relatives regarding the educational aspect of the visit to the child (see Table 6.3.1 and Figure 6.3.1b).

Adults interviewed at the Science Museum responded in the **family outing** category more frequently than those at the other two museums, suggesting that the leisure side of the visit was strongest at the Science Museum (56%, compared to 36% at Eureka! and 28% at the National Maritime Museum). Examples of comments include:

"Her sister is somewhere else. We've decided that we would have some prime time together [the child and her father]." (father, consultant engineer, Science Museum, n.23)

"Education and entertainment for her [the child]. We can socialise together."
(mother, primary school teacher, Science Museum, n.27)

"It is his birthday [the child's] on Friday, so it is like a trip for his birthday."
(father, construction worker, Science Museum, n.24)

"The children think it is wonderful. We always enjoy. It is a nice family activity."
(mother, teacher, Science Museum, n.35)

Summary:

- The findings indicate that the main motivation given by parents & relatives for taking the children to visit museums is 'educational'. At the Science Museum, the 'family outing', leisure aspect of the family visit was mentioned more often than at the other two sites.

TABLE 6.3.1: REASONS FOR TAKING THE CHILD TO VISIT MUSEUMS

Sample: 150 adults (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum **(Sc.M.), and Eureka! The Museum for Children (Euk)**

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=50)	%	**ScM** (n=50)	%	**Euk** (n=50)	%	**All** (n=150)	%
educational reasons	36	72%	33	66%	37	74%	106	71%
interest & liking	18	36%	23	46%	15	30%	56	37%
family outing	11	22%	28	56%	18	36%	57	38%
word of mouth	0	0%	2	4%	2	4%	4	3%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

FIGURE 6.3.1a: REASONS FOR TAKING THE CHILD TO VISIT MUSEUMS
(Sample: 150 adults)

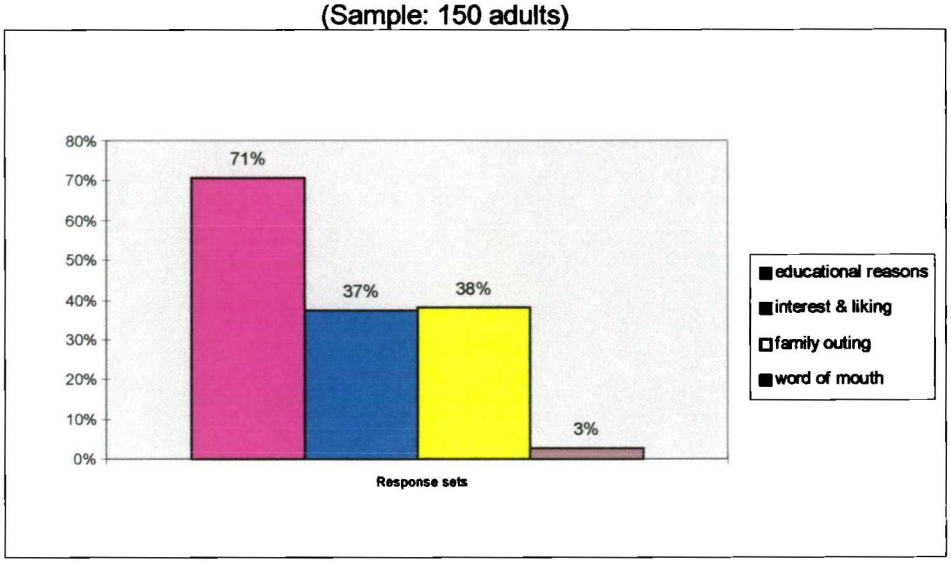
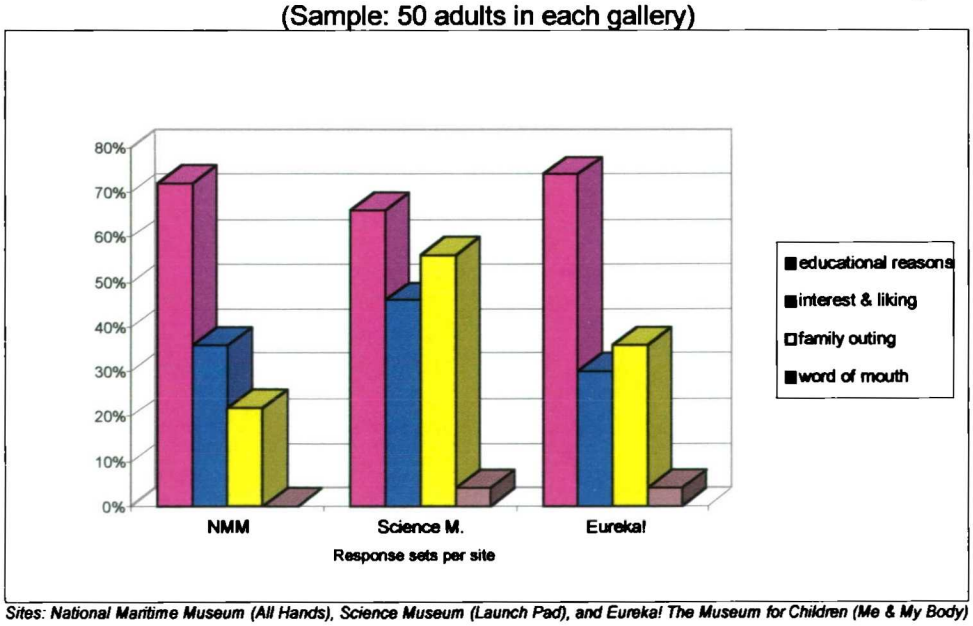


FIGURE 6.3.1b: REASONS FOR TAKING THE CHILD TO VISIT MUSEUMS (per site)
(Sample: 50 adults in each gallery)



Sites: National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

CATEGORY 2:
ADULTS' VIEWS OF CHILDREN'S GAINS FROM THE VISIT

2a) Combined findings from all interviewed adults at the three galleries

Parents and relatives were asked what they thought their children would have gained from the visit to the gallery. The **learning & new experiences** category was far greater than the others (see Table 6.3.2 and Figure 6.3.2a). The majority of parents/relatives (73%) considered that their child(ren) acquired some learning or new experience. Examples of adults' comments include:

"Well, I am sure Rachel is going to remember the signaling exhibit because she took part in it. I think it is probably the ones they are actually doing things that they are going to get more out of it."
(mother, computer analyst & programmer, NMM, n.10)

"I think they will be learning specific things like using morse code, the wind machine, how difficult it is to get the turbines going and the skill that was needed to put cargo into the boat."
(mother, teacher, NMM, n.11)

"I wonder if it [the exhibition] actually makes them [the children] question things they see around. It might help them to start questioning things. I think they enjoy but I don't know if they think about what happens. They might take away some impressions, they might remember. They remembered many things from the last time they've been here." (mother, home duties, Science Museum, n.10)

"Because we come so often, since she was three, I think she picks up bits of information, she picks up things every time she comes. I hope she will use it in her science classes."
(mother, system analyst, Science Museum, n.15)

"I think she can link it to school work. So, it is not purely leisure."
(mother, home duties, Eureka!, n.15)

"More appreciation of how the body works. Also, a certain degree of 'amazement' - for instance, the quantity of water in your body. They've kept asking: 'Is that truth?'."
(father, retail management, Eureka!, n.23)

Around a quarter of adults (24%) thought that their child(ren) had opportunities for **enjoyment, fun, recreation, and socialization** with other children during the visit to the gallery. Some parents/relatives (14%) thought it was **difficult to say** what the child had learned and a few of them (5%) said the children had probably learned **nothing or not a lot**.

2b) Comparing adults' views of children's gains from the visit at the three galleries

The proportion of adults who thought their children gained some **learning** from the visit to the child-orientated gallery was 82% at Eureka! The Museum for Children, compared to 74% at the Science Museum and 64% at the National Maritime Museum). This finding indicates that, overall, adults perceived the children's galleries as a learning environment for children.

More adults said that their children 'enjoyed themselves' or 'had fun' at Launch Pad, Science Museum, than at the other two exhibitions (36%, compared to 22% at the National Maritime Museum and 14% at Eureka!), suggesting that the '**fun**' aspect of the gallery was more evident at Launch Pad than at the All Hands Gallery and Me & My Body (see Table 6.3.2 and Figure 6.3.2b).

Summary:

- These findings support the previous finding (see Category 1) since the majority of adult relatives believed that the child gained some learning or new experiences in the child-orientated galleries, specially at the children's museum (Eureka!). In all three galleries, adult relatives believed the children gained more learning than entertainment while visiting the child-orientated galleries.
- Regarding the 'entertainment side' of the family museum visit, the proportion of adults who thought that the visit was fun and entertaining to the child was greater at the Science Museum than at the other two sites (see Category 1).

TABLE 6.3.2.: ADULTS' VIEWS OF CHILDREN'S GAINS FROM THE VISIT

Sample: 150 adults (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=50)	%	Sc.M (n=50)	%	Euk (n=50)	%	All (n=150)	%
learning, new experiences	32	64%	37	74%	41	82%	110	73%
enjoyment & entertainment	11	22%	18	36%	7	14%	36	24%
difficult ot say, unsure	9	18%	8	16%	4	8%	21	14%
nothing, not a lot	3	6%	1	2%	4	8%	8	5%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

FIGURE 6.3.2a: ADULTS' VIEWS OF CHILDREN'S GAINS FROM THE VISIT

(Sample: 150 adults)

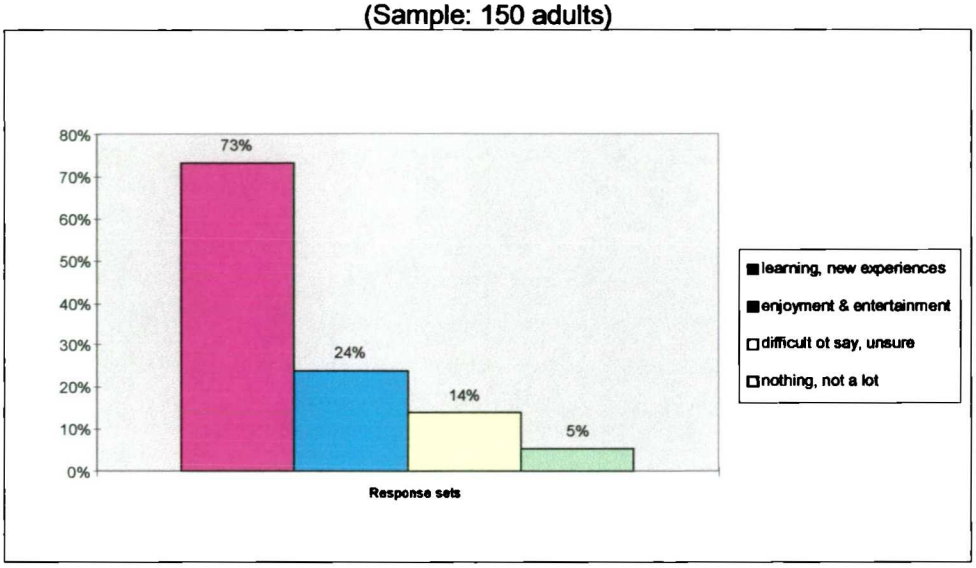
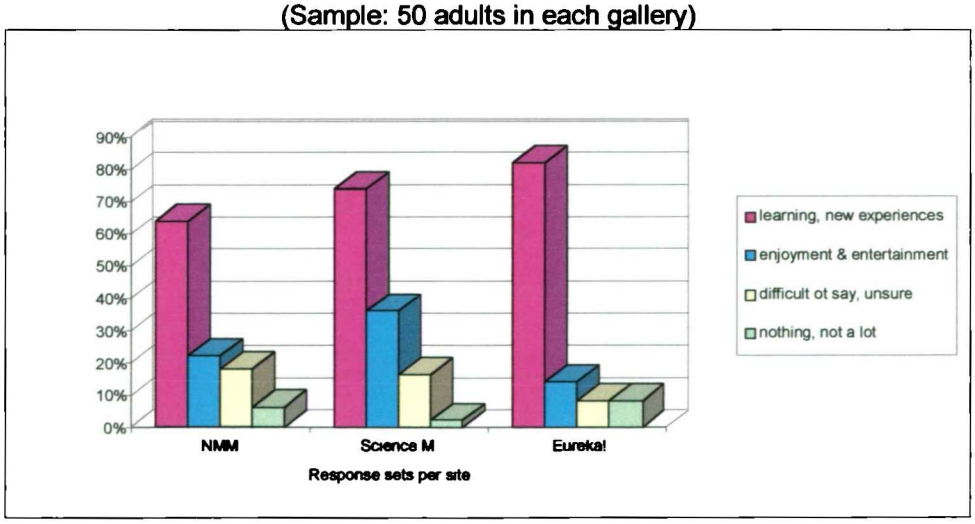


FIGURE 6.3.2b: ADULTS' VIEWS OF CHILDREN'S GAINS FROM THE VISIT (per site)

(Sample: 50 adults in each gallery)



Sites. National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

CATEGORY 3:
ADULTS' ATTITUDES TOWARDS CHILD-ORIENTATED EXHIBITS

3a) Combined findings from all interviewed adults at the three galleries

A large majority of adults interviewed (91%) were **positive and enthusiastic** about the opportunity for children to interact with exhibits in museums. They used enthusiastic expressions such as 'brilliant' and 'wonderful' and mentioned that hands-on exhibits in museums are 'essential' for children (see Table 6.3.3 and Figure 6.3.3a). Examples of adults' comments include:

"It is one of the best things in modern museums. The hands-on approach is wonderful. When I was young it was a bit boring to go to a museum." (grandmother, former school teacher, NMM, n.47)

"Good, absolutely. It speaks their language. More visible. It simplifies more complex things into simple concepts that a child can understand. It makes it interesting to see how things work." (mother, museum researcher, NMM, n.16)

"It's great. Children don't always want just to look at things. They learn more through interaction at young ages." (mother, nurse, NMM, n.19)

"It is a 'must'. It's got to be. It is good to have something for them [the children] to get involved with. If not, they are just bored. When it is only one object is OK, but then you have another hundred to see..." (father, technical assessor, NMM, n.49)

"Sure they get more out of it than just looking. If there are things in museums where children can do something and see the results, then they should learn more and remember more from it, than just looking and reading exhibits." (mother, computer analyst, NMM, n.10)

'Museums were dusty places. If you can actually do things, it makes them more alive.' (father, building site manger, NMM, n.38)

"Good idea. When we come to visit a museum, it is the interactive part they [the children] want to go to first. And it is the same at the Science Museum. They will go first to places where they can do something, before they want to go to places where they just look, like in this gallery here [Modelling Gallery]. They learn a lot more by actually doing than looking at cases." (mother, teacher, NMM, n.11)

"Excellent. It improves the quality of their learning experience. It is boring for them just to look at things. They are benefited by touching things." (mother, hospital manager, Science Museum, n.14)

"I am very keen. I think it is much better. You get them into the building. There are quite a lot of things to see in a museum when you are inside." (mother, home duties, Science Museum, n.10)

"Things have changed a lot in the past 10 years. I remember some time ago I came here (Science Museum), there wasn't many things for children. Now children ask to come to the museum. When I was a child, I would never name a museum!" (mother, system analyst, Science Museum, n.15)

"It is a pleasant change, to touch rather than just looking." (aunt, personnel manager, Eureka!, n.9)

"It is what is needed. The old type of museum where you walk past something, and look, I think it is a bit boring for children. It is good for adults but I think children would not be interested. You do need interactive things. This is one of the reasons I brought Jenifer, because a friend of mine said there were plenty of things where you need two children, so he said two children or more would have enjoyed it more. You do need hands-on things." (father, machine setter, Eureka!, n.10)

Around four in ten adults (38%) said that interactive exhibits were **motivating to the child**, that is, that it encouraged children's interest and involvement. Around a quarter of the interviewed adults (25%) believed that the interactive approach encourages children's **learning** (that hands-on exhibits are good for understanding and remembering things) and that it is 'learning by doing'. A fifth of the adults (21%) thought that **static museum displays** can be 'boring' for children when visiting a museum. A few adults expressed **reservations** regarding the interactive approach (7%). For instance, they were not sure about the 'learning outcome' of children's interaction with hands-on exhibits, or expressed concerns that the whole museum could be transformed into a hands-on environment. Some examples of reservations (mixed with other comments) made by adults include:

"I think it is good because it makes museums fun for them [the children], but I don't know if they learn as much as looking at objects. It is good because it makes them want to go to a museum, but I don't think they learn a lot. For example, I like to go to art galleries, but they think it is boring. Perhaps if it could have hands-on things in an art gallery it would make them want to go. When I say to them to go to the Science Museum they agree immediately, because they don't find it boring, they know they will find things they will enjoy." (mother, GP doctor, NMM, n.44)

"Very important. It adds an extra dimension for them. But the purpose of the interaction needs to be better explained. You learn how to do things, but the principles behind it need to be better explained." (father, rare books dealer, NMM, n.45)

"It is wonderful. But I don't like push buttons. I've always been to museums since I was young. Children are not very interested in showcases, galleries like that [pointing to the 'Ship Models' Gallery]. They are interested for a little while, but then they get tired. Of course, there is still a place for showcases. I don't want museums to become all hands-on." (mother, teacher, NMM, n.39)

3b) Comparing adults' attitudes towards child-orientated exhibits at the three galleries

All adults interviewed at Eureka! The Museum for Children were very **positive** about the opportunity their children had to interact with exhibits. The percentage of adults who said so was also high at the other two galleries (see Table 6.3.3 and Figure 6.3.3b).

More adults at the National Maritime Museum thought the children's gallery (All Hands) was **motivating to the child** and that hands-on exhibits make museums more interesting for children (48%, compared to 34% at Eureka! and 32% at the Science Museum), but there were also slightly more adults who expressed **reservations** towards the interactive approach in museums at this location than at the other two sites (12% at the National Maritime Museum, compared to 4% at Eureka! and 4% at the Science Museum).

About the same proportion of interviewed adults in all three galleries thought **hands-on exhibits encourage children's learning** (30% at the Science Museum, 28% at the National Maritime Museum, and 24% at Eureka!) and that **static displays are not child-friendly** (20%, 20%, and 24%, respectively).

Summary:

- Adult relatives who accompanied children to the galleries were enthusiastic about the opportunity for children to interact with exhibits and believed that child-orientated exhibits encourage children's interest and learning. The findings indicate that adults valued the hands-on approach and acknowledged its learning potential.
- A few adults (7%), however, mentioned that they were not sure about the learning outcome of hands-on exhibits or that they would not like to see conventional museums entirely transformed in a hands-on environment.

TABLE 6.3.3: ADULTS' ATTITUDES TOWARDS CHILD-ORIENTATED EXHIBITS

Sample: 150 adults (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=50)	%	Sc.M (n=50)	%	Euk (n=50)	%	All (n=150)	%
positive & enthusiastic	42	84%	44	88%	50	100%	136	91%
motivating to the child	24	48%	16	32%	17	34%	57	38%
it encourages learning	14	28%	15	30%	12	24%	41	27%
static displays: not friendly	10	20%	10	20%	12	24%	32	21%
reservations	6	12%	2	4%	2	4%	10	7%

FIGURE 6.3.3a: ADULTS' ATTITUDES TOWARDS CHILD-ORIENTATED EXHIBITS

(Sample: 150 adults)

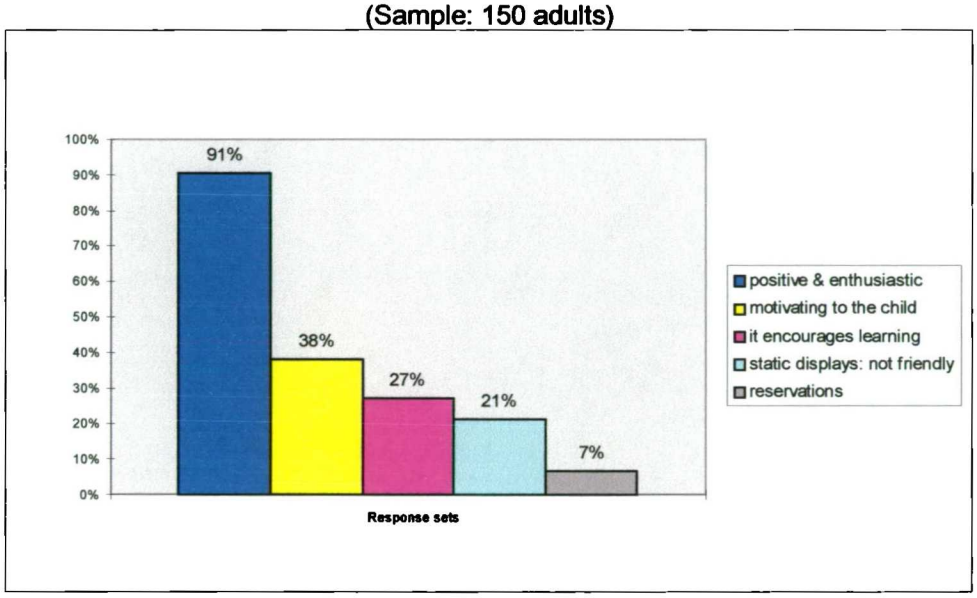
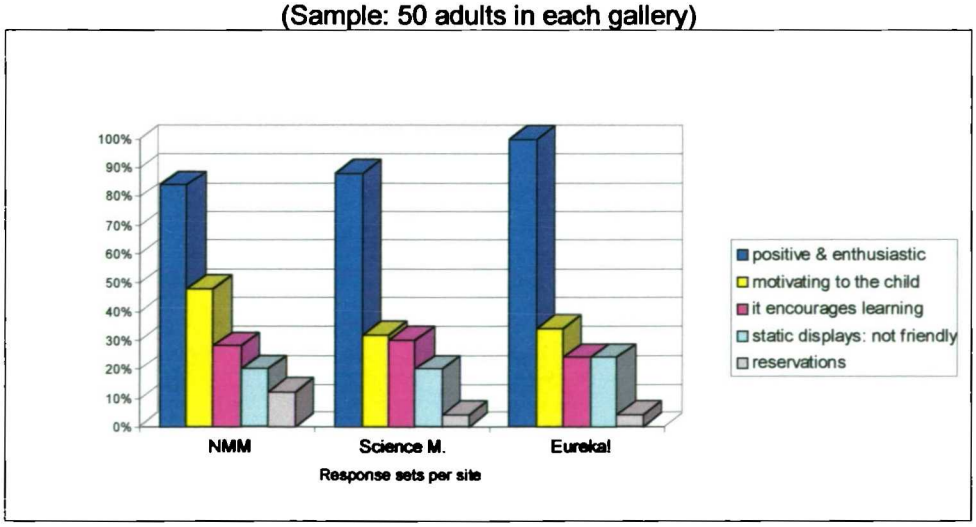


FIGURE 6.3.3b: ADULTS' ATTITUDES TOWARDS CHILD-ORIENTATED EXHIBITS (per site)

(Sample: 50 adults in each gallery)



Sites: National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

6.3.2. CATEGORIES RELATED TO CHILDREN'S RESPONSES

CATEGORY 4:
CHILDREN'S FEELINGS WHILE USING THEIR FAVOURITE EXHIBIT

4a) Combined findings from all interviewed children at the three galleries

This category describes children's emotional reactions to exhibits. Six response sets are within this category: positive feelings; experiential feelings; fun; neutral; negative feelings; and don't know. Children may have mentioned more than one feeling in their responses.

More than half of the children (59%) had **positive feelings** while using exhibits (see Table 6.3.4 and Figure 6.3.4a). They used different adjectives to express their positive feelings. Children said they felt: *'happy', 'cheerful', 'glad', 'pleased', 'really excited', 'involved', 'concentrated', 'confident', 'fascinated', 'surprised', 'interested', 'creative'*. Some children said they felt ***excited*** *'to test something new' (girl, age ten, Eureka!, n.45)* or *'because I learned a lot from it' (boy, age ten, Eureka!, n.17).*

Children also had **experiential feelings** (12%). This category encompasses feelings where the children said they 'felt as if' they were someone or they were in another time or place. In this category of responses children usually mentally took a role or felt as though they were part of an experience. Examples of comments include:

'I felt like I was the captain of the ship'
(boy, age 8, Gunnery exhibit, All Hands Gallery, n.16)

'I felt a bit like you were in ancient times'
(girl, age 8, Signalling, All Hands Gallery, n.37)

'I felt like I was under water'
(boy, age 9, Diving exhibit, All Hands Gallery, n.19)

'It was like going inside the body'
(boy, age 9, Blood exhibit, Me & My Body, n.9)

'I felt like a small person trying to explore inside the body'
(boy, age 9, Nose exhibit, Me & My Body, n.40)

'Ace! As if it was real!
(girl, age 10, 'baby moving inside the tummy', Pregnant woman exhibit, Me & My Body, n.20)

'I felt as if being part of a team, as helping each other to accomplish something'
(boy, age 10, Grain Pit exhibit, Launch Pad, n.13)

Twenty-five children out of 150 interviewed (17% of the sample) mentioned **negative feelings** while using the exhibit, such as: *'annoyed', 'nervous', 'embarrassed', 'worried', 'stupid', 'strange', 'scared', 'tired', 'hurt', 'hard'.* Some of the reasons given by children for having negative feelings can be associated with ***self-image***: *'a bit nervous to do it wrong' (girl, age 10, Signaling exhibit, All Hands, n.10)* and ***problematic exhibition design***: *'I needed to put my arms [in the diving equipment] and it hurt' (girl, age 11, Diving exhibit, All Hands, n.27).* Exhibit designers and developers can use such information to plan exhibits which take into account these types of feelings, avoiding, for instance, feelings of failure and paying more attention to ergonomic issues in exhibits that are to be used by children.

Feelings of **having fun** were mentioned by 12% of children. Only three children (2% of total sample) had **neutral** feelings while using the exhibits, such as: *'I just did it'; 'Something to do'.* A few children **did not know** how to express their feelings (7% of children).

4b) Comparing children's feelings at the three galleries while using their favourite exhibit

Children interviewed at Eureka! The Museum for Children were very enthusiastic about their interaction with the exhibits at the Me & My Body exhibition, since they expressed **positive feelings** more often at this gallery than at the other two sites (68%, compared to 56% at the National Maritime Museum and 52% at the Science Museum). About the same proportion of children had '**experiential**' feelings and '**fun**' when using the exhibits at the three galleries (see Table 6.3.4 and Figure 6.3.4b).

There were more children who had **negative or uncomfortable feelings** while interacting with the exhibits at Launch Pad, Science Museum, and at the All Hands Gallery, National Maritime Museum, than at the Me & My Body exhibition, Eureka! (24% at the Science Museum, 20% at the National Maritime Museum, and 6% at Eureka!).

Summary:

- The present findings offer significant insights into children's feelings at hands-on exhibits, indicating that child-orientated galleries raised feelings of happiness, excitement, and pleasure on children. 'Experiential feelings' mentioned by children illustrate the relevance of pretended play and the creative side of the experience for them. The provision of a sense of wonder and a happy, imaginative, and enjoyable experience seems to be an essential requirement of exhibitions which are aimed at children. The findings also point to the importance of carefully designing and testing exhibits to be used by children in order to avoid negative or uncomfortable feelings.

TABLE 6.3.4: CHILDREN'S FEELINGS WHILE USING THEIR FAVOURITE EXHIBIT

Sample: 150 children (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM(n=50)	%	ScM(n=50)	%	Euk(n=50)	%	All (n=150)	%
positive feelings	28	56%	26	52%	34	68%	88	59%
experiential feelings	6	12%	5	10%	7	14%	18	12%
fun	3	6%	5	10%	4	8%	12	8%
negative feelings	10	20%	12	24%	3	6%	25	17%
neutral	1	2%	1	2%	1	2%	3	2%
don't know	6	12%	2	4%	3	6%	11	7%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

FIGURE 6.3.4a: CHILDREN'S FEELINGS WHILE USING THE EXHIBITS

(Sample: 150 children)

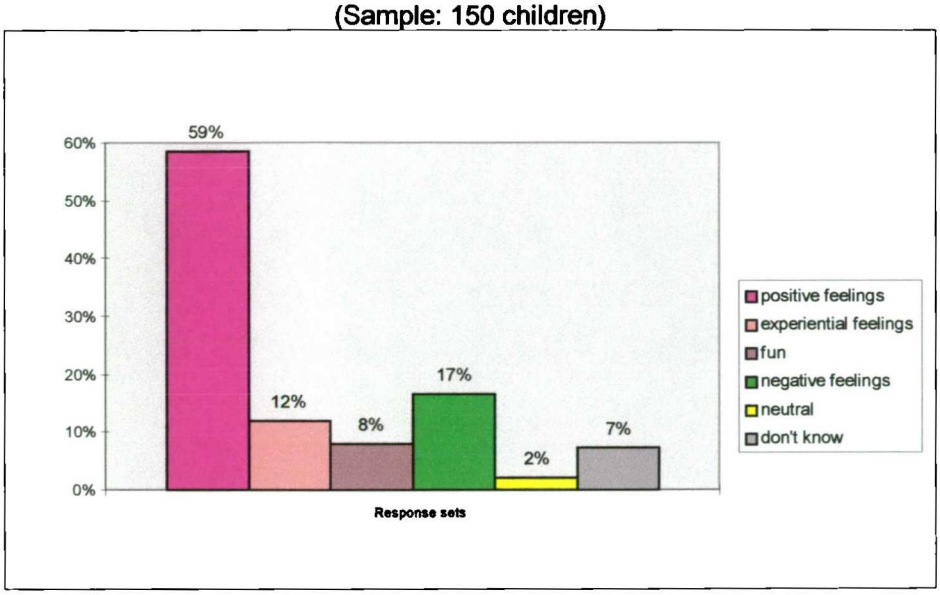
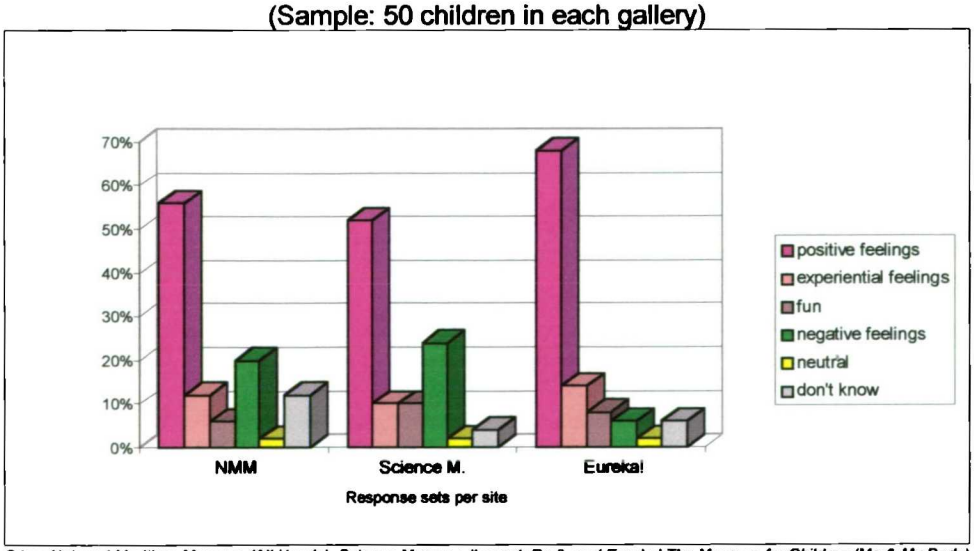


FIGURE 6.3.4b: CHILDREN'S FEELINGS WHILE USING THEIR FAVOURITE EXHIBIT

(Sample: 50 children in each gallery)



Sites: National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

CATEGORY 5:
CHILDREN'S PERCEPTION OF THEIR LEARNING IN THE GALLERIES

5a) Combined findings from all interviewed children at the three galleries

This study did not attempt to *measure* learning, but asked visitors what they thought they had learned. The purpose of this query was to gain an idea about the nature of that learning as expressed by visitors in their own words.

The majority of the children (72%) said they learned something during their visit to the galleries and gave examples (see Table 6.3.5 and Figure 6.3.5a). The **learning & new experiences** response set includes learning related to museum exhibitions, more general responses (involving ideas of culture, social history or general information related to the exhibition topics, such as how people used to live on a ship, about the people at sea, what they did, what they ate, how it was like), and some more specific responses. Examples of comments about learning include:

'I learned lots of things I didn't know about the body: the tummy, the smells, the flavours, the diseases...' (girl, age 9, Me & My Body, n.6)

'That the veins of the grown-ups can be 2.5 inches.'
(boy, age 9, Me & My Body, n.40)

'About the heartbeats, the babies' heartbeats [when sleeping].'
(girl, age 9, Me & My Body, n.36)

'That sound travels by vibration. You could stand on the platform alone and you could listen to others. It was weird.' (boy, age 10, Launch Pad, n.49)

How to communicate with ships using morse code and flags.'
(girl, age 11, All Hands, n.27)

'I learned some things I've never learned before in my class. I just learned new things.'
(girl, age 10, Me & My Body, n.7)

At the 'Me & My Body' exhibition at Eureka! The Museum for Children, children were able to relate information to themselves and others. Some children said they learned:

'How much water I have in my body.'
(boy, age 8, Me & My Body, n. 27)

'How much my bones weigh.'
(boy, age 9, Me & My Body, n.37)

'How a baby feels when he is in his mother's tummy'
(girl, age 9, Me & My Body, n.33)

'Being a blind person - that was very hard.'
(girl, age 9, Me & My Body, n.42)

Some children were able to get the intended overall metamessage of the exhibition. For instance, at Eureka!, two children said that they learned:

'That your body is important and that you have to look after it'
(boy, age 8, Me & My Body, n.28)

'How useful the body can be. I never knew the ears make you balance'
(boy, age 9, Me & My Body, n.2)

Children may have mentioned that they learned some skills such as *'how things work'*, *'how to do things'*. The learning aspect here is related to the mastering of the task required by the exhibit. Children also said that they learned *'a lot'* and *'new things'*. A few children stated a particular/personal view of the exhibition message. At the Science Museum three children said that *'science can be (is) fun'* and one child said that *'electricity can be used for fun things as well'*.

Other children (7%) said they learned something in **another museum gallery** - not specifically at the children's one. Some of them, however, **didn't know** what to say (17%) and six children (4%) said they learned **nothing**. One child did not give an answer directly related to the question but made a comment related to learning about safety:

'Some of the exhibits can be quite dangerous - You might hurt your back.'
(boy, age 7, Pump Jet exhibit, Launch Pad, n.3)

5b) Comparing children's perception of their learning at the three galleries

The proportion of children who said they **learned** something in the gallery was greater at Eureka! The Museum for Children and at the National Maritime Museum (All Hands) than at the Science Museum (Launch Pad) (82%, and 76%, compared to 58%, respectively).

A small proportion of children at Launch Pad and at the All Hands Gallery mentioned things they learned in **another museum gallery** or said that they thought that they **did not learn anything** in the children's gallery (these two categories of responses did not occur at Eureka!). A child interviewed at the Science Museum said:

> *'The Launch Pad is really good, but I didn't really learn from it. The information is not the kind of stuff you remember' (girl, age 10, Science Museum, n.37)*

There were slightly more children who were *not* able to describe what they learned at Launch Pad than at the other two galleries (24%, compared to 18% at Me & My Body and 12% at the All Hands Gallery) (see Table 6.3.5 and Figure 6.3.5b).

Summary:

- The findings indicate that children's learning is occurring in child-orientated galleries, since the majority of children perceived that they learned something in such spaces and were able to give examples. The findings suggest, however, that some exhibitions encouraged perceptions of learning more than others. Children's perceptions of their learning were greater at the children's museum exhibition (Me & My Body) than at the Science Museum (Launch Pad), in which the 'fun' aspect of the visit was perceived as a strong element when compared to Me & My Body and All Hands (see Category 2).

TABLE 6.3.5: CHILDREN'S PERCEPTIONS OF THEIR LEARNING IN THE GALLERIES

Sample: 150 children (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=50)	%	ScM (n=50)	%	Euk (n=50)	%	All (n=150)	%
learning & experiences	38	76%	29	58%	41	82%	108	72%
about another exhibition	5	10%	5	10%	0	0%	10	7%
don't know	6	12%	12	24%	9	18%	27	18%
nothing	2	4%	4	8%	0	0%	6	4%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

FIGURE 6.3.5a: CHILDREN'S PERCEPTIONS OF THEIR LEARNING IN THE GALLERIES

(Sample: 150 children)

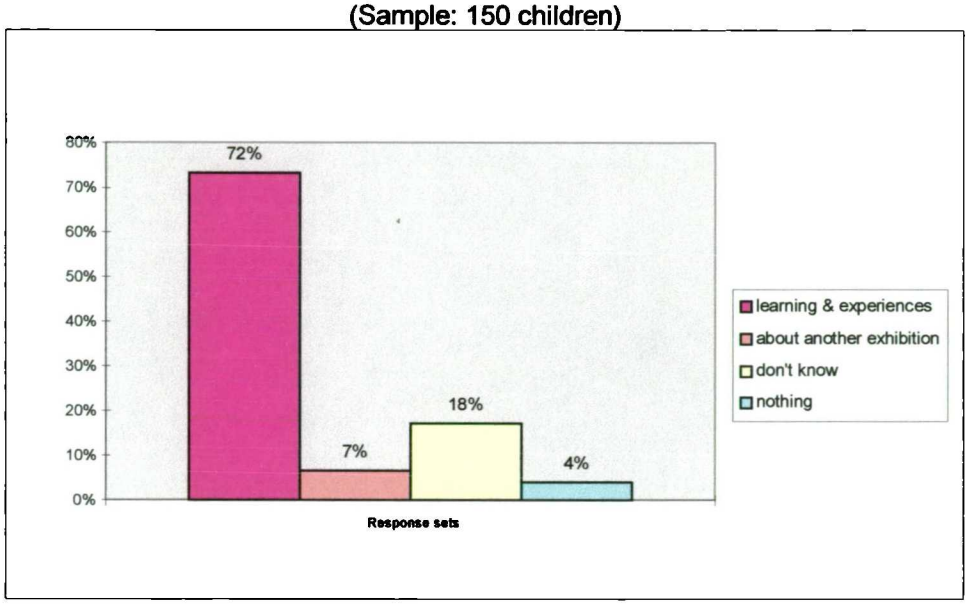
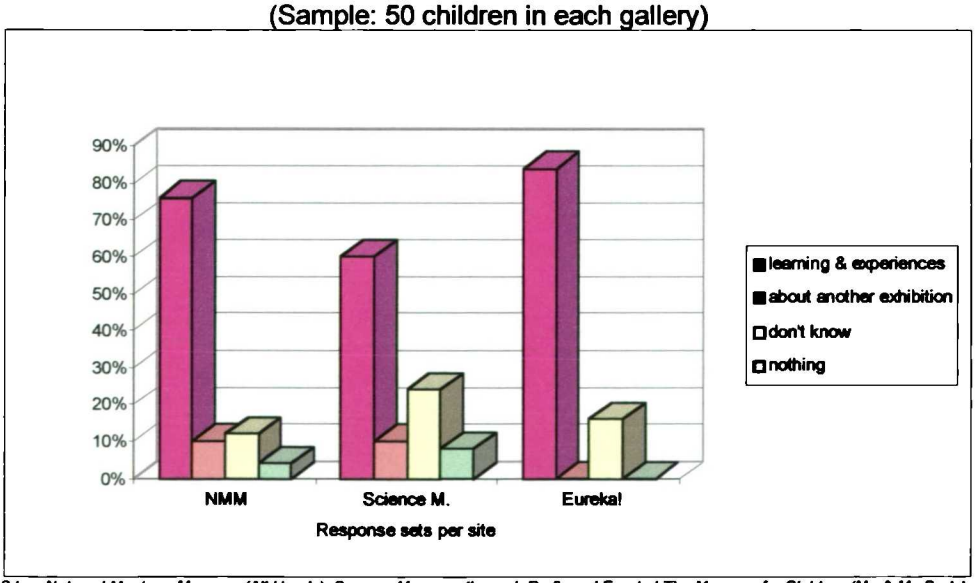


FIGURE 6.3.5b: CHILDREN'S PERCEPTIONS OF THEIR LEARNING IN THE GALLERIES

(Sample: 50 children in each gallery)



Sites Natonal Mantime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

CATEGORY 6:
CHILDREN'S PREFERENCES FOR VISITING MUSEUMS WITH THEIR 'FAMILIES' RATHER THAN WITH SCHOOL

6a) Combined findings from all interviewed children at the three galleries

This investigation has taken in consideration the physical context of the visit (description/atmosphere of the exhibition), the personal context (children's reports about their feelings, perceptions of own learning), and also the social context of the visit. The findings below may give some indications of the aspects children appreciate most when visiting the galleries with their families.

The majority of the children interviewed said they prefer to visit museums **with their family** rather than with school (61%, n=91 out of 150). The reasons given by children for this preference included assistance, attention and the help they can get from parents, freedom to make choices (independence), more fun, more relaxed, opportunity to do things with their families (see Table 6.3.6 and Figure 6.3.6a), as well as freedom from some drawbacks of visiting museums with school such as *'you have to queue', 'to hurry', 'to do worksheets'*.

A few children (9%, n=13 out of 150) said they prefer to visit museums **with their class (school)**. In this last category, the main reason given by children for preferring to visit museums with their school was because they have their '*friends*' there, indicating that children like to visit museums with people they know well and feel at ease with.

6b) Comparing children's responses sets regarding their preferences for visiting museums with family rather than with school at the three galleries

Children's responses regarding their preference for visiting museums with their families varied according to the site, suggesting that the characteristics of each gallery environment and exhibits may have affected children's preferences (some distinctive elements about the exhibits and the galleries investigated were identified in Chapter 4 and 5).

At the All Hands Gallery (National Maritime Museum), more children said they prefer to visit museums with their families rather than with school because they can get more attention and help from their relatives (**assistance**) (27%, compared to 20% at Launch Pad and 18% at Me & My Body). For instance:

'If you don't understand something, you can talk to your family straightway.'
(boy, age 11, All Hands, n. 26)

'Because they [my family] tell me what they see because I'm not a very good reader.'
(girl, age 9, All Hands, n.43)

At Launch Pad (Science Museum) more children said that they like visiting museums with family because they have more '**independence**' (44%, compared to 24% at All Hands and 15% at Me & My Body). For example:

'Because you don't have to do what the teachers says. You can do what you want... Because my family knows what I like and what I am interested in.'
(boy, age 11, Launch Pad, n.4)

At Me & My Body (Eureka! The Museum for Children) more children said they prefer visiting exhibitions with family due to the opportunity to do things together with them (**socialising**) (21%, compared 4% at Launch Pad and no occurrence at All Hands). For instance:

'Because my parents are usually working so it is an opportunity to be together.'
(boy, age 8, Me & My Body n.31)

There were about the same proportion of children at the three galleries investigated who said that they prefer to visit museums with 'families' rather than with school because it is '**more relaxed**' (24% at All Hands, 20% at Launch Pad, and 24% at Me & My Body) (see Table 6.3.6 and Figure 6.3.6b).

Summary:

- The findings indicate that the majority of children prefer to visit museums with their families than with school, suggesting that the informal context of family social interactions during a museum visit is highly appreciated by children. The findings also suggest that distinctive qualities of each gallery may influence the family dynamics. For instance, 'assistance' was very appreciated by children at All Hands; 'independence' at Launch Pad, and 'socialising' at Me & My Body.

TABLE 6.3.6: CHILDREN'S PREFERENCES FOR VISITING MUSEUMS WITH FAMILY RATHER THAN WITH SCHOOL

Sample: 91 out of 150 children (who preferred to visit museums with 'family')
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=33)	%	ScM (n=25)	%	Euk (n=33)	%	All (n=91)	%
assistance	9	27%	5	20%	6	18%	20	22%
independence	8	24%	11	44%	5	15%	24	26%
more relaxed	8	24%	5	20%	8	24%	21	23%
more time	3	9%	4	16%	5	15%	12	13%
more fun	4	12%	1	4%	2	6%	7	8%
socialising	0	0%	1	4%	7	21%	8	9%
don't know	2	6%	0	0%	2	6%	4	4%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

FIGURE 6.3.6a: CHILDREN'S PREFERENCES FOR VISITING MUSEUMS WITH FAMILY RATHER THAN WITH SCHOOL

Sample: 91 children out of 150 who preferred to visit with 'family'

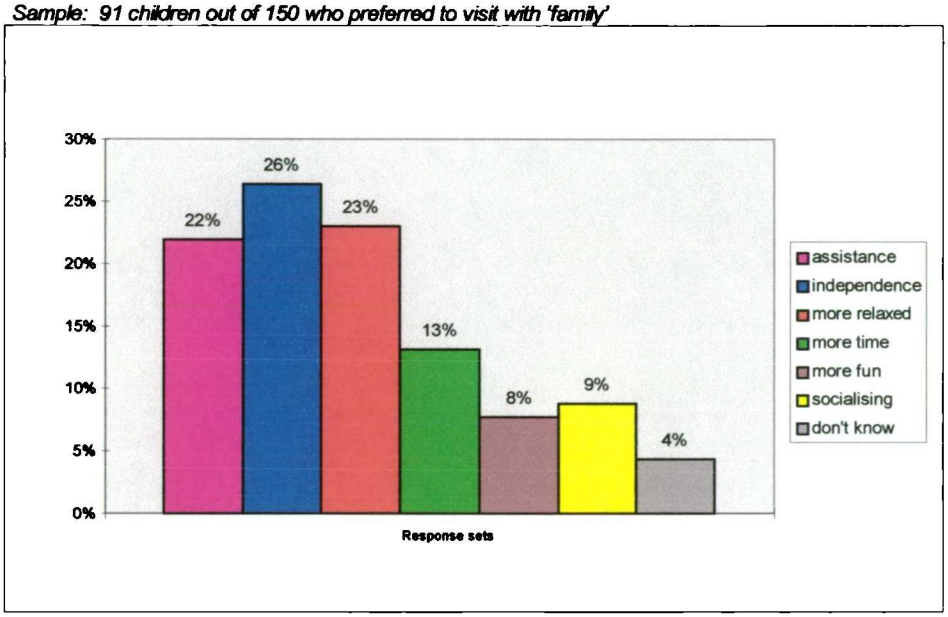
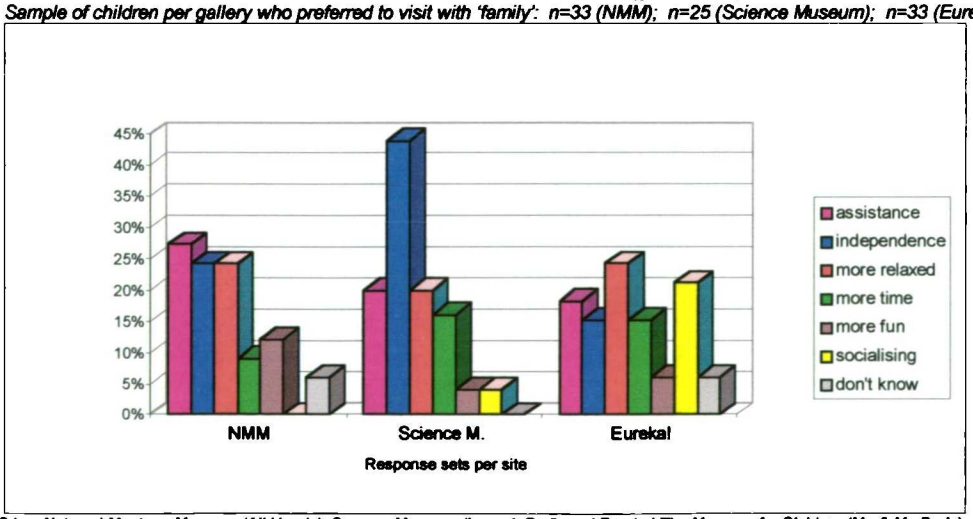


FIGURE 6.3.6b: CHILDREN'S PREFERENCES FOR VISITING MUSEUMS WITH FAMILY RATHER THAN WITH SCHOOL (per site)

Sample of children per gallery who preferred to visit with 'family': n=33 (NMM); n=25 (Science Museum); n=33 (Eureka!)



Sites National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

6.2.3. RESPONSE CATEGORIES SHARED BY ADULTS AND CHILDREN RELATED TO SIMILAR INTERVIEW QUESTIONS

CATEGORY 7:
ADULTS' & CHILDREN'S DESCRIPTIONS OF THE GALLERIES

I. Adults' descriptions of the galleries

7a) Combined findings from all interviewed adults at the three galleries

When asked to describe the gallery, **parents' and relatives'** responses fell into seven response sets (multiple comments were possible): learning and thinking; hands-on activities; forms of praise; exhibition characteristics (content/design/staff); child-friendly environment; fun / entertaining; and reservations.

Slightly more than half of the parents/relatives described the galleries as places that can encourage **learning and thinking** (54% of adults) (see Figure 6.3.7a, page 269, and Table 6.3.7, page 270). This response set encompasses multiple ideas related to aspects about thinking and learning. Examples of comments include:

"Interesting. Educational. It gives an insight about how things actually work..."
(father, civil servant, All Hands, n.32)

"They learn and it is fun. Interesting. It stimulates them [the children]. I think it stays in their memory longer, instead of if it was in a case. The chests [to open] make them inquisitive."
(mother, secretary, All Hands, n.36)

"The interactive element is very important. It prompts kids to ask questions. Very scientific, in a very simple way. Entertaining, informative." (father, consultant engineer, Launch Pad, n.23)

"Very informative. Very comprehensive. It makes the child feel very special, which is good."
(mother, consultant geologist, Me & My Body, n.17)

Adults also mentioned the **hands-on / interactive** approach of the galleries and the opportunities these exhibitions offer for participation (41%). For example:

"Lots of things children can try their skills on."
(mother, support worker for carers, All Hands Gallery, n.3)

"It has a lot of interactive experiences that demonstrate principles of science in a play way."
(father, geologist, Launch Pad, n.13)

"They can experience difference senses, explore all that goes on in the body."
(grandmother, retired, former teacher, Me & My Body, n.6)

More than a third of parents/relatives approved of the galleries, using different **forms of praise** (40% of adults) such as *'wonderful', 'terrific', 'fantastic', 'fascinating', 'brilliant', 'very interesting', 'well worth a visit',* and *'good'*. About a quarter of them talked about the **child-friendly nature** of the exhibitions (26% of adults) stressing, for example, that the exhibition *'speaks the child's language'* and it *'makes the child feel special'*.

Parents/relatives also mentioned different **characteristics of the exhibitions** (21%) such as content, variety, design, layout, the space (safe, colourful, well organized), and guidance provided by exhibition staff ('interpreters', 'explainers', 'enablers'). The **fun / entertaining** aspect of the galleries was the attribute least mentioned by adults (15% of all).

Some adults made some **reservations / criticisms** about the galleries (6%). Examples of comments include:

"Children tend to like it, but a bit of it you wonder what the purpose of it is."
(mother, computer analyst, All Hands Gallery, n.10)

"Confusing. Too haphazard. It doesn't pursue a particular line of thought."
(father, rare books dealer, All Hands Gallery, n.45)

"Not very good for girls. Not many things that interest girls. Very good for boys."
(mother, librarian, All Hands Gallery, n.46)

"Very busy, one of the main problems."
(father, geologist, Launch Pad, n.22)

"Children flip around, they don't read labels."
(mother, home duties, Me & My Body, n.4)

II. Children's descriptions of the galleries

7b) Combined findings from all interviewed children at the three galleries

Children's responses when asked to describe the galleries also fell into seven response sets (multiple comments were possible): praise & positive feelings; fun / entertaining; hands-on activities; characteristics of exhibits; learning opportunities; child-friendly environment; and reservations. The response sets were similar to the adults' but differed in frequency of comments.

Children expressed praise and positive feelings about the three child-orientated galleries more than adults did (64% compared to 40%, respectively) (see Figure 6.3.7b, page 269, and Table 6.3.7, page 270). The majority of children described the galleries with **positive feelings** comments and **forms of praise** such as *'exciting', 'surprising', 'excellent', 'very good', 'cool', 'very interesting'*. The second most frequent comment used by children to describe the galleries was **fun / entertaining**. This response set was much larger among children's responses than among adults' (43% compared to 15%, respectively). Around a third of the children (34%) mentioned the fact that there were lots of **hands-on activities** in the galleries, things that they could do and try out. A boy, aged 11, said:

"It is worth to coming to it frequently. There is stuff you can do over and over without getting bored." (All Hands Gallery, n.17)

About a quarter of the children talked about the **exhibits** they liked (23%) and about **learning opportunities** offered by the exhibits (22%). Children spontaneously mentioned that *'you learn a lot', 'it teaches you', 'you can find out about things', 'discover', 'figure out', 'explained in a simple way so children can understand', 'you learn different aspects very easily'*; and that it is *'educational'*. Some examples of children's comments about the learning opportunities offered by the exhibitions are:

"Very interesting. You could learn different methods of communication very easily. I like places like that because you don't have boards and boards of writing and writing that you have to read, and that makes children interested in it." (boy, age 11, All Hands, n.11)

"It is really fun. You learn the stuff in a good way. You don't get bored, like looking at pictures." (girl, age 11, All Hands, n.27)

"It is quite fun in there - you can make air bubbles. It is good because you can have fun and learn at the same time. The sound dishes - you can see how the sound travels. I've also learned about that at school. You learn a lot and it is quite funny." (boy, age 10, Launch Pad, n.49)

"It is a good way of learning because you can touch and do things, while in other museums you can't, you have to read the things." (boy, age 10, Me & My Body, 47)

Seven children mentioned the **child-friendly nature** of the galleries such as *'good / interesting for children'* (5% of children) (see Figure 6.3.7b and Table 6.3.7).

Three children expressed **reservations** about the All Hands Gallery and Launch Pad (no reserved comment was made by children about the 'Me and My Body' exhibition at Eureka!). Reservations made by children include:

"Some of the things are a bit hard for young children. Some instructions are not very clear." (girl, age 11, Launch Pad, n.20)

"Sometimes there are lots of people so you can't go in all the stuff." (boy, age 8, All Hands, n.28)

"Interesting, but it is only about ships. I think it could have other things inside it." (boy, age 9, All Hands, n.48)

Summary:

- Adults' and children's descriptions of the galleries fell into similar responses sets, but differed in the frequency of comments. Next, a comparison between adults' and children's responses is made in order to explore what aspects of the exhibition were more relevant for children and/or adults.

COMBINED FINDINGS FROM ADULTS' AND CHILDREN'S RESPONSES AT ALL SITES

FIGURE 6.3.7a: ADULTS' DESCRIPTIONS OF THE GALLERIES (OVERALL)
(Sample: 150 adults)

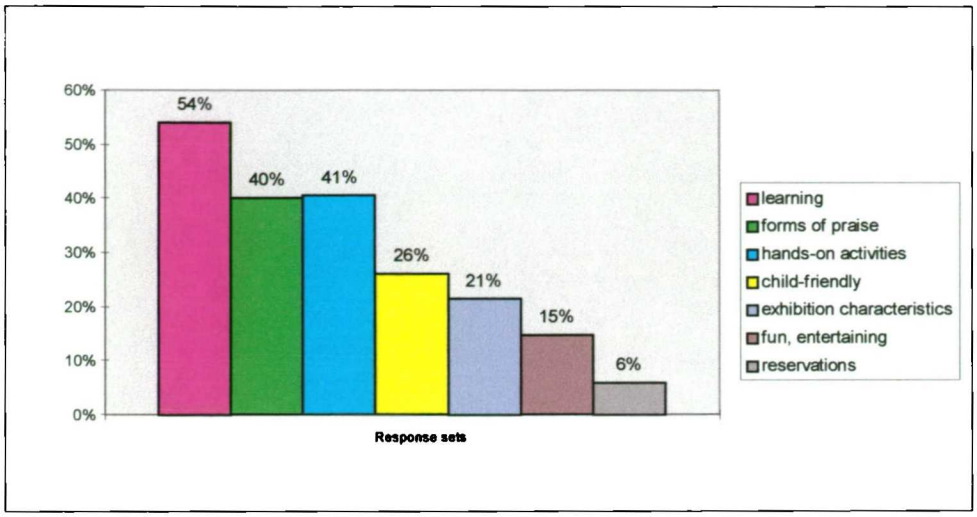
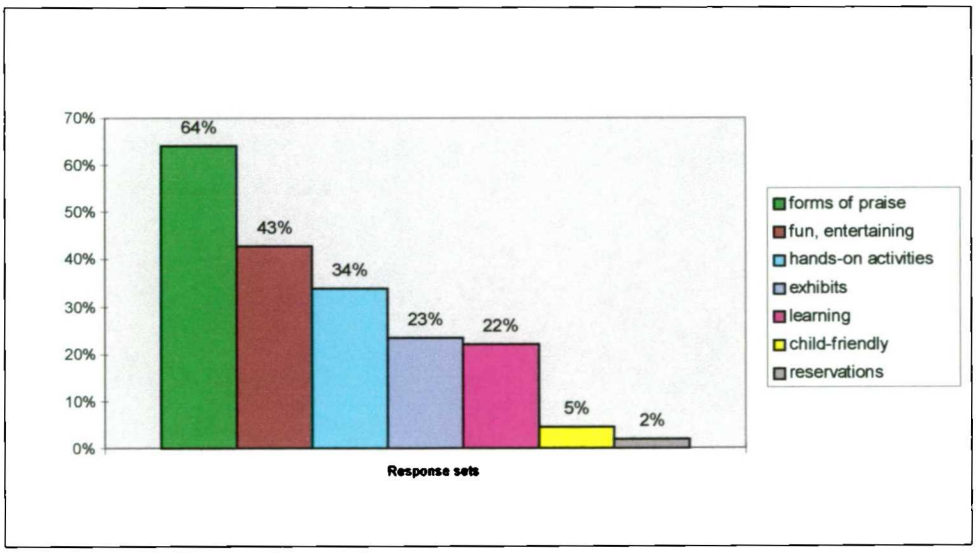


FIGURE 6.3.7b: CHILDREN'S DESCRIPTIONS OF THE GALLERIES (OVERALL)
(Sample: 150 children)



III. Comparison of adults' and children's descriptions of the galleries

Adults tended to describe the galleries as providing learning opportunities, praiseworthy and containing hands-on activities, while children tended to describe them as pleasant places, fun, and mentioning exhibits they liked.

Table 6.3.7 shows a comparison of the adults' and children's descriptions of the galleries. The findings indicate that descriptions related to **learning** opportunities in the galleries were more frequent from adults than children (54% of adults made comments in this response set compared to 22% of children), suggesting that for adults the opportunity for learning was the most noticeable characteristic of the galleries.

Table: 6.3.7:
Comparison of adults' and children's descriptions of the galleries
Sample: 150 adults and 150 children (total interview sample)

	DESCRIPTIONS OF THE GALLERIES Individuals per response set			
	ADULTS		CHILDREN	
RESPONSE SETS	%	n	%	n
learning	54%	81	22%	33
praise	40%	60	64%	96
hands-on activities	41%	61	34%	51
child-friendly	26%	39	5%	7
fun, entertaining	15%	22	43%	64
exhibition characteristics	21%	32	-	-
exhibits	-	-	35%	23
reservations	6%	9	2%	3

Note: 'n' refers to number of individuals per response set

The most frequent response sets among children when describing the galleries were related to **praise** and **fun** (64% of children compared to 40% of adults, and 43% of children compared to 15% of adults, respectively), indicating that the enjoyable and exciting side of the galleries experience was

more obvious to children than to adults. It is interesting to notice that when children where asked whether they learned something in the gallery (see Category 5), 72% of them said they did so and gave examples, but when they were asked to describe the gallery, only 22% of the children described them as educational, suggesting that child-orientated exhibitions are not seen by children as places where they go primarily to 'learn', but as enjoyable and exciting places where they may also learn new things (which is a characteristic of informal learning environments).

Children were keen to name the **exhibits** which impressed them most in the galleries, while adults were more likely to talk about the **exhibition characteristics**, such as the *content of the exhibition*, its *design*, and the friendly *gallery staff*.

Both adults and children described other aspects of the galleries, such as **hands-on** and **child-friendly**, but adults' comments in these response sets were greater than children's.

Summary:

- Adults described the galleries mostly as a learning environment while children described them as enjoyable and entertaining. In the next section, adults' responses at each site are compared in order to explore similarities and differences regarding their perceptions of the galleries. This is followed by a comparison of children's descriptions of the galleries at each site.

IV. Comparing the three galleries

7c) Comparing adults' descriptions of the three galleries

The proportion of adults whose descriptions included **learning and thinking** aspects was greatest at the Me & My Body, Eureka!, suggesting that the learning aspect was more evident to adults at the Museum for Children than at the other two sites (see Table 6.3.7a below and Figure 6.3.7c on page 274). This finding might indicate that adults believe that the exhibition at the children's museum was more conducive to learning than the children's exhibition at the maritime and science museums.

On the other hand, the **fun** aspect of the galleries was described more often at Launch Pad (Science Museum) and was less frequently cited at Eureka!, suggesting that the exhibition at Launch Pad was perceived by adults having a strong component of entertainment for the child.

The **child-friendly nature** of the exhibitions was mentioned by adults in the same proportion in all three galleries (26% of adults in each gallery), indicating that adults perceived that the galleries were designed having children in mind and to encourage children's participation and involvement.

TABLE 6.3.7a: ADULTS' DESCRIPTIONS OF THE GALLERIES PER SITE AND AT ALL SITES
Sample: 150 adults (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=50)	%	ScM (n=50)	%	Euk (n=50)	%	All (n=150)	%
learning & thinking	17	34%	28	56%	36	72%	81	54%
forms of praise	24	48%	18	36%	18	36%	60	40%
hands-on activities	17	34%	22	44%	22	44%	61	41%
child-friendly	13	26%	13	26%	13	26%	39	26%
exhibition characteristics	9	18%	13	26%	10	20%	32	21%
fun, entertaining	6	12%	15	30%	1	2%	22	15%
reservations	5	10%	2	4%	2	4%	9	6%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

7d) Comparing children's descriptions of the three galleries

About the same proportion of children expressed **praise** and **positive feelings** for the galleries at the three sites investigated. Children described the galleries as '**fun**' more often at All Hands (National Maritime Museum) and Launch Pad (Science Museum) than at Eureka! The Museum for Children. Conversely, the children interviewed at the Me & My Body, Eureka!, talked spontaneously about the **educational side** of the exhibition more often than the children interviewed at the other two locations.

Children interviewed at Launch Pad seem to have been impressed by the number of **hands-on exhibits** to 'play with', since this category was slightly higher at Launch Pad than at the other two galleries (see Table 6.3.7b below and Figure 6.3.7d on the next page). Examples of comments include:

"Lots of hands-on things you could do and interesting experiments to try - the bubbles, the thing that measures your voice waves [...] Well worth the visit." (boy, age 9, Launch Pad, n.22)

"It is good. There are lots of activities I can do. There are people [Explainers] you can ask if you don't know what to do. You can touch things and learn things." (girl, age 9, Launch Pad, n.42)

The findings indicate that children valued the enjoyable, entertaining, and interactive side of the galleries.

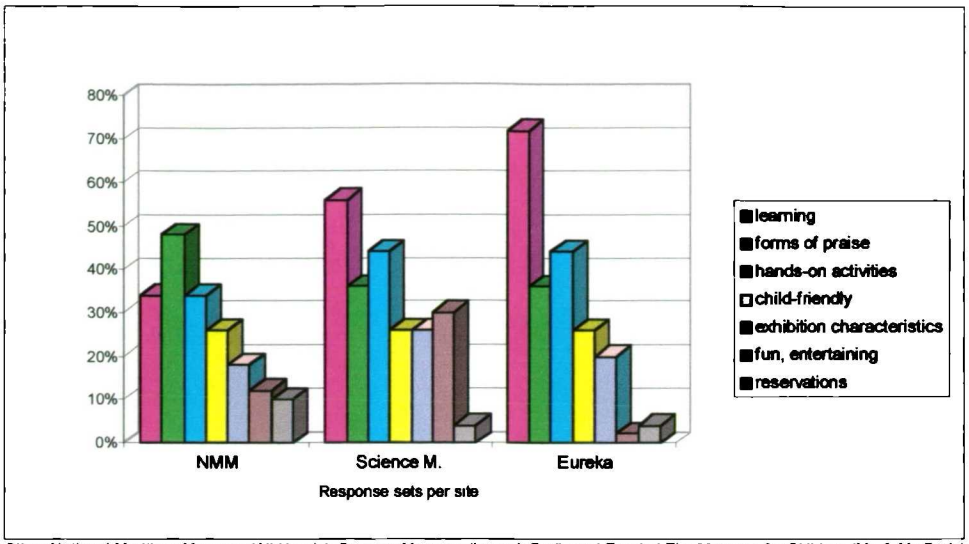
TABLE 6.3.7b: CHILDREN'S DESCRIPTIONS OF THE GALLERIES PER SITE AND AT ALL SITES
Sample: 150 children (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=50)	%	ScM (n=50)	%	Euk (n=50)	%	All (n=150)	%
praise & positive feelings	34	68%	30	60%	32	64%	96	64%
fun, entertaining	26	52%	24	48%	14	28%	64	43%
hands-on activities	19	38%	21	42%	11	22%	51	34%
exhibits	14	28%	10	20%	11	22%	35	23%
learning opportunities	7	14%	9	18%	17	34%	33	22%
child-friendly	3	6%	1	2%	3	6%	7	5%
reservations	2	4%	1	2%	0	0%	3	2%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

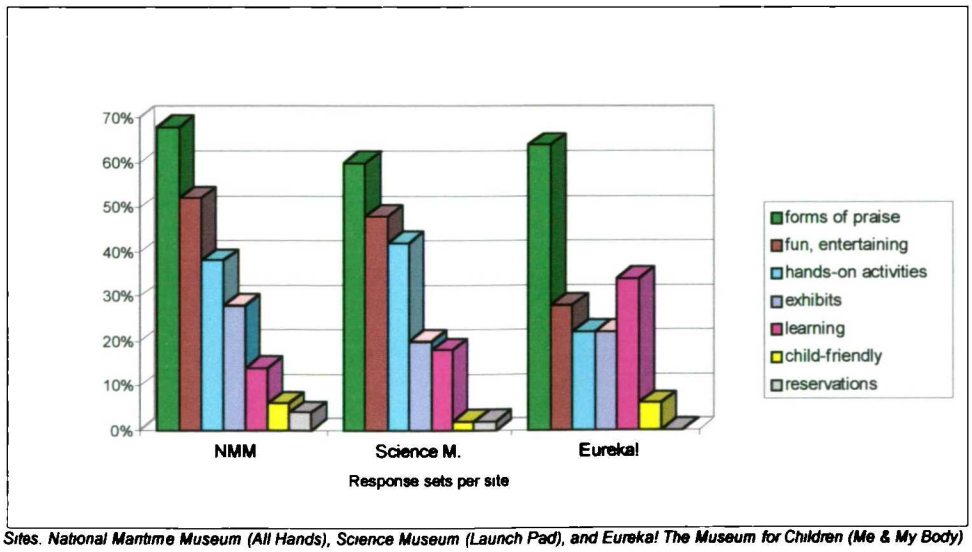
ADULTS' AND CHILDREN'S DESCRIPTIONS OF THE GALLERIES AT EACH SITE

FIGURE 6.3.7c: ADULTS' DESCRIPTIONS OF THE GALLERIES (per site)
(Sample: 50 adults in each gallery)



Sites: National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

FIGURE 6.3.7d: CHILDREN'S DESCRIPTIONS OF THE GALLERIES (per site)
(Sample: 50 children in each gallery)



Sites. National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

CATEGORY 8:
ADULTS' & CHILDREN'S IMPRESSIONS OF THE GALLERY ATMOSPHERE

I. Adults' impressions of the gallery atmosphere

8a) Combined findings from all interviewed adults at the three galleries

The question regarding the atmosphere of the galleries gave rise to similar responses to the one regarding the galleries' descriptions. The main differences are the comments related to the social and environmental aspects of the atmosphere of the galleries. There were six basic responses: forms of praise; positive feelings; social aspects (positive and negative); environmental aspects (positive and negative); fun; and educational atmosphere.

Adults used different **forms of praise** to describe the atmosphere of the galleries (41%), such as *'wonderful', 'very good', 'very nice'*, but also less enthusiastic expressions such as *'good', 'fine', 'all right'*. Thirty per cent of parents/relatives had **positive feelings** about the galleries. They used affective expressions such as *'pleasant', 'happy', 'full of life', 'stimulating', 'welcoming', 'inviting'*. Adults also mentioned **positive social aspects** (40%) of the atmosphere of the galleries, such as *'friendly atmosphere', 'family atmosphere', 'friendly staff', 'children get along well with other children', 'international atmosphere', 'not busy'*, all expressions that have a 'social' connotation (see Figure 6.3.8a, page 278 and Table 6.3.8, page 279). Nine per cent of adults mentioned **negative social aspects**, such as *'busy'* and *'crowded'*.

Some adults also mentioned environmental aspects of the atmosphere of the galleries. They stressed slightly more **negative environmental aspects** of the galleries (13% of individuals) than **positive environmental** ones (10%). Negative environmental aspects are mainly related to the level of sound and temperature inside the gallery, lack of comfort, and confusion. Positive environmental aspects are related to different aspects of the space (light, colour, lay out, and safety).

Less frequent comments regarding the atmosphere of the galleries were related to the **fun aspects** of the exhibition (7% of relatives) and **educational aspects** (2% of adults).

Comments (embracing more than one aspect) made by adults include:

"Fine. The children liked the international atmosphere of the gallery. A little overcrowded. You could have spent longer if it wasn't so busy." (mother, school nurse, All Hands, n.37)

"Very friendly. Wonderful. Calm. Lovely. You are not rushed. There was a lady [gallery staff], she was very nice." (mother, secretary, All Hands, n.36)

"Fun and light atmosphere. Staff is not intrusive. Quite easy. You don't have to worry if you are doing it wrong." (mother, hospital manager, Launch Pad, n.14)

"Very relaxed. You don't feel as if you are gonna break anything. Enjoyable. Stimulating. Positive atmosphere." (mother, fashion buyer, Launch Pad, n.29)

"Very free and easy. Parents are quite happy because there is no danger. Nice atmosphere. Very colourful." (mother, non-teaching assistant, Me & My Body, n.21)

"I've enjoyed today because there are fewer people. When it is busy you miss things. Good, because everybody seems to enjoy it. You certainly don't get bored."
(aunt, retired, former primary teacher, Me & My Body, n.11)

II. Children's impressions of the gallery atmosphere

8b) Combined findings from all interviewed children at the three galleries

The most frequent comments from children regarding the atmosphere of the galleries were mainly related to **positive feelings** (34% of children) and **forms of praise** (28%). Comments used by children to express positive feelings included *'happy'*, *'cheerful'*, *'exciting'*, *'amazing'*. To express forms of praise children used comments such as *'brilliant'*, *really nice'*, *'good'*, and *'interesting'*. Similarly to adults' responses, although in smaller proportions, children mentioned more **positive social aspects** (10% of individuals) than **negative social** ones (5%), such as *'very friendly'* and *'lots of people talking and laughing'*, and more **negative environmental aspects** (7% of children) than **positive environmental** ones (3%), *'noisy'* and *'hot'* (see Figure 6.3.8b, page 278, and Table 6.3.8, page 279).

Comments related to the **fun aspect** of the galleries were almost double those of adults (13% compared to 7%, respectively). Children commented about the **educational atmosphere** of the galleries as much as adults (3% of children compared to 2%, respectively). Eleven per cent of children did not know how to express their impressions about the atmosphere of the galleries.

Comments (encompassing more than one aspect) made by children about the atmosphere of the galleries include:

'Really good. I expected it to be quite dull but it was a really happy atmosphere.'
(girl, age 11, All Hands, n.27)

'A place where you can do things and find out about things.'
(girl, age 9, All Hands, n.46)

'Nice, because they let you touch things.'
(boy, age 9, All Hands, n.48)

'Really colourful. When I arrived I thought it would be good because it was really colourful.'
(boy, age 9, Me & My Body, n.32)

'Really exciting. Definitively fun. Good place to be.'
(girl, age 9, Me & My Body, n.34)

'I was surprised all the time.'
(boy, age 11, Launch Pad, n.48)

'I felt lost.'
(girl, age 10, Launch Pad, n.45)

Summary:

- Forms of praise and positive feelings (relating to the affective side of the experience) were the most frequent comments from children and adults regarding the atmosphere of the galleries. Social and environmental aspects (both positive and negative) were also mentioned by adults and children. In the next section, a comparison between adults' and children's responses about the atmosphere of the galleries is presented in order to outline differences in the frequency of comments between adults and children.

COMBINED FINDINGS FROM ADULTS' AND CHILDREN'S RESPONSES AT ALL SITES

FIGURE 6.3.8a: ADULTS' IMPRESSIONS OF THE GALLERY ATMOSPHERE
(Sample: 150 adults)

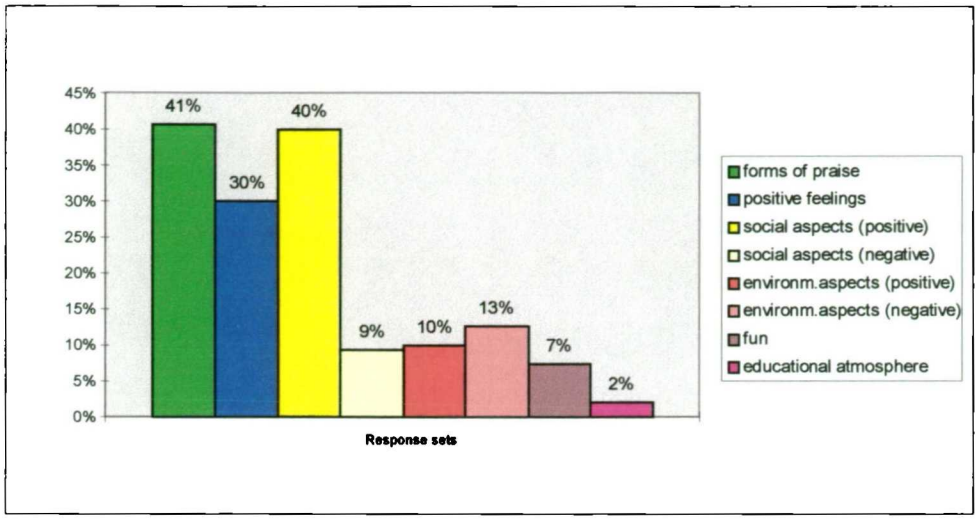
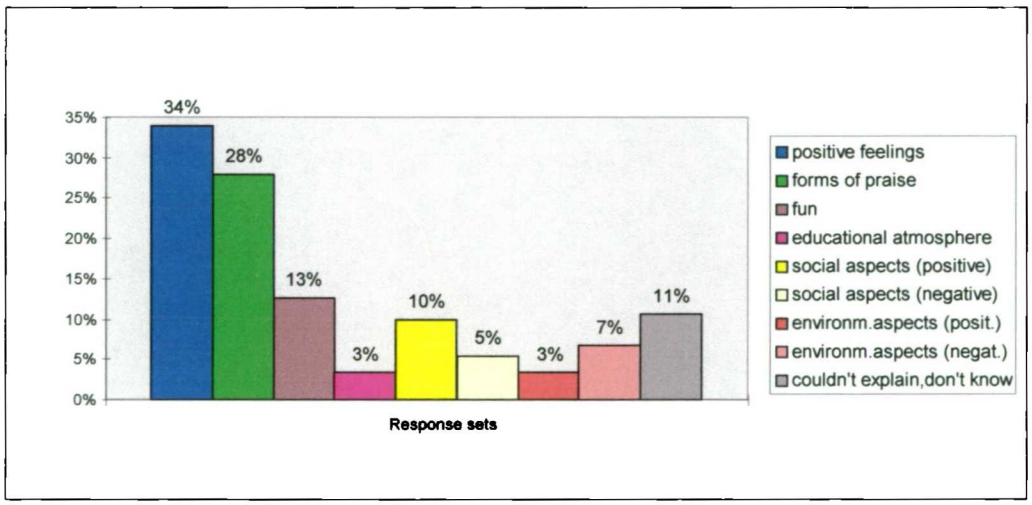


FIGURE 6.3.8b: CHILDREN'S IMPRESSIONS OF THE GALLERY ATMOSPHERE
(Sample: 150 children)



III. Comparison of adults' and children's impressions of the gallery atmosphere

Adults tended to describe their impression of the atmosphere of the galleries with expressions of praise and positive feelings and stressing the positive social aspects of the galleries' atmosphere. Children also tended to describe their impression of the atmosphere of the galleries with expressions of praise and positive feelings.

Table 6.3.8 shows a comparison between all adults' and children's responses regarding their impressions of the atmosphere of the galleries. Adults made more frequent comments than children in the following response sets: **forms of praise**, *positive* **social aspects**, and *positive* and *negative* **environmental aspects**, while children used the word '**fun**' more often than adults to describe their impressions of the galleries. These findings suggest that adults were more able than children to express a varied view of the gallery atmosphere.

Table: 6.3.8:
Comparison of adults' and children's impressions of the gallery atmosphere
Sample: 150 adults and 150 children (total interview sample)

	IMPRESSIONS OF GALLERY ATMOSPHERE Individuals per response set			
	ADULTS		CHILDREN	
RESPONSE SETS	%	n	%	n
forms of praise	41%	61	28%	42
positive feelings	30%	45	34%	51
social aspects (positive)	40%	60	10%	15
social aspects (negative)	9%	14	5%	8
environmental aspects (positive)	10%	15	3%	5
environmental aspects (negative)	13%	19	7%	10
fun	7%	11	13%	19
educational atmosphere	2%	3	3%	5
don't know, couldn't describe	-	-	11%	16

Note: 'n' refers to number of individuals per response set.

About the same proportion of adults and children declared **positive feelings** regarding the gallery atmosphere (30% and 34%, respectively) and, less frequently, *negative* **social aspects** (9% and 5%, respectively), and **educational atmosphere** (2% and 3%, respectively), suggesting that the gallery atmosphere had a positive impact on both adults' and children' affective side of the experience (even if there were a few of them who mentioned negative social aspects such as 'busy' and 'crowded'). The educational aspect of the gallery *atmosphere* was not considered the most obvious one by adults and children (the educational aspect was more frequent in the *descriptions* of the gallery).

Children had more difficulty than adults in describing the atmosphere of the galleries, since 11% of them could not describe it.

Summary:

- Adults were more able than children to express a varied view of the galleries atmosphere. Positive social aspects of the gallery were a frequent comment among adults. Praise and positive feelings were most common among children, who also valued the entertaining and positive social aspects of the atmosphere of the galleries. Next, a comparison of adults' comments about the gallery atmosphere at the three sites is presented, followed by a comparison of children's responses at the three galleries.

IV. Comparing the three galleries

8c) Comparing adults' impressions of the gallery atmosphere at the three locations

The proportion of adults who had **positive feelings** about the atmosphere of gallery was higher at Eureka! The Museum for Children, and the proportion of adults who expressed **praise** was greater at the National Maritime Museum (see Table 6.3.8a below and Figure 6.3.8c, page 283).

The proportion of adults who mentioned 'positive' **social aspects** was greater at Launch Pad (Science Museum) than at the other two locations, but the proportions of adults who cited environment aspects (positive and negative) were about the same at the three galleries. The **educational atmosphere** of the galleries was mentioned by adults at Eureka! and at the Science Museum (although not frequently), and it was not mentioned at the National Maritime Museum (All Hands Gallery). Examples of comments include:

"Educational atmosphere, because they [the children] are learning without realising. Relaxed atmosphere for the adult because children are not going to break anything. Fun atmosphere." (mother, Special Needs assistant, Me & My Body, n.34)

"Children seem to like it. Adults are learning as well." (father, electrician, Launch Pad, n.41)

TABLE 6.3.8a: ADULTS' IMPRESSIONS OF THE GALLERY ATMOSPHERE PER SITE AND AT ALL SITES
Sample: 150 adults (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=50)	%	ScM (n=50)	%	Euk (n=50)	%	All (n=150)	%
forms of praise	27	54%	17	34%	17	34%	61	41%
positive feelings	13	26%	10	20%	22	44%	45	30%
social aspects (positive)	18	36%	26	52%	16	32%	60	40%
social aspects (negative)	2	4%	6	12%	6	12%	14	9%
environm.aspects (positive)	5	10%	4	8%	6	12%	15	10%
environm.aspects (negative)	6	12%	6	12%	7	14%	19	13%
fun	3	6%	4	8%	4	8%	11	7%
educational atmosphere	0	0%	1	2%	2	4%	3	2%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

8d) Comparing children's impressions of the gallery atmosphere at the three locations

Children expressed **positive feelings** regarding the atmosphere of the gallery more often at Eureka! the Museum for Children than at the other two museums (42%, compared to 34% at the Science Museum and 26% at the National Maritime Museum). Comments related to the '**fun**' aspect of the atmosphere of the exhibitions were about the same at the three locations. More children interviewed at Launch Pad, Science Museum, mentioned 'positive' **social aspects** of the atmosphere of gallery, such as 'friendly', and more children at Eureka! referred to 'positive' **environmental aspects**, such as 'colourful'. More children at the Science Museum referred to 'negative' **environmental aspects** of the gallery, such as 'busy' and 'crowded' (see Table 6.3.8b below and Figure 6.3.8d on the next page).

Three children at the All Hands Gallery (National Maritime Museum) (6%) and two children at the Me & My Body (Eureka!) (4%) thought that the atmosphere of the gallery was '**educational**', while no children cited this aspect at Launch Pad. Examples of comments include:

"Lots of people were being educated and having some fun." (boy, age 10, All Hands, n.35)

"Like learning something new; something different to do." (girl, age 9, All Hands, n.33)

"Good to learn things." (boy, age 8, Me & My Body, n.50)

"Very educational and fun." (girl, age 11, Me & My Body, n.35)

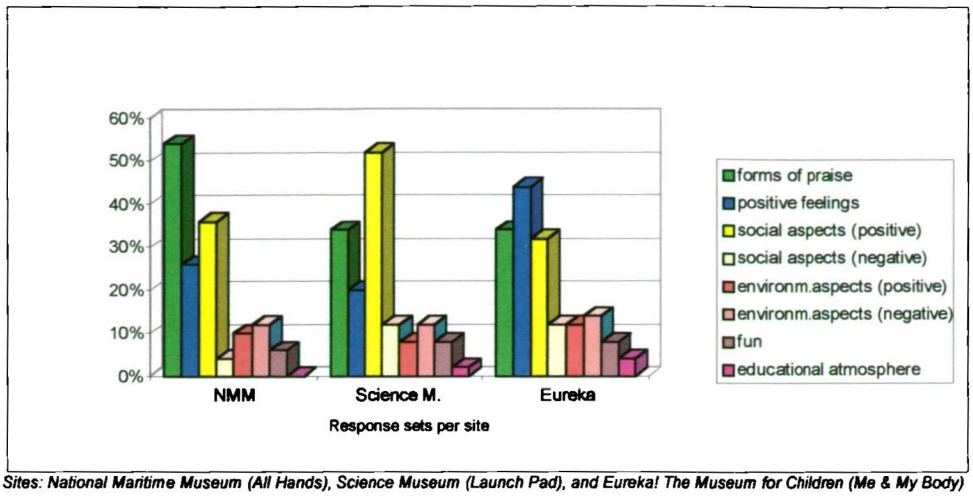
TABLE 6.3.8b: CHILDREN'S IMPRESSIONS OF THE GALLERY ATMOSPHERE PER SITE AND AT ALL SITES
Sample: 150 children (50 in each museum)
Sites: National Maritime Museum (NMM), Science Museum (Sc.M.), and Eureka! The Museum for Children (Euk)

RESPONSE SETS	INDIVIDUALS PER RESPONSE SET							
	NMM (n=50)	%	ScM (n=50)	%	Euk (n=50)	%	All (n=150)	%
positive feelings	13	26%	17	34%	21	42%	51	34%
forms of praise	14	28%	14	28%	14	28%	42	28%
fun	8	16%	6	12%	5	10%	19	13%
educational atmosphere	3	6%	0	0%	2	4%	5	3%
social aspects (positive)	3	6%	8	16%	4	8%	15	10%
social aspects (negative)	1	2%	3	6%	4	8%	8	5%
environm.aspects (positive)	1	2%	0	0%	4	8%	5	3%
environm.aspects (negative	2	4%	5	10%	3	6%	10	7%
couldn't explain, don't know	8	16%	6	12%	2	4%	16	11%

(Note: multiple comments from an individual were possible, so percentages may add to more than 100%.)

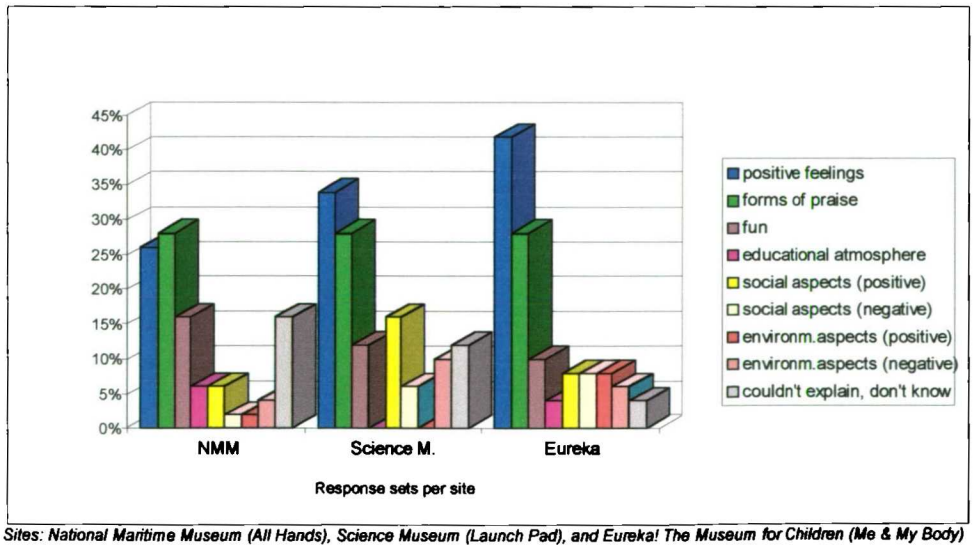
ADULTS' AND CHILDREN'S IMPRESSIONS OF THE GALLERIES ATMOSPHERE AT EACH SITE

FIGURE 6.3.8c: ADULTS' IMPRESSIONS OF THE GALLERY ATMOSPHERE (per site)
(Sample: 50 adults in each gallery)



Sites: National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

FIGURE 6.3.8d: CHILDREN'S IMPRESSIONS OF THE GALLERY ATMOSPHERE (per site)
(Sample: 50 children in each gallery)



Sites: National Maritime Museum (All Hands), Science Museum (Launch Pad), and Eureka! The Museum for Children (Me & My Body)

6.4. OVERVIEW OF THE FINDINGS FROM ADULTS' AND CHILDREN'S RESPONSES TO THE OPEN-ENDED INTERVIEW QUESTIONS

The findings from the adults' and children's responses to the open-ended interview questions about their perceptions of, and experience, in the three child-orientated museum exhibitions investigated indicate that the galleries were successful with family groups with regard to aspects of the visit such as perceived learning, the affective side of the experience and social outcomes.

Adults' perceptions

Parents and other relatives perceived the child-orientated galleries as learning environments, had a positive attitude towards the hands-on approach used in children's galleries and believed that their children benefited from the visit. They also believed that the children gained a better understanding of museum related subjects and were able to connect the exhibits with other things, that the visit to the galleries is good for their general education, and that they got some enjoyment and fun as well.

Children's perceptions

The findings indicate that children perceived the galleries mainly as praiseworthy and entertaining places, although they also see opportunities for learning in the child-orientated galleries. The provision of a sense of wonder and a happy, imaginative, and enjoyable experience seems to be an essential requirement of exhibitions which are aimed at children.

The wide range of children's comments regarding what they learned in the galleries suggests that personal aspects, such as children's interests and preferences, direct learning in informal settings.

Comparing adults' and children's perceptions

Comparing adults' and children's descriptions of the galleries, adults were more likely to describe the gallery as 'educational' and children were more likely than adults to describe it as 'exciting' (and other forms of praise) and 'fun'. The hands-on opportunities provided by the galleries were mentioned in similar proportions by adults and children. Regarding adults' and children's impressions' of the atmosphere of the galleries, a similar proportion of them expressed 'positive feelings', but adults were more likely to make comments expressing their 'praise', the positive social aspects of the gallery atmosphere and about environmental aspects (positive and negative), while children used the word 'fun' more often than adults to describe their impressions of the galleries. These findings suggests that adults had a more varied perception of the galleries, while for children the affective and entertaining side of the experience was more notable.

Perceptions regarding the three galleries

Comparing the three galleries, the findings suggest that *learning aspects* of the visit were more evident to adults and children at the Me & My Body exhibition, Eureka! The Museum for Children, while the *positive social aspects* of the gallery were noticed more by both adults and children at Launch Pad. The *fun, entertaining nature* of the exhibitions was commented on more often by children at Launch Pad and All Hands Gallery than at Me & My Body. Children had less *negative feelings* while interacting with the hands-on exhibits at the Me & My Body, Eureka!, than at exhibits at the other two locations. It might be that the design of the Me & My Body exhibition at the children's museum (Eureka!), dedicated exclusively to children, had a more positive impact on children's affective and physical (ergonomic) sides of the visit experience. At the National Maritime Museum, the opportunity to interact with exhibits was seen by adults as '*motivating to the child*' and as a *encouragement for children to visit museums.*

Learning and fun in the galleries

The findings indicate that children and adults acknowledged learning and fun experiences in the children's galleries, but a positive relationship between learning and fun was not identified in this study. The present findings indicate that in the galleries where the perception of learning was higher (such as in the Me & My Body exhibition), the perception of fun was lower, and where the perception of fun was higher (such as in Launch Pad), the perception of learning decreased (see pages 249, 261, and 274). This finding is worthy of further investigation.

The relevance of the social context of the visit for children

The findings indicate that the social context of the visit is a very important aspect of the child museum experience since the majority of children interviewed said that they prefer to visit museums with their families rather than with school. Autonomy and an easy, relaxed, and appropriate attentive pace seem to be what children value in a museum visit with their relatives. Drawbacks of visiting museums with school groups are related to the short time spent in the gallery, lack of close attention from the teacher, lack of independence, and class work obligations (worksheets). The findings are in accordance with previous studies on children's perceptions of their museum experience (Jensen, 1994) and support previous work on the use of worksheets in museums (McManus, 1985). These findings have implications for museums and schools. Museums should stimulate family visiting through programmes and special exhibitions and be able to provide an appropriate environment for family interaction. Regarding schools, it would seem that teachers should organise their school trips in a more flexible way, finding ways to supply the needs of each pupil as well as giving them more personal attention, more time, more autonomy and space for being creative in their own ways.

In the next chapter, interviewees' responses were analysed statistically in order to explore possible relationships between variables related to the personal, social, and physical contexts of the family visit.

CHAPTER 7: STATISTICAL ANALYSIS OF ADULTS' AND CHILDREN'S RESPONSES TO THE CLOSED INTERVIEW QUESTIONS

7.1. INTRODUCTORY SECTION

7.1.1. ANALYTIC METHOD

Cross-tabulation, using chi-squared statistical tests, was used to examine adults' and children's responses to the interview closed questions in order to explore how personal context (such as age, gender, education), social context (such as group composition) or physical context of the visit (such as type of museum gallery) affected the child and adult experience and/or perceptions in child-orientated galleries (see research questions nos. 5, 6, and 7 in Chapter 3, page 113).

Statistical tests indicate whether a finding observed could have occurred as a random event or not, that is, that the occurrence witnessed *probably* did not occur by chance alone (Black, 1994: 120-122). The *chi squared test* involves evaluation of possible associations between variables and checks whether or not the distribution of subjects among categories of one variable is dependent or independent of their distribution among the categories of the other (Altman,1991:247). For this reason chi squared tests have been used in this study to explore possible relationships between the variables studied.

The variables drawn from the interviewees' responses (adults' and children's) can be classified as *qualitative* (or *categorical*) data. Categorical data may follow a logical order (*ordinal* scales) or not (*nominal* scales). *Ordinal* measures assume that variable categories have values with *some* intrinsic order, for instance: 'time spent in the gallery' ('less than 30 minutes'; 'about 30 minutes to 1 hour'; 'more than 1 hour'). *Nominal* measures assume that variable categories have values with *no* intrinsic order, for instance: 'gender' ('male'; 'female') (Norusis, 1994: 111-120).

The computer programme used to analyse the data was the 'Statistical Package for the Social Sciences' (Norusis, 1994). The tests adopted were the *Pearson* Chi-squared test, the Chi-square test for linear Trend (*Linear-by-linear*

association), and the *Fisher Exact test* (two-tail). The *Pearson* chi-squared test is a reliable and widely accepted test, used mainly with nominal variables but also valid with ordinal variables when looking for associations between them. The chi-square test for linear trend is more powerful with ordinal variables or when exploring 'linearity' between variables, and it is used when both variables are ordinal or when one variable is ordinal and the other has only two categories (Fearn, 1999). The *Fisher Exact Test* is an alternative to the use of the chi-squared test for assessing association of two variables in a two-by-two contingency table (Everitt, 1998: 126). The *Fisher Exact Test* is indicated particularly when the frequencies are small, because the test has no assumptions.

It is important to mention, however, that an observed association does not necessarily indicate a causal relation between variables. Furthermore, the probability levels (p values) do not indicate the strength of the association, but rather the strength of the evidence against the null hypothesis of 'no association' (Altman, 1991: 247,248).

Ultimately, the sample size and the significance level adopted in the study will influence the findings obtained and conclusions drawn (Black, 1993:128-29).

Significance level adopted in the present study

Traditionally, in social science research, a probability level of 5 per cent is employed. "At this level, there is something probably influencing the event(s), or at least the event(s) has/have occurred as the result of some external influence other than natural random fluctuation" (Black, 1994:122).

In the present study, a probability level of 5 per cent and below was taken to be significant. Probability values of 6% and 7% were considered to be *marginally statistically significant* and of interest to the study as they might indicate a *tendency* that could be further investigated with a larger sample.

Chi squared tests assumptions

The chi squared test cannot support variables with many categories if there are not enough subjects represented in each category. The chi squared test

assumptions state that it is not possible to have any cell in a table with expected frequency less than 1 and the table should not have more than 20% of the cells with expected frequency less than 5 (Altman, 1991:248). For this reason, categories were collapsed thoughtfully where necessary, taking into account the context of the study, and the procedure was aimed at not compromising the characteristics of the sample or the interviewee's responses. A list of the variables used in the statistical analysis is reported below.

Samples used in research about children and family groups in museums

The samples used in the study of family groups are generally of a relatively small size (with a few exceptions) when compared to surveys carried out in museums or at a national level. This is due to the fact that many of the studies about family groups in museums are qualitative (Dockser, 1989; Jensen, 1994), although statistical analysis may also be applied. For instance, Dierking used a sample of 56 families in order to analyse 13 types of attentional behaviours in museum exhibits, utilising analysis of variance (ANOVA) (Dierking, 1987). Blud used a sample of 150 family groups (50 families at three different exhibits) in her study of family interactions at interactive exhibits carried out at the Science Museum, London (Blud, 1988, 1990). A recent research project - the PISEC Family Learning Project - also used a control group of 50 families per museum to test the impact of *enhanced* exhibits on family learning behaviour (Borun et al., 1997:281).

Sample used in the present study

In the present study, adults' and children's responses to the interview closed questions were analysed statistically. A sample of 300 individuals, 150 children and 150 adult relatives (equivalent to 150 family groups), were investigated. Therefore, each interview variable used in the statistical analyses (20 in total) amount to 150 individual responses (from adults or children), which were cross-tabulated in order to explore possible associations with other variables. A list of the variables used in the statistical analysis and a description of the overall frequency of responses in each category is reported in Appendix F.

7.1.2. CROSS-TABULATION ARRAY

In total, 139 cross-tabulations were performed with the 20 variables drawn from the interviews with adults and children, based on the interview closed questions. Table 7.1.1 shows the cross-tabulations considered of relevance for statistical analysis in the context of the study, indicating the *significant* findings obtained (n=22), the *marginally statistically significant* values (n=4), the *insignificant* ones (n=100), and the cross-tabulations where the statistical results could not be considered (n=13) because the number of small expected frequencies was too numerous and did not meet the test's assumptions. Most of the small expected frequencies occurred in associations related to the variables *'adults' use of exhibits with their children'* and *'child's preference for the social context of the visit'*. This was due to the fact that there were very few adults who 'did not use exhibits with their children', and few children who said they 'prefer to visit museums with school' (rather than with their families), so there were not enough subjects in the cells when associated with some of the other variables.

Table 7.1.1 also indicates the cross-tabulations which were not considered of relevance for statistical tests in the context of the study (n=51).

Variable names used in Table 7.1.1:

1. Relationship of accompanying interviewed adult
2. Adult gender
3. Adult age group
4. Adult education
5. Adult occupation
6. Adult's use of interactive exhibits with their children
7. Adult's perception of his/her own learning in the gallery
8. Child gender
9. Child age
10. Group composition
11. Way child likes to use exhibits
12. Child's perception of his/her own learning
13. Child's preference for social context of visit
14. Child's feelings at interactive exhibits
15. Child's memories from other visits
16. Time spent
17. Type of museum (sites investigated)
18. Annual frequency of family museum visits
19. Previous visit to the gallery
20. Visits to similar galleries elsewhere

TABLE 7.1.1: CROSS-TABULATION ARRAY

Sample: 150 family units (150 children and 150 adults)

Note: Statistical tests which are significant and marginally statistically significant are represented in the table by their probability values.
Values followed by: no sign = 'Pearson chi-square'; * = 'chi-square for linear trend'; ** = 'Fisher exact test'

Code: n.s = not significant statistically
- = cells with more than twenty per cent of expected frequency less than five (not applicable for valid test)
= variables not relevant for cross-tabulation in the context of the study

VARIABLES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1																				
2	#																			
3	#	#																		
4	.05	#	#																	
5	#	#	#	#																
6	n.s	n.s	-	n.s	-															
7	.01	.006	n.s	n.s	n.s	n.s														
8	n.s	#	#	#	#	n.s	#													
9	n.s	#	#	#	#	.04	n.s	#												
10	.05	#	#	#	#	n.s	n.s	#	n.s											
11	n.s	n.s	-	n.s	n.s	-	#	.04	.02	n.s										
12	.059	n.s	n.s	n.s	n.s	n.s**	n.s	n.s	n.s	n.s	n.s									
13	.04	.057	-	n.s	-	-	n.s	n.s	n.s	n.s	-	.04								
14	n.s	n.s	n.s	n.s	n.s	n.s**	n.s	.06	n.s	n.s	n.s	n.s	n.s							
15	#	#	#	n.s	#	n.s**	#	n.s	n.s	n.s	n.s	n.s	#	n.s						
16	.002	.007	-	n.s	n.s	-	n.s	n.s	.04	n.s	#	006*	#	n.s	n.s					
17	n.s	n.s	n.s	n.s	n.s	-	n.s	n.s	n.s	00001	.068	.02	-	.04	n.s	n.s				
18	n.s	#	#	#	#	#	#	n.s	n.s	#	#	n.s	-	#	n.s	n.s	n.s			
19	n.s	#	#	n.s	#	n.s	n.s	#	n.s	#	n.s	n.s	n.s	n.s	n.s	n.s	.007	#		
20	n.s	#	#	.005	003*	n.s	n.s	.002	n.s	#	n.s	n.s	n.s	n.s	n.s	n.s	.01	001*	n.s	

Total variables cross-tabulated: 139
Significant values: 22
Marginally statistically significant values: 4

Variables NOT relevant for cross-tabulation: 51
Insignificant values: 100
Cells with excessive small expected frequencies (not applicable for valid test): 13

7.2. FINDINGS FROM THE STATISTICAL ANALYSIS

The findings from the associations between variables are presented in the following order: (7.2.1) associations between adult variables and the family experience in the galleries; (7.2.2) associations regarding children's experience and perceptions in the galleries; (7.2.3) associations regarding the type of museum; (7.2.4) associations regarding family visiting to child-orientated galleries. At the end of each section, a summary of the significant and marginally statistically significant associations is outlined, and at the end of the chapter an overview of the findings is presented.

Tables, charts, and conceptual diagrams are used in order to illustrate the significant and marginally statistically significant associations found (all 'significant' and the 'marginally statistically significant' associations' tables are presented in Appendix G).

Table 7.2.1 (on the next page) summarises the statistically significant associations (n=22) found from the cross-tabulations of variables related to the children's and adults responses to the interviews. The significant cross-tabulations are indicated in the table, as well as the test used and the probability level.

Reporting just the significant probabilities, though widely practiced, is not a proper research procedure (Black, 1993:129), so marginally statistically significant values and statistically insignificant associations of interest to the study are discussed as well. Table 7.2.2 shows the marginally statistically significant associations of interest to the study (n=4) which are reported in the same sections as the significant ones, in order to give an integrated picture of the associations.

TABLE 7.2.1:
SIGNIFICANT ASSOCIATIONS BETWEEN VARIABLES RELATED TO CHILDREN'S AND ADULTS' RESPONSES TO INTERVIEW

Sample: 150 family groups (150 children and 150 adults)

Tests: Pearson (chi-square); **Trend** (linear-by-linear association chi-square for trend); **Fisher** (Fisher exact test, 2 tail)

Variables cross-tabulated			*Test*	*Probability level*
Significant associations affected by adults' variables n=7				
relative	by	time spent in the gallery	Pearson	.002
relative	by	adult's perception of learning	Pearson	.01
relative	by	child's preference for social context of visit	Pearson	.04
relative	by	adult education	Pearson	.05
relative	by	child's perception of learning	Pearson	.05
adult gender	by	adult's perception of learning	Pearson	.006
adult gender	by	time spent in the gallery	Pearson	.007
Significant associations affected by children's variables n=7				
child age group	by	way child prefers to use exhibit	Pearson	.02
child age group	by	adults' use of exhibits with their children	Pearson	.04
child age group	by	time spent in the gallery	Trend	.04
child gender	by	way child prefers to use exhibit	Pearson	.04
child's perception of learning	by	time spent in the gallery	Trend	.006
child's perception of learning	by	type of museum	Pearson	.02
child's perception of learning	by	child's preference for social context of visit	Pearson	.04
Significant associations affected by type of museum n=4				
type of museum	by	group composition	Pearson	<.00001
type of museum	by	previous visit to the gallery	Pearson	.007
type of museum	by	visits to similar galleries elsewhere	Pearson	.01
type of museum	by	child's feelings at exhibits	Pearson	.04
Significant associations which may affect visiting to children's galleries n=4				
visits to similar galleries elsewhere	by	annual frequency of family museum visits	Trend	.001
visits to similar galleries elsewhere	by	adult education	Pearson	.005
visits to similar galleries elsewhere	by	adult occupation	Trend	.003
visits to similar galleries elsewhere	by	child gender	Pearson	.002

TOTAL OF SIGNIFICANT ASSOCIATIONS: 22

TABLE 7.2.2: MARGINALLY STATISTICALLY SIGNIFICANT ASSOCIATIONS OF INTEREST TO THE STUDY

Sample: 150 family groups (150 children and 150 adults)

Test: Pearson Chi Square

Variables cross-tabulated			*Test*	*Probability level*
adult gender	by	child's preference for social context of visit	Pearson	.057
relative	by	group composition	Pearson	.059
child gender	by	child's feelings at interactive exhibits	Pearson	.06
type of museum	by	way child prefers to use exhibit	Pearson	.068

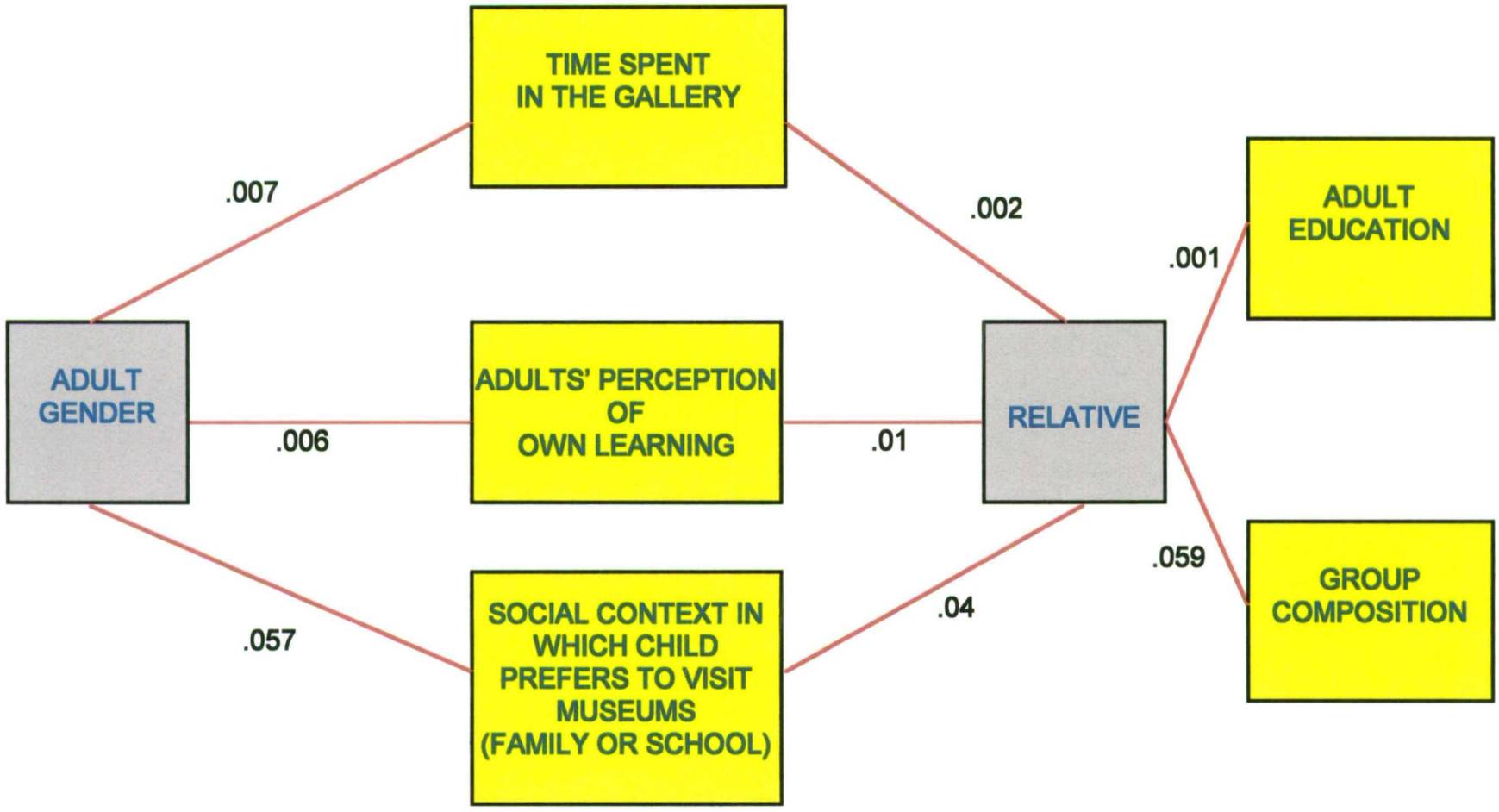
Total of marginally significant associations: 4

7.2.1. ASSOCIATIONS BETWEEN ADULT VARIABLES AND THE FAMILY EXPERIENCE IN THE GALLERIES :

SECTION A

Figure 7A, on the next page, shows the statistically significant and marginally statistically significant associations (and their significance levels) between variables which relate to adults characteristics (relationship to the child, gender, education) and aspects of the museum experience in the child-orientated galleries investigated (adults' perception of own learning, time spent in the gallery, group composition, and child's preference for the social context of the visit). These variables are related to the personal and social contexts of the family museum visit and are very relevant to the present study since these variables are likely to affect the child's and family's perceptions and experience in the galleries.

FIGURE 7A: ASSOCIATIONS BETWEEN ADULTS' VARIABLES AND THE FAMILY EXPERIENCE IN THE GALLERIES



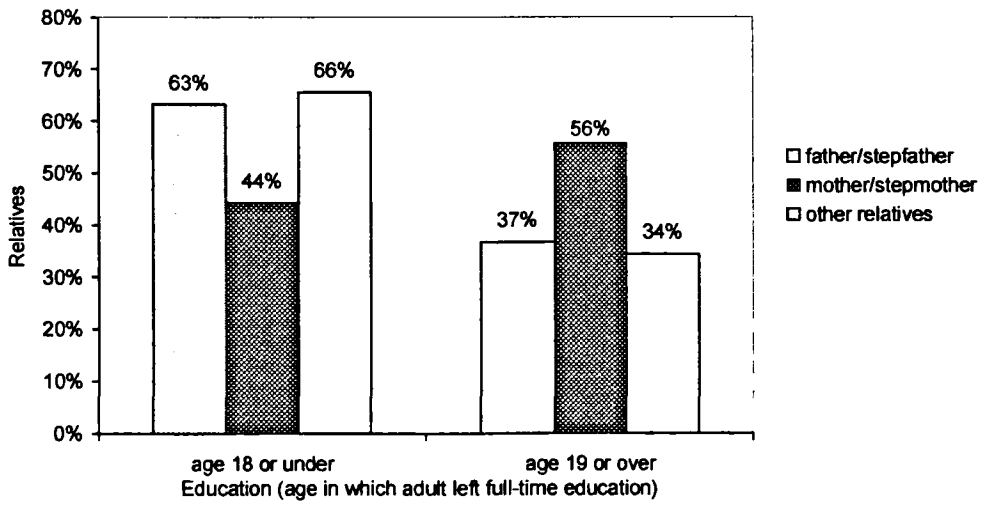
HOW 'ADULT RELATIONSHIP TO THE CHILD' AND/OR 'ADULT GENDER' AFFECT THE TIME SPENT IN THE GALLERY, THE ADULT'S PERCEPTION OF OWN LEARNING, THE CHILD'S PREFERENCE FOR THE SOCIAL CONTEXT OF THE VISIT, AND THE FAMILY GROUP COMPOSITION

A1. Association between 'relative interviewed' and 'adult education'

This study considers that, in order to understand the visitor museum experience, it is important to know about the personal context of the visitor (Falk & Dierking, 1992). Among the personal characteristics of the visitor, 'education' is a significant one since it may affect the visitor's own perception of his or her experience and behaviour in a museum gallery as well as perceptions of experience of those visiting with them, such as children.

The statistical analyses indicate that, in the sample investigated, *relative status* of the accompanying adult interviewed (father; mother; or other relatives) and *adult education* are associated (p=.05). The *mothers* in the sample were found to be more highly educated than *fathers* or *other relatives* interviewed. Figure 7.2.1 shows that the proportion of *mothers* in the sample who left full-time education at age 19 years or older (**56%**, n=34 out of 61 mothers) was greater than those of *fathers* or *other relatives* (**37%**, n=21 out of 57 fathers, and **34%**, n=11 out of 32 other relatives).

Figure 7.2.1: Association between 'relative' and 'adult education' (p=.05)



This finding should be viewed in the context of the following findings. They suggest that more educated relatives are likely to affect significantly variables related to perceptions of learning and behaviour.

A2. Association between 'relative interviewed' and 'time spent in the gallery' and between 'adult gender' and 'time spent in the gallery'

The measure of the amount of time visitors spend in a gallery is frequently used in museum visitor studies since it is considered that it indicates a personal interest and engagement with exhibits which is likely to enhance the visitor's understanding (Hein, 1998).

Since the 'relative status' (father, mother, and other relatives) and the 'adult gender' are directly associated (male=father, female=mother, other relatives= male or female), both relative status and adult gender are likely to be associated with the same variables (see Figure 7A on page 296).

The statistical analysis indicates that there is a significant association between the 'relative status of the accompanying adult' (father, mother, or other relatives) and the 'time spent in the gallery' (less than 30 min.; 30 min. to one hour; more than one hour) ($p=.002$) and between 'adult gender' and the 'time spent in the gallery' ($p=.007$).

The findings indicate that *male adults / fathers* visiting child-orientated galleries with children were more likely to spend *less* time in the galleries than *female adults / mothers* and *other relatives* (who were mostly females) (see Figure 7.2.2 and 7.2.3).

Figure 7.2.2: Association between 'adult gender' and 'time spent in the gallery' (p=.007)

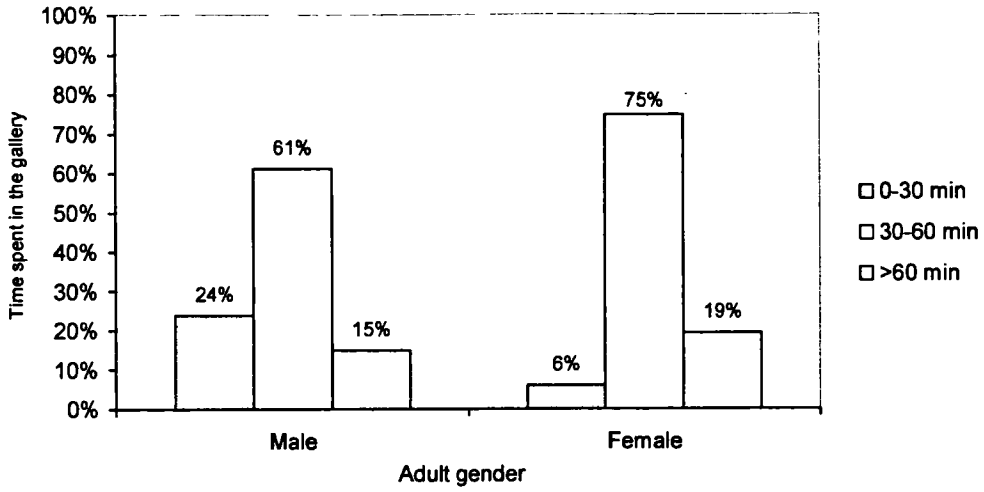
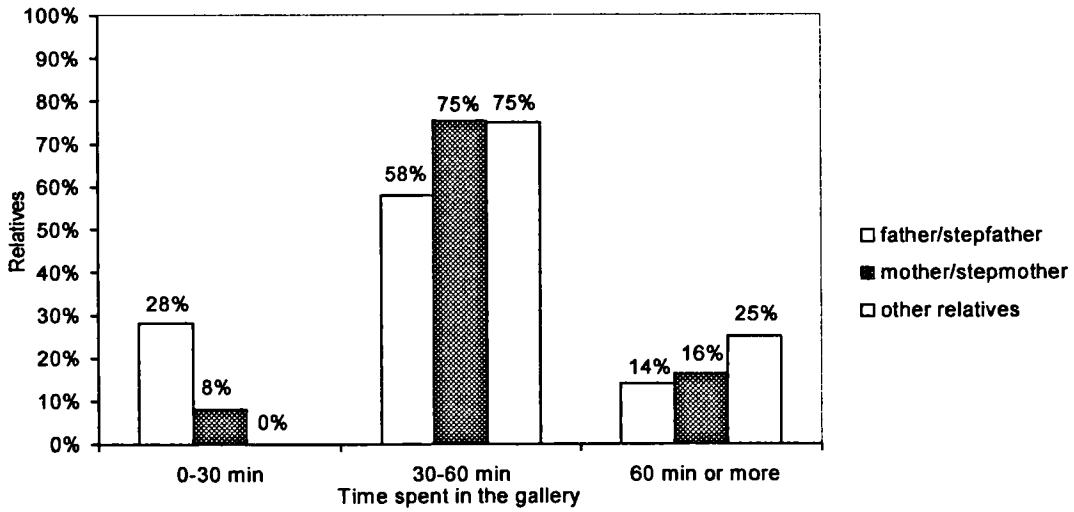


Figure 7.2.3: Association between 'relative status of interviewed adult' and 'time spent in the gallery' (p=.002)



The findings suggest that the personal attributes of the accompanying relative (such as gender and education) are likely to affect adult behaviour in children's galleries, since female / more educated relatives (such as the mothers in the sample) were more willing to stay longer in the galleries.

A3. Associations between 'adult gender' & 'adult's perception of own learning' and 'relative interviewed' & 'adult's perception of own learning'

Adult's perception of own learning in the galleries investigated was found to be closely associated with *adult gender* (p=.006). *Female adults* were more likely than *males* to think they learned something in the gallery. This finding indicates a gender effect in child-orientated galleries regarding adults' perceptions of their own learning. Similarly, *fathers* were less likely than *mothers* and *other relatives* to think they learned something in the galleries (see Figure 7.2.4 and 7.2.5).

Figure 7.2.4: Association between 'adult gender' and 'adults' perception of their learning' in the gallery (p=.006)

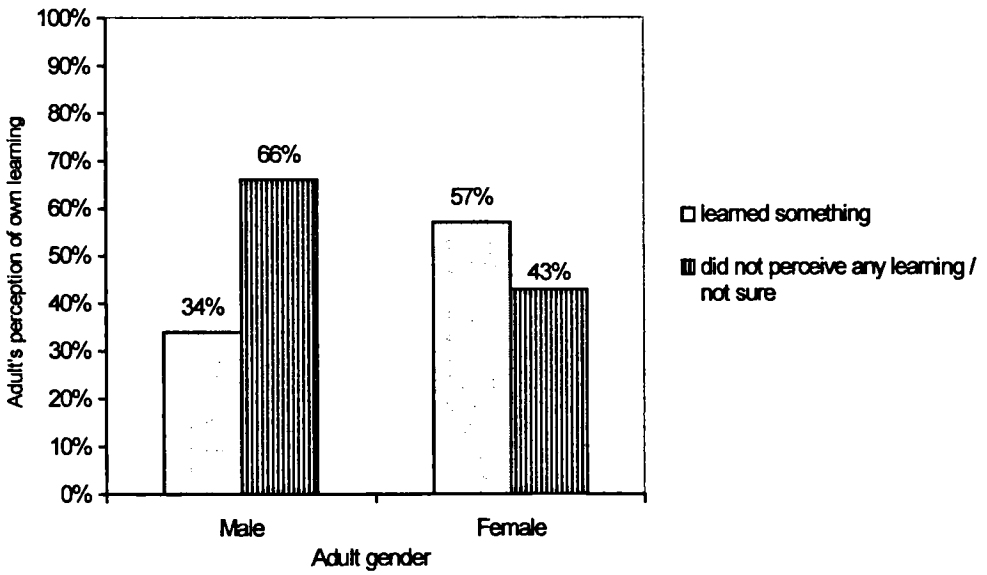
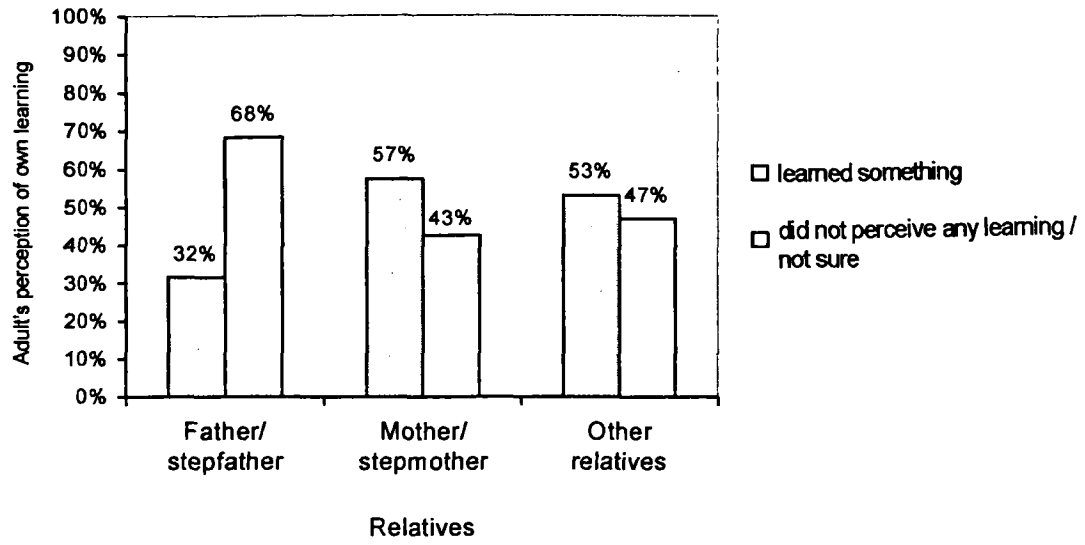


Figure 7.2.5: Association between 'relative status of interviewed adult' and 'adults' perception of their learning' in the gallery (p=.01)



Relating this finding to the previous one (see point A2), it suggests that adults who thought they learned something in the galleries (female adults / mothers & other relatives) were more likely to stay longer in the galleries. These findings are likely to have implications for children's learning, since further statistical findings presented on section 7.2.2 indicated that the amount of time spent in the gallery is likely to affect the children's perception of their learning (see point B1).

Regarding whether the time spent in the gallery affects adults' perception of own learning, the statistical analysis indicates that adults' perception of own learning is *not* affected by the amount of time spent in the gallery (p=.28), suggesting that a personal attitude of openness and interest from female relatives (possibly due to higher levels of education in this grouping) to the simple messages that are conveyed in a children's gallery, might explain adult's perceptions of their own learning in such galleries and their willingness to stay longer in the gallery.

A4. Association between the 'relative interviewed' and the 'child's preference for the social context of museum visits'

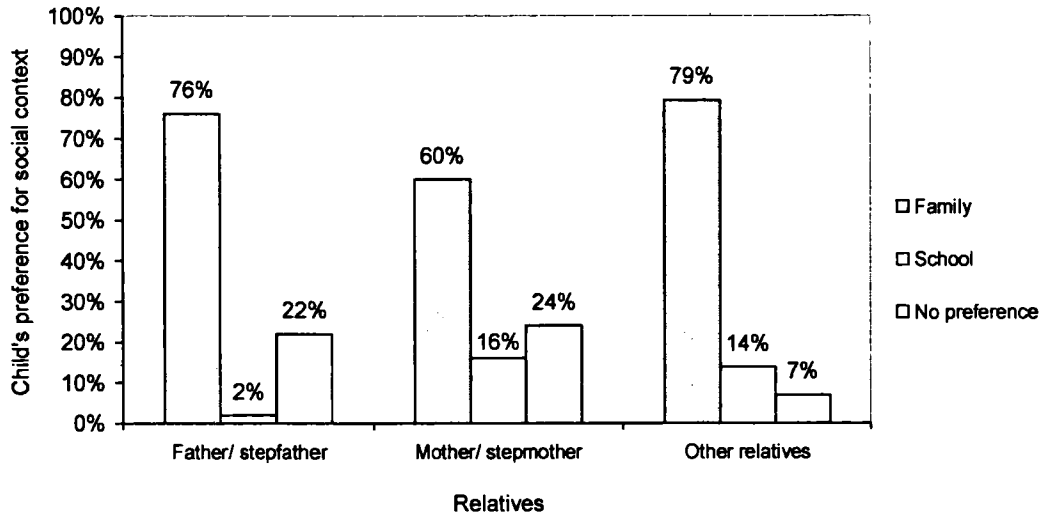
The social context of a museum visit can considerably influence the visitor experience, as stressed by many researchers (McManus, 1987; Blud, 1988; Falk & Dierking, 1992). For this reason, this study has considered it important to discover whether children prefer to visit museums with their families (where the visit is characterised by informal interactions between family members) or with schools (in which the visit is more formally organised).

In this sample, the majority of children said they prefer to visit museums with their families (61%, n=91 out of 150) rather than with school (9%, n=13 out of 150) (see Appendix F, Table F2, page 425). Twenty one children said that they had 'never visited museums with school' and, since it was not possible for these children to state their preference, they were not considered in the statistical test.

The findings indicate that the *child's preference for the social context of museum visits* (with family or with school) is associated with the *relative interviewed* variable (father, mother, or other relatives) (p=.04).

Children were more likely to say that they prefer to visit museums with 'family' when they were with *other relatives* or *fathers*, rather than with *mothers* (see Figure 7.2.6). This might be explained by the fact that in daily life children are more likely to be in contact with their mothers (their main carers) more frequently than fathers and other relatives and perhaps this factor influenced this finding. It might be that children consider a 'day out' with their *fathers* and *distant relatives* a 'special occasion', thus their preference for visiting museums with them.

Figure 7.2.6: Association between the 'relative' and the 'child's preference for the social context of the visit' (p=.04)



A5. Marginally statistically significant association between 'relative status of interviewed adult' and 'group composition'

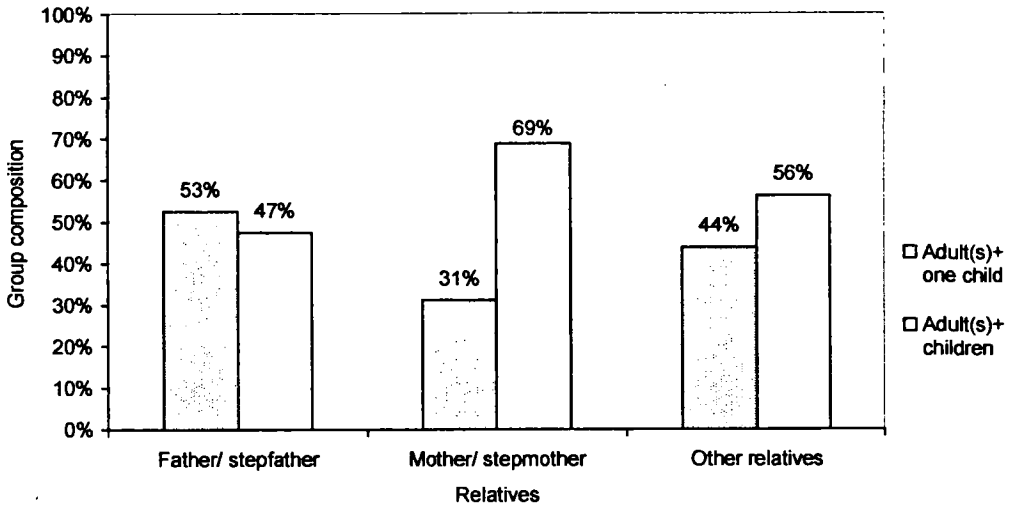
Group composition is an important aspect of the social context of the visit, thus of interest to this study.

A marginally statistically significant association (p=.059) was found between the *group composition* in which the child was visiting the gallery (with adults *or* with adult and other children) and the *relative status* of the adult interviewed (father; mother; or other relatives). This finding suggests a *tendency* that *mothers* and *other relatives* might be more likely to visit museums with 'more than one child' than *fathers*. *Fathers* showed the highest proportion of group compositions with 'one child only' (see Figure 7.2.7).

Since group composition is likely to affect the museum experience (McManus, 1987; Falk & Dierking, 1992), the fact that children visited the galleries with *adults only* (in the sample, mainly when they were with *fathers*) or with *other children* in the group (mostly when they were with *mothers* and *other relatives*) is likely to provide children with different visit experiences. This topic is worthy of further investigation. It would be interesting to know whether the

child prefers to visit hands-on galleries with siblings or young friends or whether they prefer to have the full attention of their adult relatives, as a single child in the group, and how this affects their experience.

Figure 7.2.7: Marginally statistically significant association between 'relative status of interviewed adult' and 'group composition' (p=.059)



A. Summary of findings regarding adults and the family experience at the child-orientated galleries

. Regarding the level of education of the adults interviewed at the three child-orientated galleries, *mothers* were likely to be more educated than *fathers* and *other relatives* (p=.05).

. Concerning the time spent in the gallery, *fathers* were more likely to spend *less* time in the children's galleries than *mothers* and *other relatives* (p=.002), while *female adults* from any relationship to the child were more likely than *male adults* to spend longer periods of time with children in the galleries (p=.007).

. A gender effect regarding the adults' perception of their learning in children's galleries may have been identified. More *female* than *male adults* thought they learned something in the child-orientated galleries (p=.006). Likewise, more *mothers* than *fathers* did (p=.01).

. The majority of children said they prefer to visit museums with 'family' (rather than with 'school'). However, the percentage of children who said that they prefer to visit museums with 'family' was greater from children visiting with *fathers* and *other relatives* than with *mothers* (p=.04).

. Regarding the family group composition, there was a *tendency* for *mothers* to be more likely than fathers to visit the galleries with more than one child, while *fathers* were more likely than mothers to visit child-orientated galleries with one child only (p=.059).

7.2.2. ASSOCIATIONS CONCERNING CHILDREN'S EXPERIENCE AND PERCEPTIONS IN THE GALLERIES :

SECTION B

This section is presented in three parts in order to describe the associations related to: aspects affecting the children's perceptions of their learning in the galleries (Figure 7B1); aspects of the child experience affected by the child's age group (Figure 7B2); and aspects affecting child's feeling while interacting with exhibits (Figure 7B3).

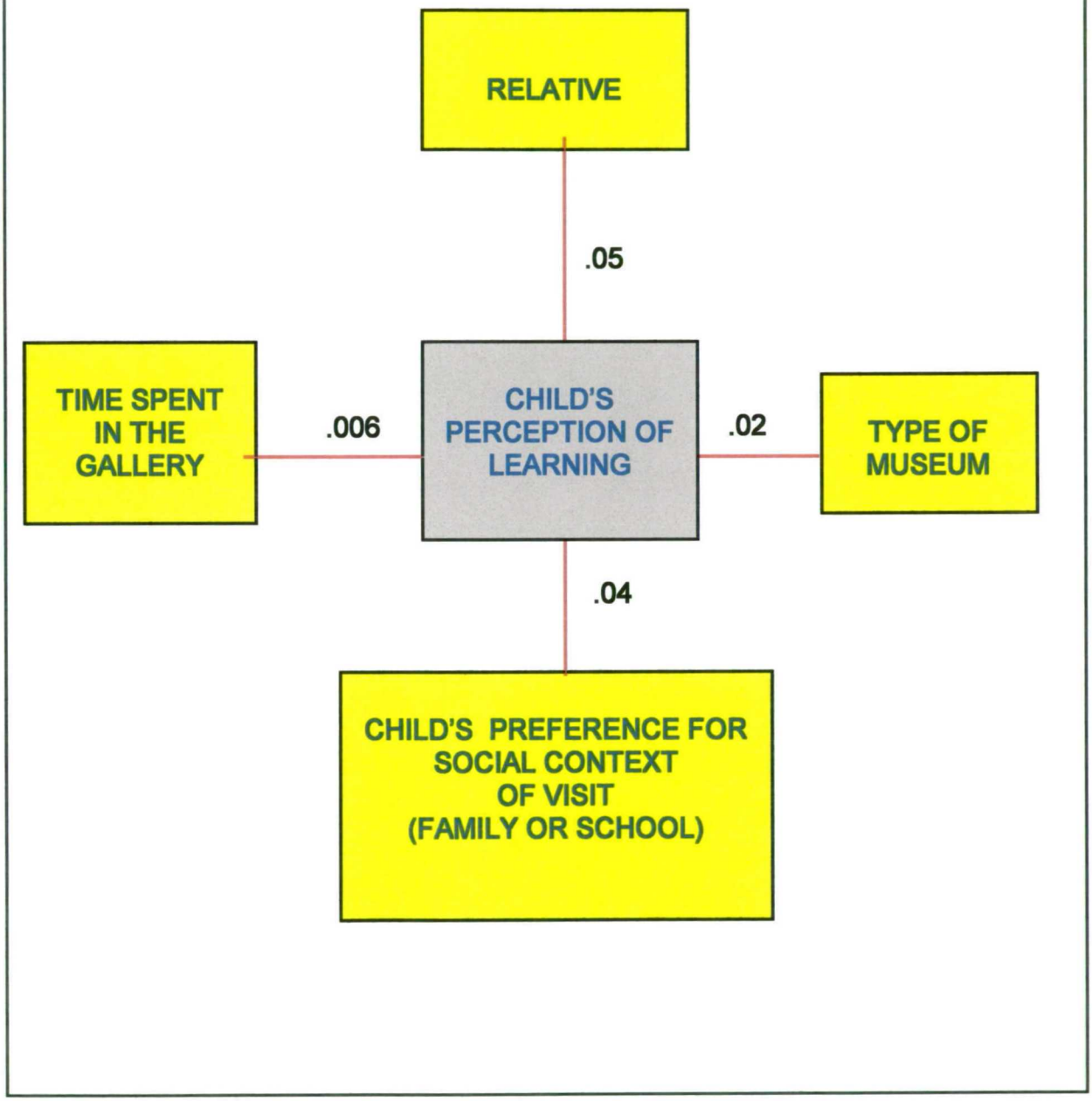
HOW THE 'CHILDREN'S PERCEPTION OF THEIR LEARNING' IS AFFECTED BY THE TIME SPENT IN THE GALLERY, THE TYPE OF MUSEUM, THE SOCIAL CONTEXT, AND THE ACCOMPANYING ADULT RELATIVE

This study attempts to explore aspects which may affect the children's and adults' perceptions of learning in the child-orientated galleries investigated. Understanding the aspects which may affect the child and/or adult perception of learning in children's galleries can help exhibition planners to plan more appropriate exhibitions for the family audience.

The statistical analyses indicate that there are four aspects which are likely to affect the child's perception of own learning in a child-orientated gallery. Figure 7B1 (on the next page) illustrates the significant associations between these variables. The aspects are related to the social context of the visit (*accompanying relative* and *child's preference for the social context of the visit*), the physical context (*type of museum*), and the *time spent in the gallery*.

These significant associations are described below, excepted for the association related to *type of museum* which is presented on section C, together with other significant associations related to 'type of museum'.

FIGURE 7B1: FOUR ASPECTS AFFECTING THE CHILDREN'S PERCEPTION OF THEIR LEARNING



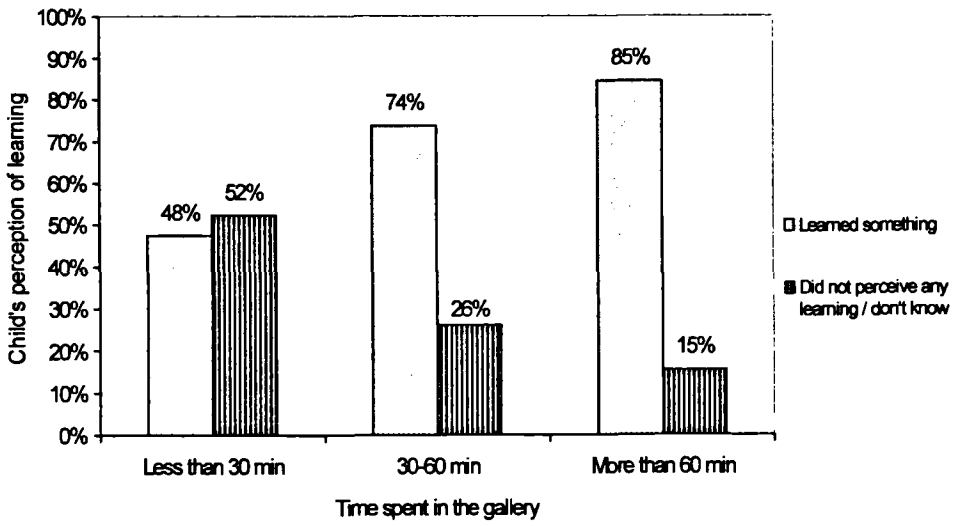
B1. Association between 'time spent in gallery' and the 'child's perception of own learning'

The children's perceptions of their learning was found to be closely associated with the time spent in the gallery (p=.006). The more time spent in the gallery, the more children said they learned something, and the less time spent, the less they said they learned something.

Comparing the three categories of time spent, **85%** of the children who spent 'more than 1 hour' in a gallery said they learned something (n=22 out of 26), compared to **74%** of children who said so when spending about '30 minutes to 1 hour' (n=76 out of 103), and **48%** of them when spending 'less than 30 minutes' in the gallery (n=10 out of 21) (see Figure 7.2.8).

For adults, on the other hand, there was *no significant* association between time spent in the gallery and the adults' perception of their learning (p=.28), indicating that the time spent in the exhibition does not influence the adults' perception of their learning.

Figure 7.2.8: Association between 'time spent in gallery' and 'child's perception of own learning' (p=.006)

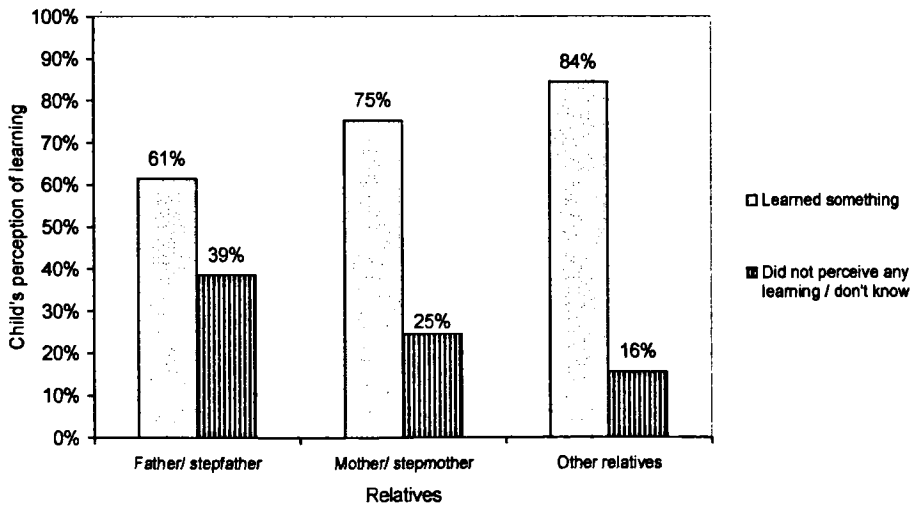


B2. Association between the 'relative status of interviewed adult' and the 'child's perception of own learning'

Many studies have stressed how the social context of the visit may affect the visitor experience (McManus, 1987; Falk & Dierking, 1992), but few studies have shown how social context may affect learning. The statistical analysis indicates that the children's perception of their learning in child-orientated exhibitions is significantly associated with the *relative status* of the interviewed adult visiting with the child (father, mother, or other relatives) (p=.05).

The findings suggest that children were more likely to think they learned something when they were with *distant relatives* or *mothers* rather than with *fathers.* Figure 7.2.9 shows that the majority of children visiting with *other relatives* and *mothers* said they *learned* something (**84%** and **75%**, respectively), compared to **61%** of children visiting with *fathers.*

Figure 7.2.9: Association between the 'relative status of interviewed adult' and the 'children's perception of their learning' (p=.05)



As we have seen in the previous findings in section A concerning the associations regarding the *relative status* of the accompanying interviewed adult, the *mothers* in the sample were more educated than *fathers* (see point A1) and *fathers* were more likely to spend less time in the gallery than *mothers* or *other relatives* (see point A2) and to think that they did not learn much in the galleries (see point A3).

On the other hand, children were more likely to say they prefer to visit museums with 'family' when they were with *fathers* and *other relatives*. Perhaps 'social pleasure' in the form of a day out with fathers and other relatives competes with a 'learning focus' (time spent in the gallery, perception of learning).

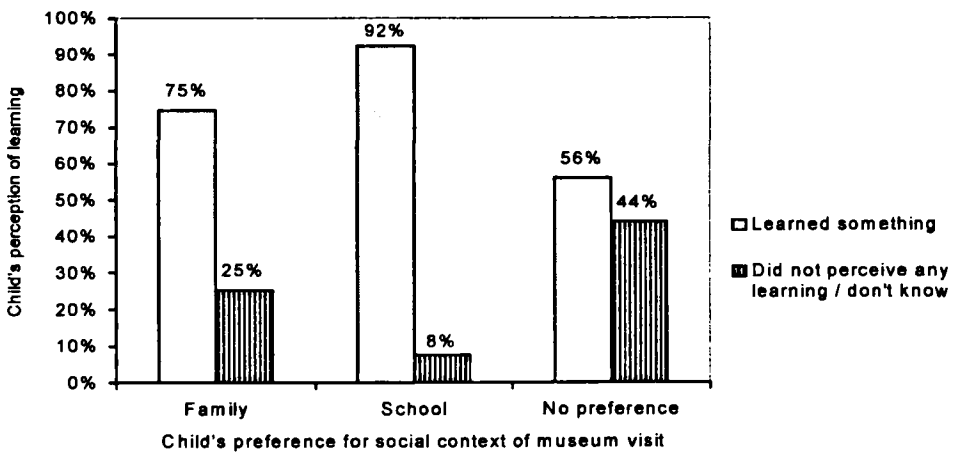
This finding suggest that children were more likely to perceive they learned something in the galleries when they were in the company of more educated relatives, which supports Vygotsky's theory of social mediated learning.

B3. Association between the 'child's preference for the social context of the visit' and the 'child's perception of own learning'

This finding also indicates that the *child's perception of their learning* is affected by the social context of the museum experience, since it is associated with the *child's preference for the social context of the visit* (p=.04).

Figure 7.2.10 illustrates the proportion of children who said they *learned something* in the galleries according to their preferences for the social context of the visit (family, school, or no preference).

Figure 7.2.10: Association between the 'child's preference for the social context of the visit' and the 'child's perception of own learning' (p=.04)



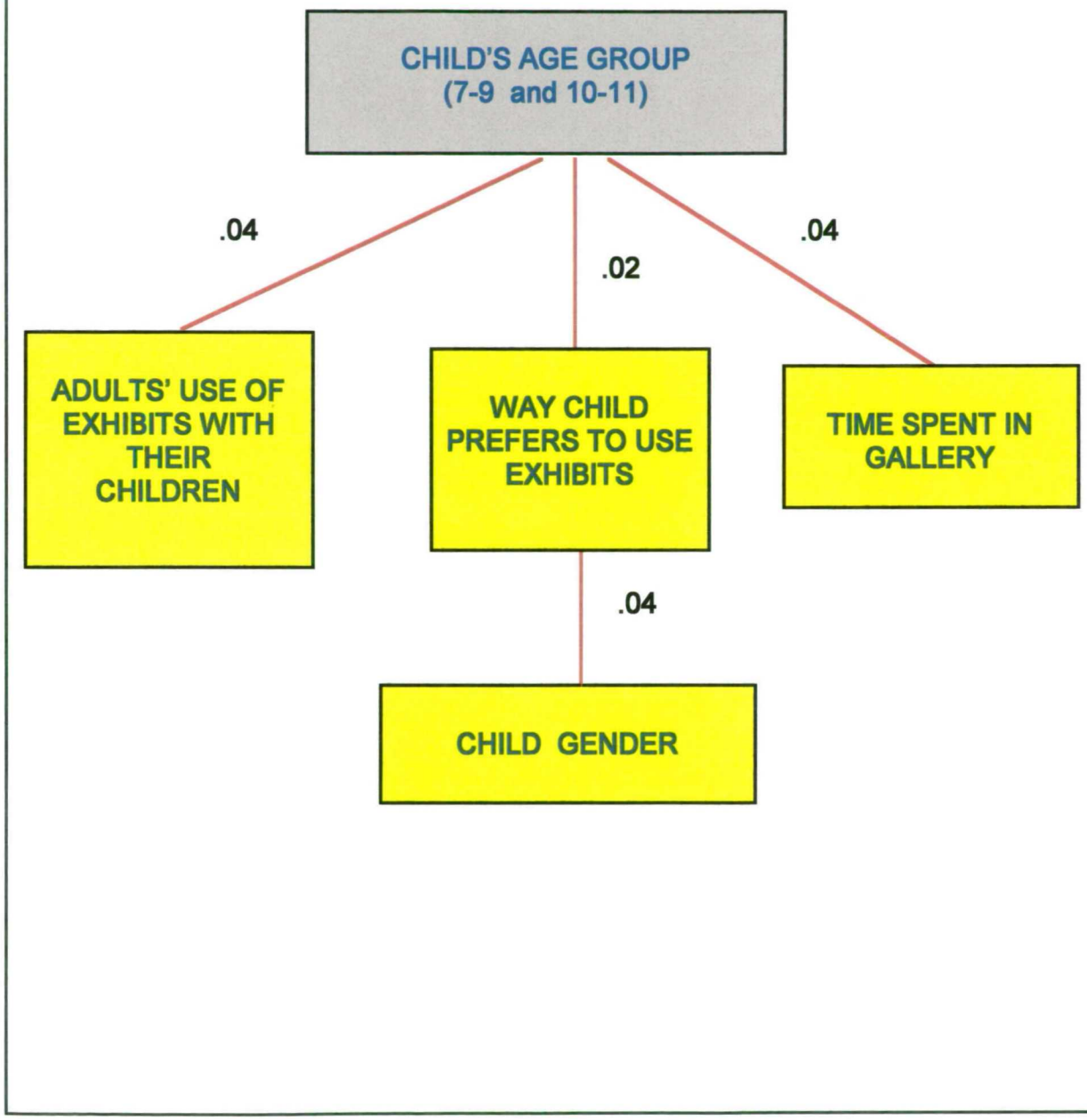
It seems to be the case that the majority of children who said that they prefer to visit museums with either 'school' or 'family' perceived that they learned something in the gallery, while the children who didn't have a preference ('either family or school') were more likely to say they *did not* learn anything in the galleries. It might be the case that children who had a preference for visiting with *family* or *school* might have had a more 'focused' visit with these social groups than the children who had *no preference* for the social context of the visit.

HOW THE 'WAY THE CHILD PREFERS TO USE THE EXHIBIT' IS AFFECTED BY THE CHILD'S AGE, GENDER, AND BEHAVIOUR OF ACCOMPANYING ADULT, & HOW THE CHILD'S AGE GROUP AFFECTS THE TIME SPENT IN A GALLERY

The children's ages considered in the study (ages seven to eleven years) were coded into two categories: age group 7-9 and age group 10-11, in order to explore whether the age of the child may affect the child and/or adult experience in the galleries investigated.

Figure 7B2 (on the next page) indicates three aspects which were significantly affected by the child's age group: the *way the child prefers to use exhibits* (on his/her own, with someone else, or either) (p=.02); the *adults' use of exhibits with children* (p=.04) and the *time spent* in the gallery (p=.04). The *way the child prefers to use exhibits* was also found to be associated with the *child's gender* (p=.04).

FIGURE 7B2: ASPECTS AFFECTED BY THE CHILD'S AGE GROUP



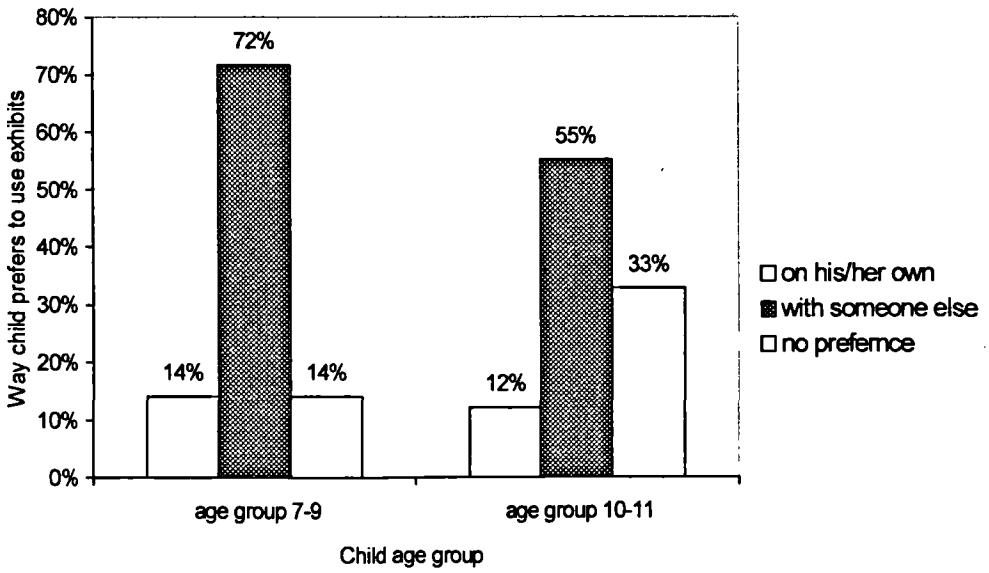
B4. Association between 'child age group' and the 'way the child prefers to use exhibits'

The *way the child prefers to use exhibits* (on his/her own, with someone else, or either way) is likely to be affected by the *age of the child* (p=.02). The findings indicate that younger children prefer to use exhibits 'with someone else' and that as they get older they tend to have no preference.

Figure 7.2.11 illustrates that the proportion of children who said they prefer to use exhibits *with someone else* (rather than *on their own*) was greater from children in *age group 7-9* than from children in *age group 10-11* (**72%**, n=66 out of 92, compared to **55%**, n=32 out of 58, respectively).

This finding suggest that the younger children in the sample appreciated to have the support of their accompanying relatives while older children were more likely not to have a particular preference.

Figure 7.2.11: Association between 'child age group' and the 'way the child prefers to use exhibits' (p=.02)



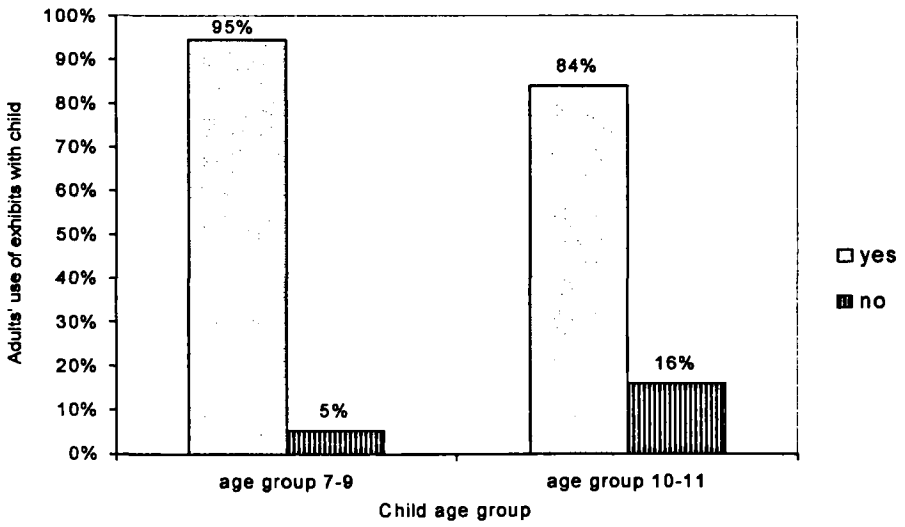
B5. Association between 'child age group' and ' adults' use of exhibits with children'

The adults' interaction with children at exhibits is also likely to be influenced by the age of the child (p=.04).

Overall, most adults said they interacted with the children from both age groups (91%, n=136 out of 150 adults) (see Appendix F, Table F2). However, as Figure 7.2.12 illustrates, the proportion of adults who said they *did not* use the exhibits with a child was greater from adults with children in *age group 10-11* (**16%**, n=9 out of 58) than from adults with children in *age group 7-9* (**5%**, n=5 out of 92).

This finding suggests that adults are less likely to interact with children at child-orientated exhibits as children get older. It may be that adults feel that as children get older they do not need their help as much as the younger ones.

Figure 7.2.12: Association between 'child age group' and ' adults' use of exhibits with children' (p=.04)



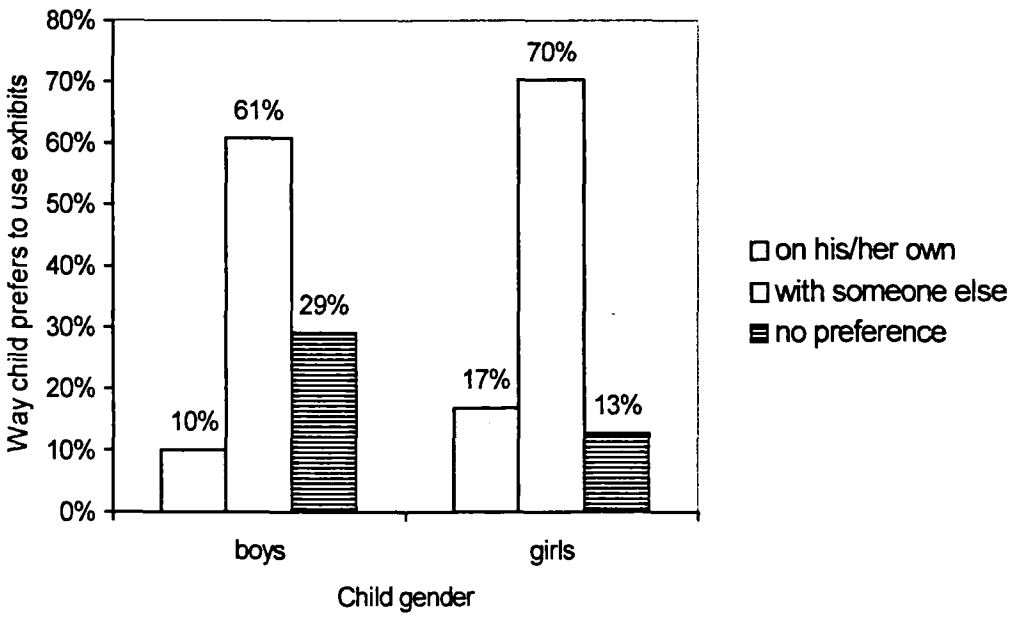
B6. Association between 'child gender' and the 'way the child prefers to use the exhibit'

Other than being affected by the child's age group (see point B4), the *way children like to use child-orientated exhibits* is also likely to be affected by the *child's gender* (p=.04). The findings suggest that girls were more likely to prefer to use hands-on exhibits with 'someone else', while boys had no preference (they like to use exhibits 'either on their own or with someone else').

Although the majority of boys and girls said that they preferred to use exhibits 'with someone else', girls showed their preference more strongly for the category 'with someone else' (**70%**, n=50 out of 71 girls, compared to **61%**, n=48 out of 79 boys). Also, a larger percentage difference between boys' and girls' responses exists for the category 'no preference'. Boys were more likely than girls to say they like to use the exhibits either alone or with someone else (**29%**, n=23 out of 79 boys, compared to **13%**, n=9 out of 71 girls) (Figure 7.2.13).

These findings indicate that the personal context, such as the age and gender of the child, are likely to affect the child and adult behaviour in child-orientated galleries.

Figure 7.2.13: Association between 'child gender' and the 'way the child prefers to use the exhibit' (p=.04)



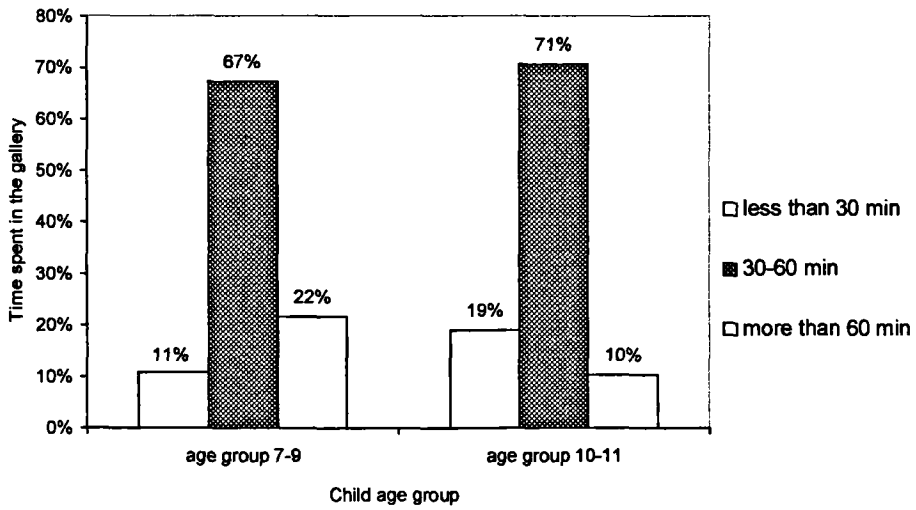
B7. Association between 'child age group' and 'time spent in the gallery'

The *child's age* is also likely to affect the *time spent* by the family in the gallery ('less than 30 minutes', '30 minutes to 1 hour', 'more than 1 hour') (p=.04). The finding indicates that families tended to stay longer in the gallery with younger children.

As Figure 7.2.14 illustrates, the proportion of children in *age group 7-9* staying in the galleries 'after 1 hour' was greater than those in *age group 10-11* (**22%** compared to **10%**, respectively).

Previous findings also indicated that the time spent in the gallery was likely to affect the child's perception of learning (see point B1).

Figure 7.2.14: Association between 'child age group' and 'time spent in the gallery' (p=.04)



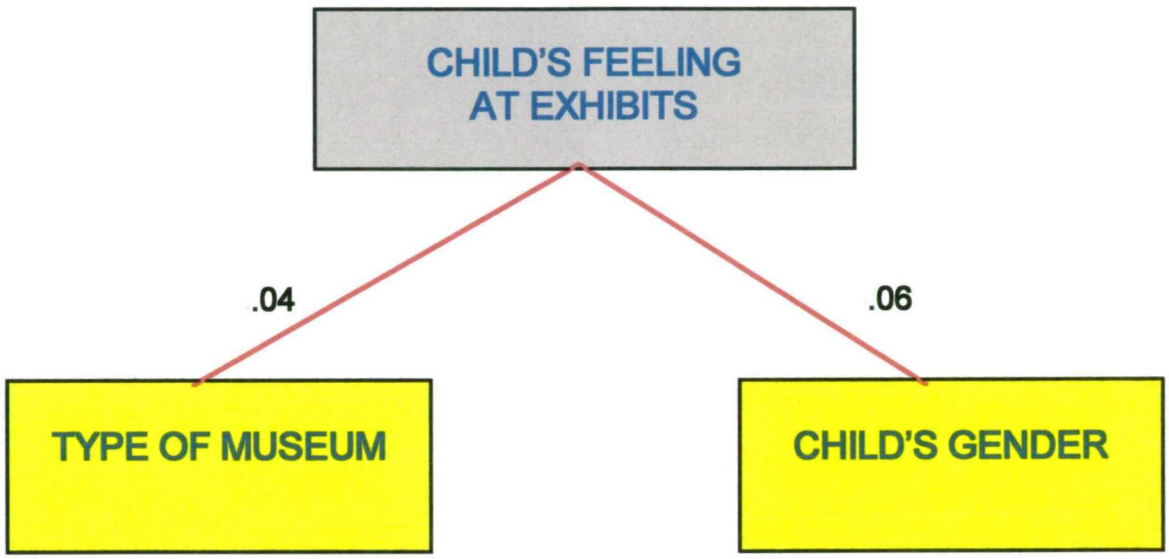
HOW THE CHILD'S FEELING OF INTERACTING WITH AN EXHIBIT IS ASSOCIATED WITH 'TYPE OF MUSEUM' AND 'CHILD'S GENDER'

This study adopted an holistic approach to inquiry, so affective elements of the children's and adults' experience were also investigated.

Figure 7B3 on the next page illustrates that the *child's feeling* while interacting with an exhibit is likely to be affected by the type of museum exhibition (p=.04). A marginally statistically significant association between child gender and type of museum was also found (p=.06).

The association between *child's feeling* at an exhibit and *type of museum* is presented in section C, together with the other findings related to 'type of museum'.

FIGURE 7B3: ASPECTS AFFECTING CHILD'S FEELINGS WHILE INTERACTING WITH EXHBITS



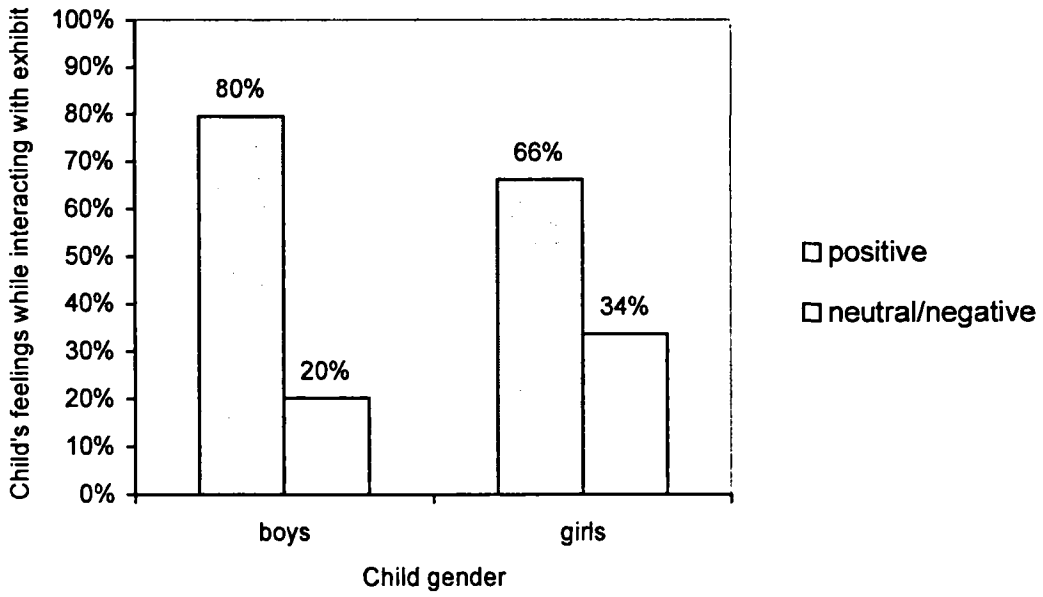
B8. Marginally statistically significant association between 'child gender' and 'child's feeling at exhibits'

The association between the child's gender and the child's feelings at exhibits was marginally statistically significant (p=.06). The findings suggest a *tendency* for girls to be more likely than boys to have *negative or neutral feelings* while interacting with hands-on exhibits.

Figure 7.2.15 illustrates that **34%** of girls (n=24 out of 71) had negative or neutral feelings about their interaction with an exhibit, while a smaller percentage of boys had them (**20%**, n=16 out of 79).

Since the affective side of the museum experience is an important aspect of the informal learning experience, this finding is worthy of further investigation. Exhibition planners should be aware of possible gender effects in child-orientated exhibits and aim to create a gender-balanced environment which has attractive elements to both boys and girls. Ergonomic issues should also be taken in consideration in order to avoid uncomfortable feelings, as pointed out in Chapter 6 (see page 255).

Figure 7.2.15: Marginally statistically significant association between 'child gender' and 'child's feeling at exhibits' (p=.06)



B. Summary of findings regarding children's experience and perceptions at the child-orientated galleries

. Concerning the children's perceptions of their learning, the more time spent in the gallery, the more the child was likely to say that s/he learned something (p=.006).

. The *relative status* of the accompanying adult was likely to affect the children's perception of their learning. Children were more likely to say they learned something when they were with *other relatives* and *mothers* than with *fathers* (p=.05). Since the mothers in the sample were likely to be more educated than fathers, the findings suggest that more educated parents are likely to affect positively the child's perceptions of learning.

. Children were more likely to say that they learned something in the galleries if they preferred to visit museums with either 'school' or 'family' rather than if they had *no preference* ('either family or school') (p=.04). It might be that children who had *a* preference (family or school) had a more focused and/or rewarding museum visit with these social groups before (rather than the children who had *no preference*).

. The child's age is associated with the duration of the visit to the galleries. Families with younger children (age group 7-9) were likely to stay longer in the gallery ('more than one hour') than families with older children (age group 10-11) (p=.04).

The relative status of the accompanying adult and the adult gender also affected the time spent in the gallery (p=.002 and p=.007, respectively) (see summary A).

. Regarding the way children prefer to use hands-on exhibits, children in age group 7-9 prefer to use them 'with someone else' (rather than 'on their own'), and as they get older (age group 10-11), they tend to have *no preference* (p=.02).

. A gender effect was indicated in the way children prefer to use hands-on exhibits. Girls were more likely to prefer to use exhibits 'with someone else', while boys were more likely to prefer to use them 'either alone or with company' (p=.04). This finding could be influenced by the fact that, in the sample, the proportion of girls in age group 7-9 was greater than that of boys (68%, n=48 out of 71 girls, compared to 56%, n=44 out of 79 boys), and the proportion of boys in age group 10-11 was greater than that of girls (44%, n=35 boys, compared to 32%, n=23 girls) (see previous finding above).

. The majority of interviewed adults used the exhibits together with the interviewed children (aged between 7 to 11 years old). However, adults were more likely *not* to use exhibits with older children (from age group 10-11) (p=.04).

. The findings suggest a gender effect regarding the child's feeling about interacting with a hands-on exhibit (p=.06). Girls were slightly more likely to have more 'negative or neutral feelings' at exhibits than boys at the three galleries investigated. This finding is worthy of further investigation.

Children's feelings at exhibits is also related to the 'type of museum/exhibition' investigated (p=.04) (see summary on section C).

7.2.3. ASSOCIATIONS REGARDING THE TYPE OF MUSEUM :

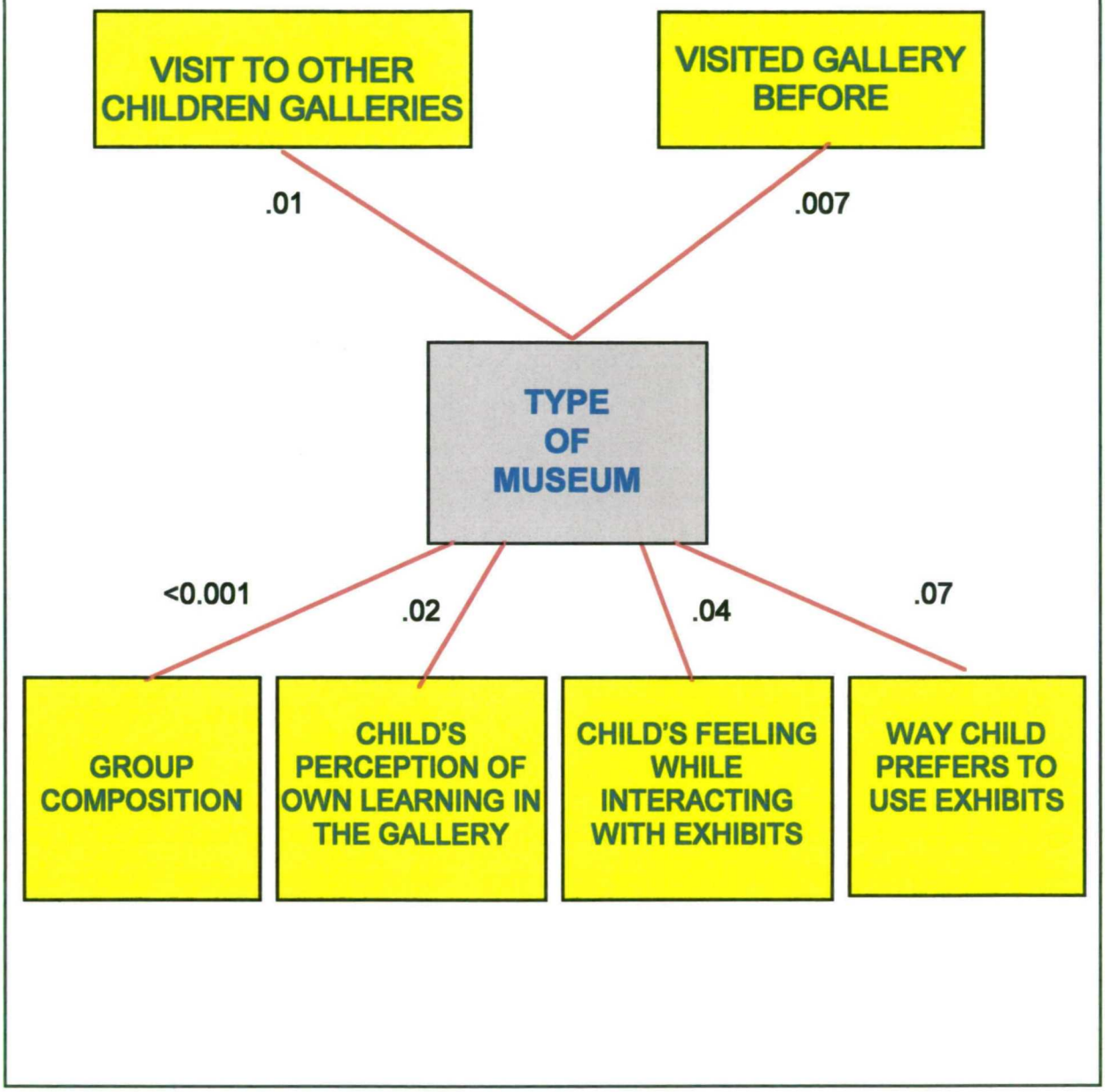
SECTION C

The physical context of a museum visit (that is, the gallery environment and its exhibits) is considered to affect the visitor experience (Falk & Dierking, 1992). Since the present study was carried out in three different child-orientated galleries in distinct museums (a maritime museum - the National Maritime Museum, Greenwich; a science museum, the Science Museum, London ; and a children's museum - Eureka! The Children's Museum), it is important to investigate similarities and differences between these exhibitions and explore how the type of museum exhibition may affect the child/adult experience and perceptions.

Figure 7C (on the next page) shows the statistically significant associations found between the *type of museum exhibition* where data was collected and aspects related to the social context of the visit, perceptions of learning, affective side of the experience, behaviour, and visiting habits.

Type of museum was found to affect: the *group composition of the visit to the gallery* ($p<.0001$), the *child's perception of own learning* ($p=.02$), and *the child's feelings while interacting with hands-on exhibits* ($p=.04$). The probability value of the association between *type of museum* and *way the child prefers to use exhibits* was marginally statistically significant ($p=.068$) and this finding could be further investigated with a larger sample. The *type of museum* also affects family visiting habits: *repeated visits to the gallery* ($p=.007$) and *whether the family have visited other children's galleries elsewhere* ($p=.01$).

FIGURE 7C: ASSOCIATIONS REGARDING THE TYPE OF MUSEUM



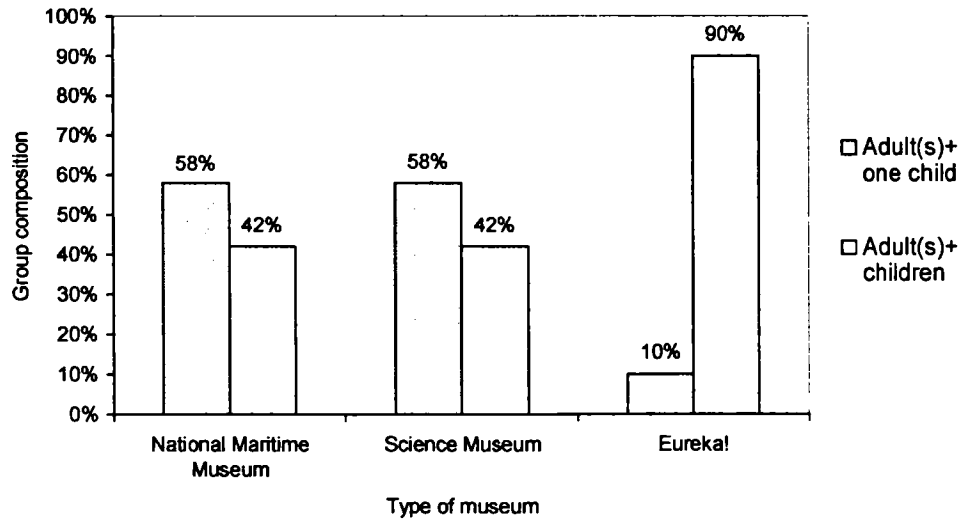
HOW THE 'TYPE OF MUSEUM' IS ASSOCIATED WITH THE SOCIAL CONTEXT OF THE VISIT, THE CHILDREN'S PERCEPTION OF THEIR LEARNING, THE CHILD'S FEELINGS AT EXHIBITS, AND THE WAY THE CHILD PREFERS TO USE EXHIBITS

C1. Association between 'type of museum' and 'group composition'

The 'types of museum' investigated (a maritime museum, a science museum and a children's museum) are likely to affect the family group composition, that is, whether the adult accompanying adult is visiting the museum with one *or* more children in the group ($p<.0001$).

While the National Maritime Museum and the Science Museum had exactly the same proportions of group composition of adults visiting the galleries with 'one child' *and* adults visiting 'with children' (**58%**, n=29 out 50 adults with 'one child', and **42%**, n=21 out of 50 adults with 'children', at both museums), at Eureka! The Museum for Children the most common group composition was adults visiting 'with children' (**90%**, n=45 out of 50) (see Figure 7.2.16).

Figure 7.2.16: Association between 'type of museum' and 'group composition' (p=<.0001)



This indicates that the social context in which the child visited the gallery at Eureka! was likely to be different from the social context at the other two museums: at Eureka!, the child was more likely to have other children in the group to explore the exhibits with, so the child experience was likely to be

different according to the group composition in each gallery. The findings also suggest that the children's museum might attract families with more than one child in the group more than the other two museums investigated.

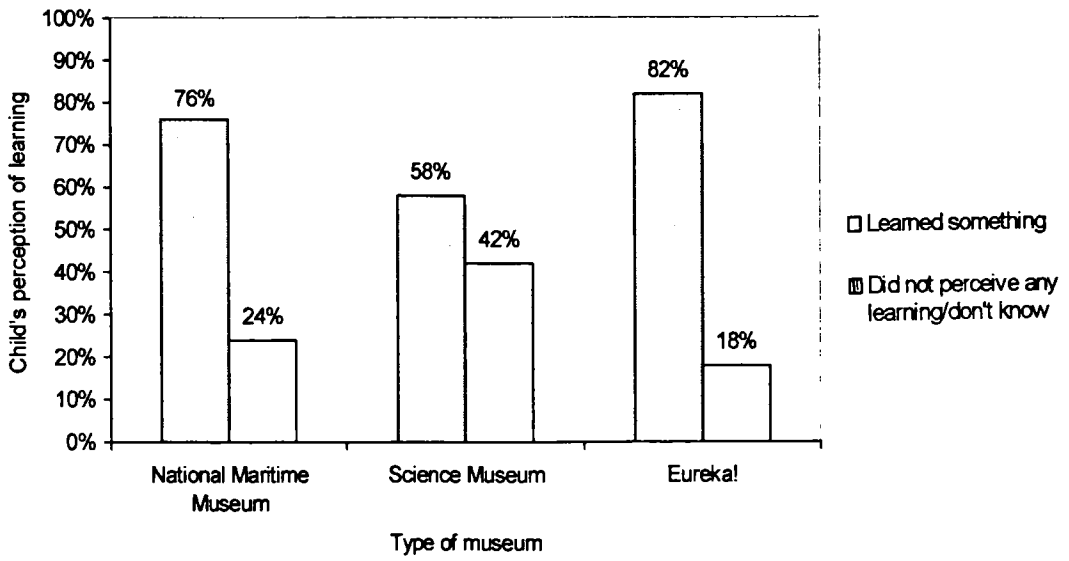
C2. Association between 'type of museum' and 'child's perception of own learning'

A statistically significant association was found between *type of museum* and the *children's perception of their learning* (p=0.02), suggesting that children's perceptions of learning is affected by different child-orientated exhibitions design approaches.

Eureka! The Museum for Children had the highest proportion of children who said they had learned something, when compared to the other two locations (**82%** at Eureka!, compared to **76%** at the National Maritime Museum and **58%** at the Science Museum) (see Figure 7.2.17).

These findings suggest that the child's perception of any learning was less evident to the children at the experimental type of science exhibit from Launch Pad, Science Museum, and that children were more likely to think that they learned something at the children's museum type of exhibits, which are specifically geared for children.

Figure 7.2.17: Association between 'type of museum' and 'child's perception of own learning' (p=.02)

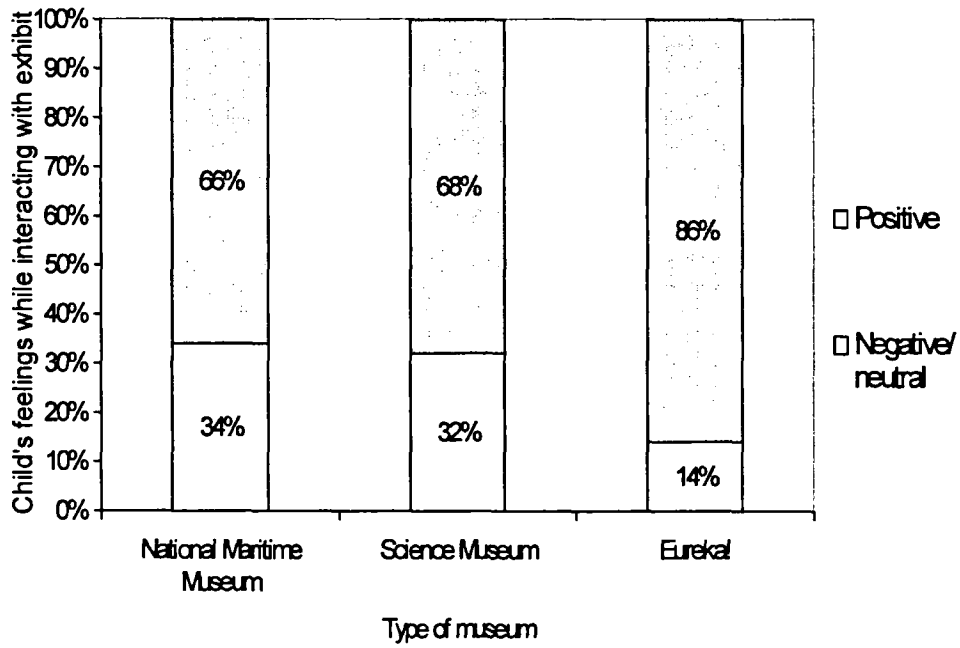


C3. Association between 'type of museum' and 'child's feelings at exhibits'

The type of museum exhibition investigated is likely to affect the child's feelings while interacting with hands-on exhibits (p=.04). Children were more likely to have 'positive feelings' at the children's museum (Eureka!) than at the science or the maritime museums (**86%**, n=43 out of 50 children at *Me & My Body*, compared to **68%**, n=34 out of 50 at *Launch Pad*, and **66%**, n=33 out 50 at *All Hands*) (see Figure 7.2.18).

This findings suggest that an environment exclusively designed for children, like in a children's museum, is likely to have a very positive impact on the affective side of the child experience.

Figure 7.2.18: Association between 'type of museum' and 'child's feelings at exhibits' (p=.04)

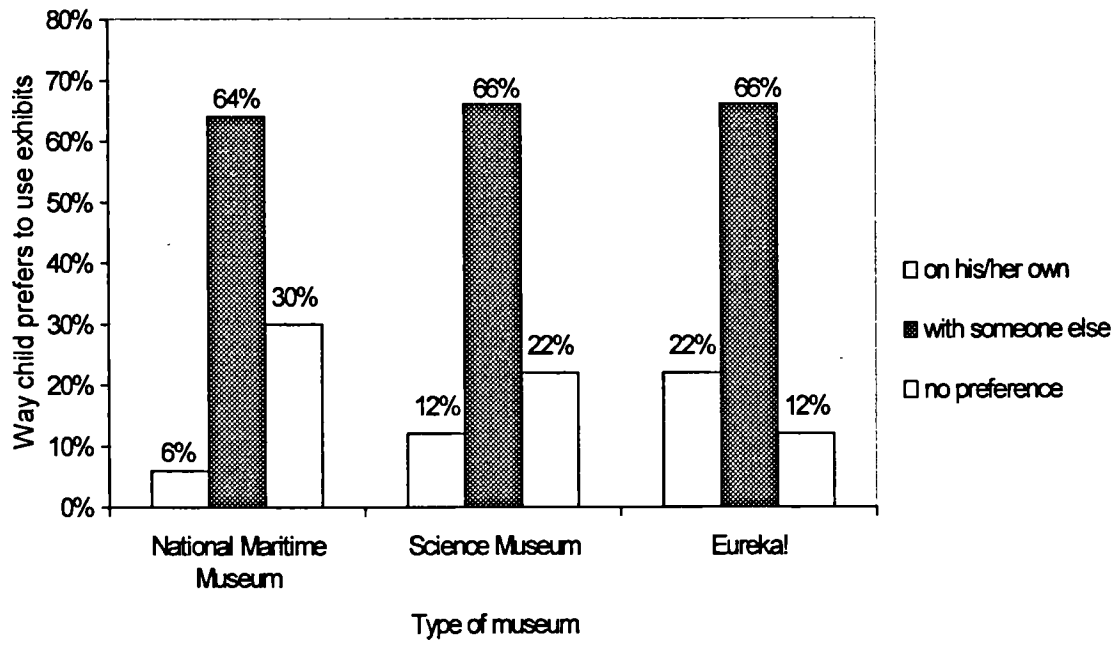


C4. Marginally statistically significant association between 'type of museum' and the 'way child prefers to use exhibits'

A marginally statistically significant association was found between *type of museum* and the *way child prefers to use an exhibit* (on his/her own, with someone else, or either way) (p=.068) and might show a *tendency* that could be further investigated. This tendency suggests that children might prefer to use exhibits 'on their own' at a children's museum.

Comparing the children who said they prefer to use exhibits '*on their own*' at the three locations, the percentage of them at *Eureka! The Museum for Children* was higher than in the other two museums (**22%**, n=11 out of 50, compared to **12%**, n=6 out of 50 at the *Science Museum* and **6%**, n=3 out of 50 at the *National Maritime Museum*) (see Figure 7.2.19).

Figure 7.2.19: Marginally statistically significant association between 'type of museum' and the 'way child prefers to use exhibits' (p=.068)



Since the exhibits at Eureka! were planned specifically for children (while the other two child-orientated museum exhibitions investigated were designed for children and other ages), the possibilities that children like to be more autonomous at the children's museum (Eureka!), as the finding suggests, or that parents may be likely to withdraw from interaction if they think exhibits are meant only for children, are worthy of further investigation.

HOW 'TYPE OF MUSEUM' AFFECTS FAMILY VISITING TO CHILD-ORIENTATED GALLERIES

Prior visits to the children's galleries investigated and to other child-orientated galleries elsewhere were considered in the study in order to understand more about the background of family visits to such exhibitions.

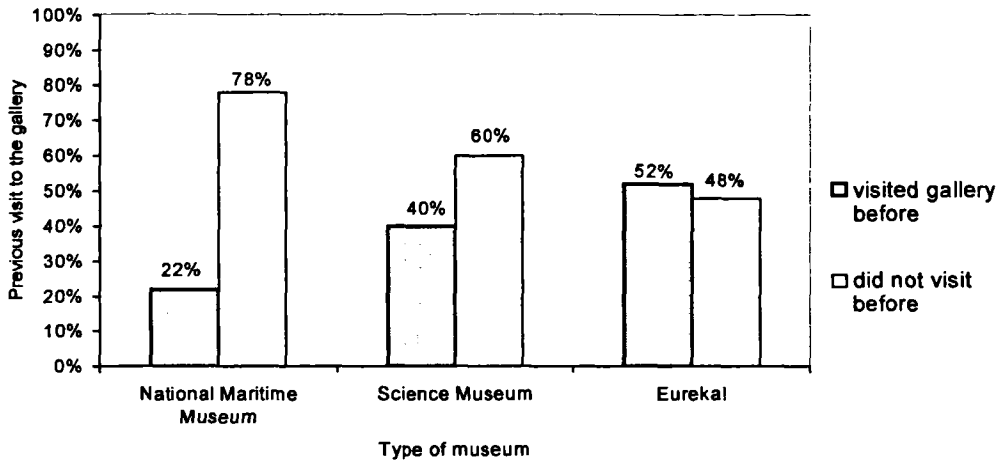
As shown in Figure C (on page 323), the *type of museum* is likely to affect *whether the family had already visited the gallery before* (p=.007) and *if the family had visited other child-orientated exhibitions* (p=.01). This may give an indication of how popular these exhibitions are with family groups and whether families visit this type of gallery frequently.

C5. Association between 'type of museum' and 'previous visit to the gallery'

Families seem to make more repeated visits according to the type of museum investigated, that is, whether it is a children's museum, a science museum, or a maritime museum (p=.007). The findings indicate that the children's museum (Eureka!) encouraged more repeated visited than the maritime and science museums.

As shown is Figure 7.2.20, more adults interviewed at Eureka! said they *had already visited the gallery before*, when compared to the other two museums (**52%**, n=26 out of 50 at Eureka!, compared to **40%**, n=20 out of 50 at the Science Museum, and **22%**, n=11 out of 50 at the National Maritime Museum).

Figure 7.2.20: Association between 'type of museum' and 'previous visit to the gallery' (p=.007)



This finding could be influenced by the location of the museums. Eureka! in Halifax is in an area where there are few competing children's exhibitions of its size, whereas the other two museums are in metropolitan London where there are lots of competing institutions which offer provision for children (e.g. Natural History Museum, London Transport Museum, etc.). It might also be that children's museums have a more permanent audience than the others.

C6. Association between 'type of museum' and 'visits to similar galleries elsewhere'

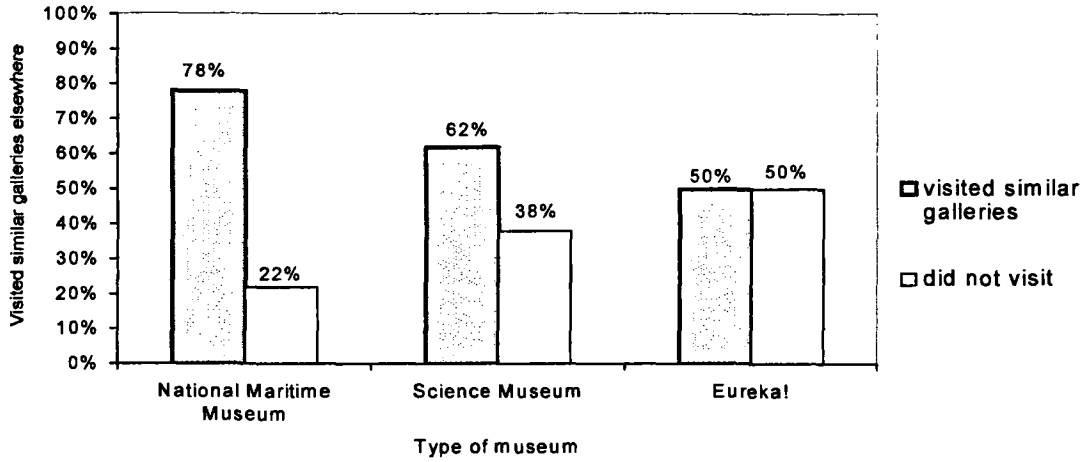
The frequency of family visits to other child-orientated exhibitions was found to be associated with the type of museum surveyed (p=.01).

Families who were visiting the National Maritime Museum and the Science Museum, both in London, tended to visit other child-orientated exhibitions more than families who were visiting Eureka! The Museum for Children, in Halifax (see Figure 7.2.21)

As explained previously (see point C5), this could be due to location, since in the Halifax area and its surrounding there are not many children's exhibitions of this kind to compete with Eureka!.

Comparing this finding to the previous one regarding how *type of museum* affects whether the family visited the gallery before, it would seem that the families interviewed at Eureka! The Children's Museum visited *less* children's galleries elsewhere than families from the other two sites, but they tended to make *more* repeated visits to the Museum.

Figure 7.2.21: Association between 'type of museum' and 'visits to similar galleries elsewhere' (p=.01)



C. Summary of findings regarding the types of museum investigated

. The type of museum investigated (a children's museum, a science museum, and a maritime museum) was likely to affect the social context (group composition) of the visit. Eureka! the Museum for Children was likely to have more family groups consisting of adult(s) with more than one child than the National Maritime Museum and the Science Museum ($p<.0001$).

. The type of museum was likely to affect the children's perception of their learning. At the children's type of museum (Eureka!), children were more likely to say they learned something than at the other two museums. The experimental type of science exhibition at Launch Pad, Science Museum, was the one which had the lowest percentage of children who said that they thought they had learned something, when compared to the other two locations ($p=.02$).

. The type of museum was also likely to affect the child's feelings while interacting with the exhibits. The proportion of children who had 'positive feelings' at exhibits was greater at Eureka! The Museum for Children than at the other two museums (p=.04).

. Families interviewed at Eureka! were more likely to have visited the gallery before (repeat visit) than families interviewed at the National Maritime Museum and the Science Museum (p=.007). On the other hand, families from the National Maritime Museum and the Science Museum took their children to more children's galleries elsewhere than the families interviewed at Eureka! (p=0.01).

It might be that external factors, such as the museum location, have influenced this finding, since there are more choices of family days out of an educational nature in London (where the National Maritime Museum and the Science Museum are located) than in Halifax (where Eureka! is located).

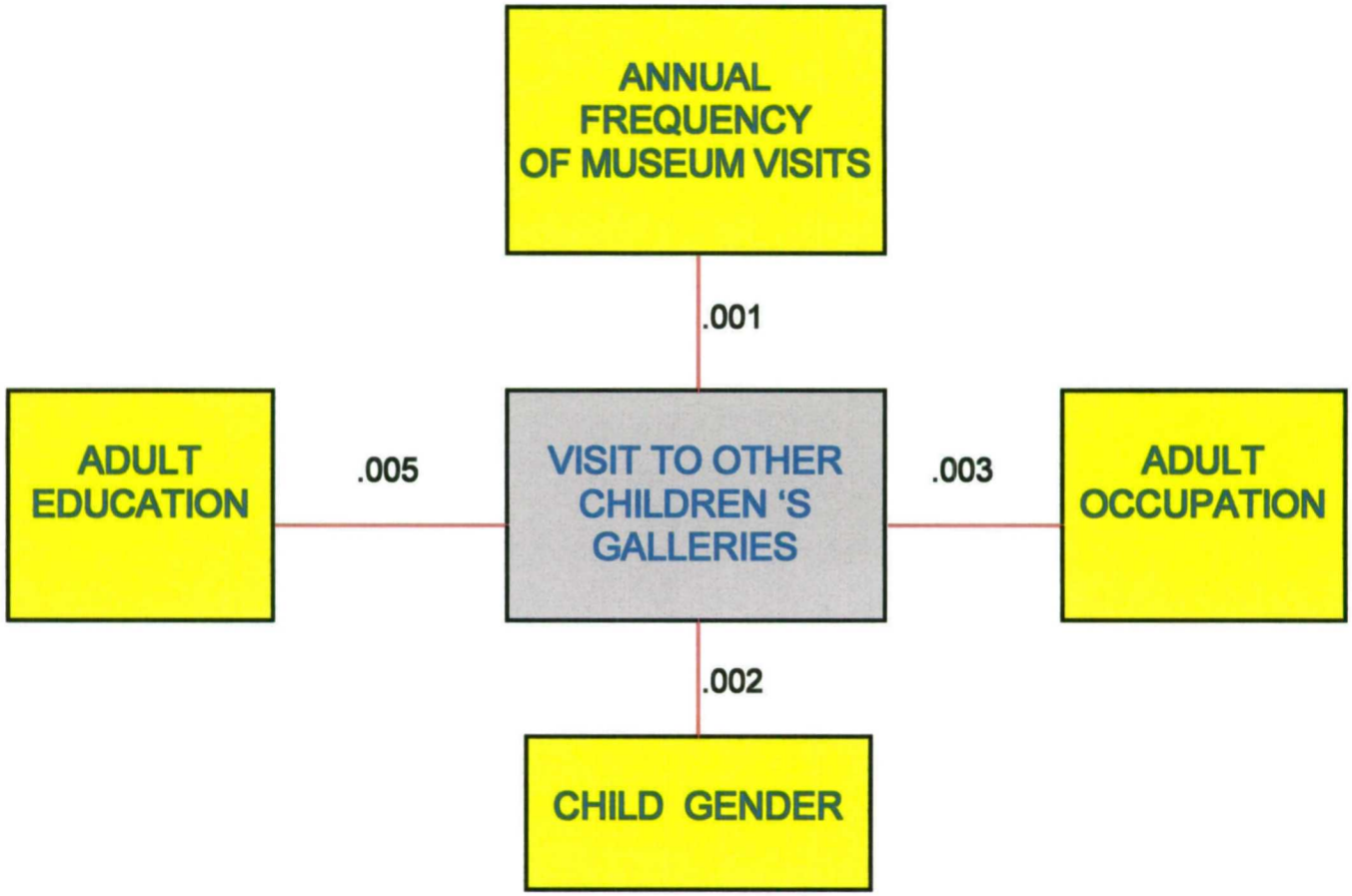
. The findings suggest an unconfirmed *tendency* that the type of museum might affect the way the child prefers to use an exhibit. It was found that more children prefer to use exhibits 'on their own' at the *children's* type of museum (Eureka!) than at the other two types of museum investigated (p=.068). This finding should be further investigated.

7.2.4. ASSOCIATIONS RELATED TO FAMILY VISITING TO CHILD-ORIENTATED GALLERIES :

SECTION D

Figure 7D on the next page shows the significant statistical associations between *family visits to similar galleries elsewhere* and variables related to personal aspects such as *adult education*, *occupation*, and *child gender*. *Annual frequency of family museum visits* is also likely to affect visiting to similar children's galleries elsewhere. These findings are concerned with museum visiting and may have implications for museum audience development strategies regarding families and children.

FIGURE 7D: ASSOCIATIONS REGARDING FAMILY VISITING TO CHILD ORIENTATED GALLERIES



HOW ADULT 'EDUCATION', 'ADULT OCCUPATION', 'CHILD GENDER', AND 'ANNUAL FREQUENCY OF FAMILY MUSEUM VISITS' ARE ASSOCIATED WITH FAMILY VISITING TO OTHER CHILD-ORIENTATED GALLERIES

D1. Association between 'adult education' and 'visits to similar galleries elsewhere' and between 'adult occupation' and 'visits to similar galleries elsewhere'

Whether or not families had visited other child-orientated exhibitions elsewhere is affected by the adult level of education and adult occupation (p=.005 and p=.003, respectively). Both probability levels for these two associations are high, indicating that both adult education and adult occupation affect the family visiting habits to other child-orientated exhibitions.

This finding indicates that the more highly educated adults interviewed in the sample were more likely to have visited similar galleries elsewhere, and that visitors from occupations classified in the social classes A/B and C1 were more likely to have visited other child-orientated exhibitions than visitors from social classes C2/D/E (see Figure 7.2.22 and 7.2.23).

These finding confirms previous work which show relations between education and social class and museum visiting (Merriman, 1991).

Figure 7.2.22: Association between 'adult education' and 'visits to similar galleries elsewhere' (p=.005)

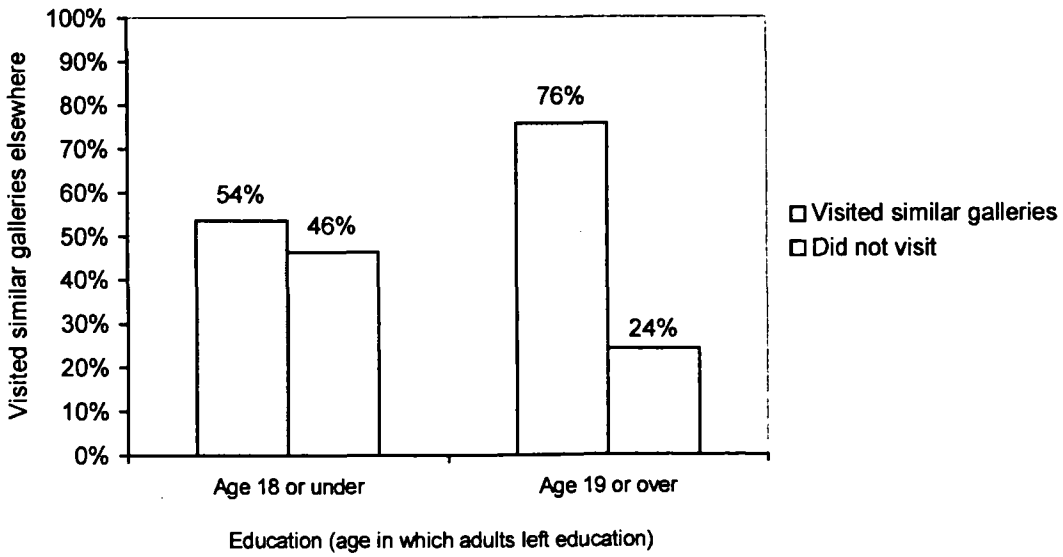
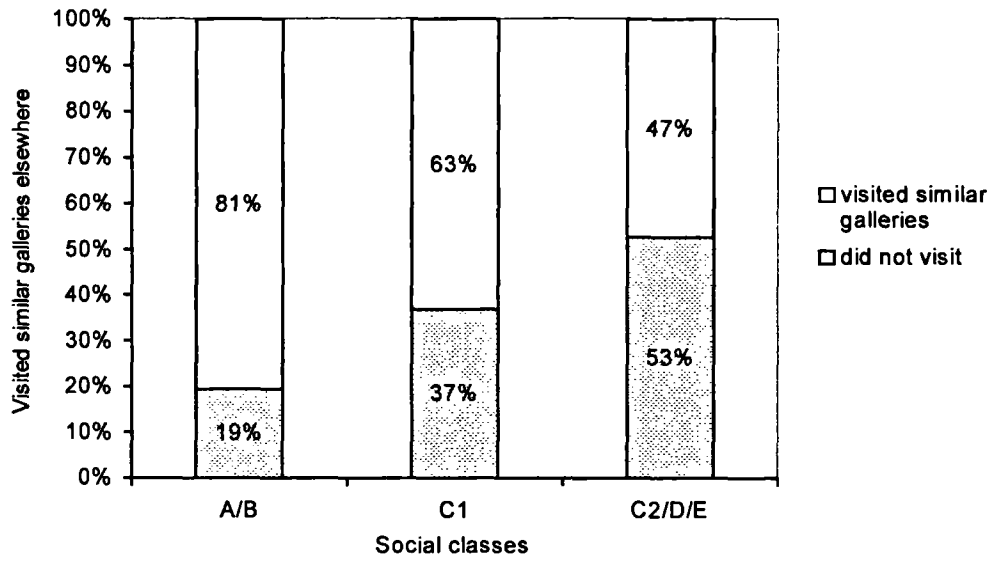


Figure 7.2.23 : Association between 'social class (adult occupational grade)' and 'visits to similar galleries elsewhere' (p=.003)

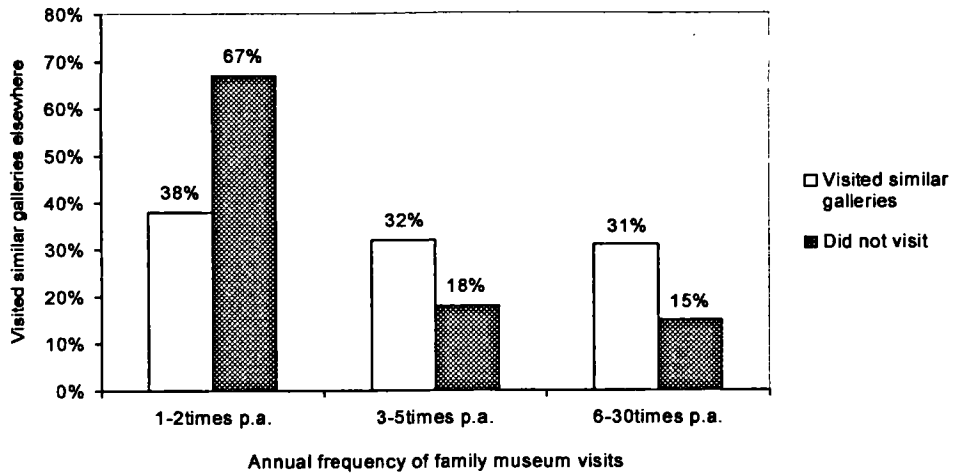


D2. Association between 'annual frequency of family museum visits' and 'visits to similar galleries elsewhere'

This finding indicates that *visits to similar galleries elsewhere* is associated to the *annual frequency of family visits to museums* (p=.001). Families who visit museums less frequently (once or twice in a year) were more likely ***not*** to have visited similar galleries elsewhere than the families who go to museums more frequently (more than 6 times a year).

Figure 7.2.24 shows that from the total of families who said they had *never* been to other children's galleries before (n=55 out of 150), **67%** were from the visiting category '1-2 museum visits p.a.' (n=37 out of 55), compared to **15%** of families who were from the visiting category '6-30 museum visits p.a.' (n=8 out of 55).

Figure 7.2.24: Association between 'annual frequency of family museum visits' and 'visits to similar galleries elsewhere' (p=.001)



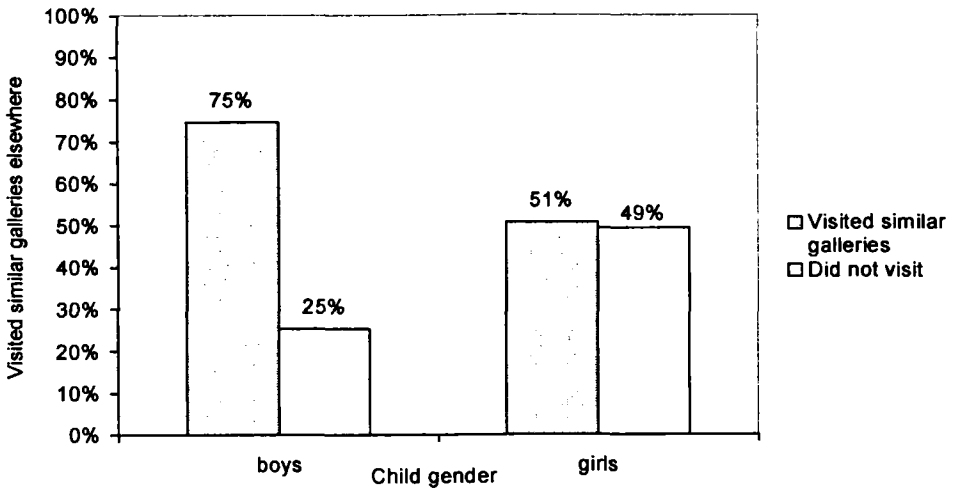
D3. Association between 'child gender' and 'visits to similar galleries elsewhere'

The findings indicate that the *child gender* and visits to similar child-orientated exhibitions elsewhere are associated (p=.002). As the number of boys and girls interviewed was relatively balanced (n=79 boys and n=71 girls), it is not considered to have affected the outcome described here.

Figure 7.2.25 indicates that **75%** of boys (n=59 out of 79) said they had already visited similar exhibitions, compared to **51%** of girls who said so (n=36 out of 71).

It would seem that those families with an interviewed boy aged between 7 to 11 were more likely to have visited other children's galleries than those families with an interviewed girl aged 7 to 11, suggesting that child-orientated exhibitions might be perceived by adults to be more interesting / attractive to boys than girls.

Figure 7.2.25: Association between 'child gender' and 'visits to similar galleries elsewhere'(p=.002)



D. Summary of findings related to family visiting to child-orientated galleries

. The findings indicate that *frequent* museum visitors (six or more times a year) are more likely to visit other children's galleries elsewhere than *infrequent* museum visitors (once or twice a year). Adults from occupational groups classified in social classes A/B and C1, who are more educated, and who visit museums 6 to 30 times a year, were more likely to have taken their children to visit other similar galleries elsewhere (p=.003, p=.005, and p=.001, respectively).

. In this sample, boys aged 7 to 11 were more likely to have been taken to visit other children's galleries elsewhere than girls aged 7 to 11 (p=.002). A gender determination regarding the children's visits to child-orientated galleries may have been identified. This matter is worthy of further investigation.

7.3. OVERVIEW OF THE FINDINGS FROM THE STATISTICAL ANALYSIS OF ADULTS' AND CHILDREN'S RESPONSES TO THE CLOSED INTERVIEW QUESTIONS

Aspects affected by the 'type of museum'

The type of museum/exhibition investigated was found to affect different aspects of the child perceptions, experience, and preferences (such as learning, feelings, and use of exhibits), family social context and museum visiting habits.

The findings indicate that the child-orientated gallery at Eureka! The Museum for Children (*Me & My Body*) was more successful regarding its impact on the children's affective and cognitive dimensions of experience than the *All Hands Gallery*, National Maritime Museum, and *Launch Pad*, at the Science Museum. Children were more likely to say that they *learned something*, that they had *positive feelings*, and that they preferred to use exhibits '*on their own*' (more autonomously) at Eureka! The Children's Museum.

Families were likely to make more repeated visits to the children's museum (Eureka!) than to the other to museums, which might indicate that the children's museum has a more *permanent* audience. As a consequence, children may be more likely to have had the opportunity to built on their previous visit experience every time they return to the museum. Furthermore, relatives may have the opportunity to follow their child development in such context.

Since so far there is no *children's museum* of Eureka!'s kind in London (inspired on the American type of children's museum), it is not possible to check whether this tendency (more repeated visits to the children's museum than to other museums) would occur in London as well.

'*Type of museum*' was found to be associated to '*whether families had visited other children's galleries elsewhere*'. However, other variables were also found to influence the visit to other child-orientated galleries. The findings indicate that '*visit to other children's galleries*' is also related to *social class*, *adult education level* and *annual frequency of museum visits*.

Adults interviewed who left education at age 19 years or older were more likely to have visited other children's galleries elsewhere, suggesting that such adults were more likely to offer a variety of experiences to their children.

The families interviewed at Eureka! The Museum for Children tended to make *fewer* visits to other child-orientated exhibitions, while families interviewed at the National Maritime Museum and Science Museum were more likely to have visited other children's galleries elsewhere. According to the findings above, this might be due to the fact that there were slightly more interviewed adults at Eureka! from lower education levels than at the other two museums. The proportions of adults in these categories might suggest that regional children's museum may reach different education levels and social classes (not only the more educated and upper classes, as usual in museums).

The type of museum was also found to be associated with the group composition of the visit to a child-orientated exhibition. The children's museum attracted families with more children in the group than the other two types of museum. Group composition was also related to the 'relative status of the accompanying adult'. *Mothers* were more likely than *fathers* to visit the galleries with more than one child. The finding related to the 'type of museum and group composition' might be influenced by the fact that there were more *mothers* interviewed at Eureka! than in the other two museums (and it was found that *mothers* were more likely to visit the galleries with 'more than one child'). The sample of adults interviewed and the sample of adults observed (see Chapter 4) suggest that there might be a gender effect regarding the adult attendance in a children's museum. In both samples, the proportion of female adults at Eureka! was greater than the proportion of male adults. This issue should be further investigated.

Aspects which affect the children's perception of their learning

The children's perception of their own learning is likely to be affected by four aspects: the *time spent in the gallery*, the *relative status* of the accompanying adult, the *preference for the social context of the visit*, and the *type of museum*.

Since the children's perception of their learning is associated with the relative status of the accompanying adult, the associations related to the children's interviewed 'relative' are of importance, since they might influence indirectly the children's learning. There were significant differences between *mothers* and *fathers*. In the sample, *mothers* were likely to be *more educated* than *fathers*. Regarding the *relatives'* perception of their learning, *mothers* and *other relatives* (mostly females) were more likely than *fathers* to think they *learned something* in the child-orientated gallery. Concerning the time spent in the gallery, *fathers* tended to spend *less time* in the gallery compared with *mothers* and *other relatives* which, according to the findings, discourages children's perception of learning in the gallery. These findings indicate that the more educated relatives in the sample (*mothers* and *other relatives* who were mostly females) were more likely to stay longer in the gallery, suggesting that they had a more positive attitude to learning in child-orientated exhibitions. It implies that more educated relatives are more likely to care about the quality of the informal educational experiences they are providing to children.

Aspects affecting the adults' perceptions of their learning

The time spent in the gallery does not affect adults' perception of their learning. However, the gender of adults is very likely to affect adults' perception of their learning, as the statistical analysis indicates.

Female adults were much more likely to think they learned something in the gallery than male adults. This finding suggests a differing attitude between male and female adults regarding their learning experiences or learning opportunities in child-orientated galleries. Female adults seem to be more 'open' than males to the *simple*, condensed messages that a child-orientated exhibition aims to convey.

Although the attitude of the adult carer is bound to have an impression on the child visit experience (as seen above), the fact that the accompanying adult (male or female) thinks that s/he learned (or did not learn) something in the gallery *is not likely* to affect the children's perception of their learning in the gallery, since the association between *adult gender* and *children's perception of their learning* was *not* statistically significant (p=.14), indicating that whether or

not the adults, regardless of their gender, think they learned something in the gallery, did not affect directly the children's perception of their learning. Other factors are likely to influence children's learning (as seen above), such as time spent in the gallery, the type of museum/exhibition, and the characteristics of the 'relative' accompanying the child (such as education).

It has been said that the needs of adults (intellectual, spaces to rest/relax) should be considered when designing children's galleries (Kropf & Wolins, 1989; Studart, 1996). If adults become interested in the content of the children's exhibits, and feel relaxed, they might be more open to engaging in social learning with their children.

Child's preference for the social context of the visit

Children were more likely to say they prefer to visit museums 'with family' when they were with *fathers* or *other relatives* than with *mothers*. It may be that children consider a 'day out' with their fathers or other relatives to be a special occasion. Perhaps 'social pleasure' in the form of a day out with fathers and other relatives competes with a 'learning focus'.

Aspects affected by the child age group

The 'age' of the child was likely to influence the *time spent in the gallery*, the *way the child prefers to use hands-on exhibits*, and *whether the adults use the exhibits with children*. The younger children in the sample (7-9 years old) were likely to prefer to use exhibits with '*someone else*', and adults were *less likely* to use exhibits with older children (age group 10-11) than with the younger ones (age group 7-9). Also, families with children aged between *seven* and *nine* years were more likely to *stay longer* in the galleries.

Limitations of the study

The variable '*children's memories of visits to child-orientated exhibitions*' did not provide any significant statistical association. It is likely that this result may be due to the nature of the categories (children who '*remembered something*', '*did not remember anything*', and '*never visited other children's galleries*'). Children who 'never visited' other children's galleries were not considered in the statistical tests (because, obviously, they did not have memories of other similar visits). Children's memories may be better explored using a qualitative approach. If statistical analysis is employed, then other categories should be devised.

The sample used in this study provided a number of statistically significant findings. However, there were a few marginally statistically significant associations (see Table 7.2.2, on page 294) which could be further investigated with a slightly larger sample. For this reason, in future similar studies, a slight increase in the sample size is recommended, in order to avoid a possible Type II error (Black, 1993: 128). However, the findings presented in this chapter show that the sample size used in this study enabled significant associations to be found between the adults' and children's interview variables (related to adults and children's perceptions, behaviour, preferences, habits, and demographics), providing new insights to the study of family groups in child-orientated galleries.

CHAPTER 8 : CONCLUSIONS

8.1. CONTRIBUTIONS

This investigation pioneered the study of children's galleries as a characteristic exhibition environment, with its particular features. The study is original because it has attempted to investigate family experiences in a child-orientated exhibition in its entirety, including the gallery environment, interpretation approach, and design of exhibits. This study compared children's and adults' experiences and perceptions across three child-orientated galleries in different museums (a maritime museum, a science museum, and a children's museum) and, in this sense, it is an innovation in the field since most studies on family behaviour and learning have been carried out in science exhibitions. The findings provide a major body of empirical data on families' natural behaviour at child-orientated exhibits and, also, children's and adults' own views and perceptions of their experience and learning in such spaces, which can be used as a reference for anyone involved in the planning of children's galleries and museum education work related to the child and family audiences.

The study stressed the importance of taking a holistic approach to the investigation of the museum visitor experience, taking in consideration the personal, social, and physical contexts of the visit (see Falk & Dierking, 1992) and the use of different research instruments (unobtrusive observation, interviews, and children's drawings) to allow data triangulation (see pages 345-54). Since the problem explored was new (there aren't previous studies which attempted to investigate the family experience in three distinct children's galleries), an inductive approach to inquiry was adopted.

The introduction of a new methodological approach involving analysis of children's drawings can be considered an important advancement in the research field. The categories drawn from the drawings aimed to derive meaning of the children's interactive engagement with exhibits and they provide insights that are qualitatively different from that given by interviews and observations (see Chapter 5, pages 181-83 and 185-210). The use of chi-squared tests to analyse the interviews with adults and children is a

contribution to the analysis of interviews with family groups, due to the method of cross-tabulating adults' with children's responses. The statistical tests indicated significant associations between adults' and children's variables, presented in Chapter 7 (see Table 7.2.1 on page 293).

In the next sections, the findings related to the research questions are presented and referred back to the analyses chapters and the visitor studies literature, followed by a discussion of the implications from the findings and insights for the planning of child-orientated galleries. The chapter concludes with suggestions for further research and a final thought about the provision of child-orientated galleries in museums.

8.2. THE RESEARCH QUESTIONS & THE FINDINGS

The research questions asked in this study (see Methodology Chapter, page 113) derived from the museum literature on informal learning environments and the visitor studies literature on children and families presented in Chapter 2, sections 2.2 and 2.3 (see pages 82-100). The findings from the analysis of the observation studies carried out in the three galleries (Chapter 4); the children's drawings of exhibits (Chapter 5); and the open-ended and closed interview questions (analysed qualitatively and statistically, respectively) (Chapter 6 & 7), offered a picture of children's and families' perceptions and experiences in child-orientated museum exhibitions which contributes to the understanding of the framework within which the family audience attends this particular type of museum gallery.

In this section, the research questions are addressed in relation to the findings obtained through the observations, interviews and/or children's drawings, with the aim to triangulate the findings from the several analysis of the data derived from the three research methods adopted.

RESEARCH QUESTION 1: What aspects of the visit to a child-orientated gallery do children and adult relatives value and why?

Adult relatives had an enthusiastic attitude towards the opportunity for the children to interact with exhibits in museums because they believe it is both motivating to the child with regard to learning and encourages children to visit museums more frequently (see Chapter 6, pages 250-53).

Parents and relatives perceived the child-orientated exhibitions as pleasant, relaxed, friendly, entertaining and educational environments. Children perceived the galleries as exciting places; they also perceived them as educational and as spaces where people can learn (pages 265-83). Children had positive feelings while in the galleries and reported enjoyable experiences (pages 254-57).

RESEARCH QUESTION 2: Do children and adults perceive themselves to be in a learning situation in a children's gallery or are their perceptions more oriented towards having a 'fun' experience?

Visitors' comments would suggest that the hands-on approach used in the galleries is perceived by parents and children alike to be educational and motivating to the child with regard to learning (see Chapter 6, pages 250-52 and 258-61).

The term 'fun' was not commonly used by parents and relatives. Children used the term 'fun' more often than adults, but this comment was not the most frequent in their descriptions of the exhibitions (comments related to *praise* and *positive feelings* were more frequent than *fun* in children's responses) (see page 278). When asked about their perception of learning in the galleries, around three quarters of the interviewed children mentioned learning outcomes and experiences (see page 261).

Children and their relatives did not perceive the galleries just as a fun experience but, rather, had rich and varied perceptions of the exhibitions and explicitly mentioned their learning potential.

RESEARCH QUESTION 3: How do children perceive their visit to a museum in a family situation in comparison to a school situation ? What do they value in the family context of the visit ?

Sixty-one per cent of the children interviewed said that they prefer to visit museums with their family rather than with school (see Chapter 6, pages 262-64). This is supported by Jensen's findings about children's perception of their museum experience, where she reported that most of the children interviewed preferred to visit museums with their family and friends and perceived the role of the teacher as interfering with their desire to look and act freely (Jensen, 1994:311). The present study shows that children valued in their family visit to museums the close and personal attention they get from their relatives, the fact that they can ask questions straightway if they don't understand something, that they have more independence to go where they want, and that they can spend more time in the gallery. They disapproved of the lack of autonomy they have when visiting with a school group, the classwork obligations (such as worksheets), and lack of close attention received from the teacher.

The implication of this finding for informal education is that museums should provide an appropriate environment, such as a relaxing and friendly atmosphere, for family interaction. Regarding school trips, it would seem that they should be organised in a more flexible way and take into account the characteristics of the informal educational environment of museums. As stressed by Salmi in his study of children's motivation and learning in school groups to a science centre exhibition: 'Schooling methods are too easily transferred to informal education settings [...] but the characteristic features of the informal setting must be preserved in order to maintain and develop its value as an alternative learning medium' (Salmi, 1993: 183). It would seem that schools should not try to 'transfer' their schooling methods to the informal educational environment but should acknowledge the complementary nature of informal learning experiences with regard to formal education.

RESEARCH QUESTION 4: How do adults and children behave at child-orientated exhibits and what are the family dynamics?

The findings from the observations indicate that the *type* of children's gallery affected the 'manipulation of exhibits' by adults. Overall, adults were most active at the *All Hands Gallery*, less active at *Launch Pad* and even less active at the *Me & My Body* exhibition (see Chapter 4, page 165, Figure 4.3.1). *All Hands* combines hands-on exhibits with objects in showcases, so aiming at a broad child and adult audience. It also contains a large number of exhibits requiring group interaction so adults tend to help the children in their care. At the exhibits observed in *Launch Pad*, which is said to be a gallery for 'all ages', it was found that the gallery is used *actively* more often by children than by adults. At the exhibits observed, adults were probably letting the child take the lead and assuming, overall, a more *caretaker* or *observer* role. The *Me & My Body* exhibition is a gallery inside a children's museum, targeted specifically at children. Perhaps adults are inhibited from using exhibits which overtly signal that they were designed for children and this may push them into an observer role. Also, because many of the exhibits are child-sized, it prevents adults from using them. These findings suggest that *adult manipulation* of hands-on exhibits is likely to vary according to design decisions and the nature of the task.

The observation findings presented in Chapter 4 (pages 163-70) also indicate: gender effects in adult activity according to the exhibit nature/subject and in splitting behaviour according to the most frequent joint-activity compositions in each gallery (page 164); adult splitting behaviour according to the average time spent at exhibits (page 167); and the most frequent type of conversation at exhibits within the family group (page 170). The findings all point out that the interpretation approaches and design decisions taken (exhibit subject, nature of the exhibit task and outcome, allocation of time, interpretation, design, whether or not the exhibit can be used in collaboration) will substantially affect the family dynamics. Therefore, these aspects should receive careful thought during exhibit development and be evaluated before production of the final exhibit.

RESEARCH QUESTION 5: In which ways are the child-orientated galleries investigated similar or different from each other and how do any differences affect the child and adult experience ?

The study has shown that child-orientated galleries, although sharing an experiential learning philosophy and a hands-on approach, are likely to differ from each other with regard to their specific educational goals, subject, interpretative style, design approaches and environmental characteristics and that these factors affect the children's and their adult relatives' perceptions of the gallery, their interactions with exhibits and with others.

The statistical findings indicate that the child-orientated gallery at Eureka! The Museum for Children (*Me & My Body*) had a more positive impact on the children's affective and cognitive dimensions of experience than the *All Hands* and *Launch Pad* galleries. Children were more likely to say that they *learned something* (p=.02) and that they had *positive feelings* (p=.04) in this gallery than in the other two. Also, there was a tendency showing that they preferred to use exhibits '*on their own*' (more autonomously) at Eureka! The Children's Museum (p=.07) (see Chapter 7, pages 323-27; 330-31).

It would seem that the design and content of the *Me & My Body* exhibits (exclusively designed for children and exploring one main theme: 'how your body works') had a powerful impact on the affective side of the child's experience, making children more confident in using the exhibits 'on their own', and supporting their perception of their own learning more than the exhibits at the science and maritime museums, where exhibits were designed for children but, also, for 'all' ages and were not focused on developing a single subject. It might also be the case that the *Me & My Body* exhibition, at Eureka!, offers more factual information of direct interest to children, while the interpretation strategy in *Launch Pad*, Science Museum, leaves a lot of space for visitors' own interpretation of the phenomena experienced. Furthermore, the subject of the *Me & My Body* exhibition is familiar to children while at *Launch Pad* and *All Hands* the physical sciences and maritime technology subjects are more abstract. That is, children can relate easier to information about their body than to abstract topics such as maritime technology or scientific principles.

The findings from the analysis of children's drawings indicate that *Launch Pad* exhibits were more effective than those at the other two galleries in making an impact on the child's memory of the exhibit and the subsequent representation of its characteristics, colours, outcomes, and the social interactions experienced there (see Chapter 5, pages 212 and 215). Although these findings may seem to contradict the interview findings (which show that children's perceptions of learning was weaker in *Launch Pad* than in the other two galleries), actually it seems to indicate that the representation of a remembered exhibit phenomenon represented in the children's drawings from *Launch Pad* was not always perceived as 'learning' by children. This might be due, as said earlier, to the *Launch Pad* interpretation strategy which leaves a lot of space for visitors' own interpretation of the phenomena experienced. Another explanation might be found in Piaget's assimilation-accommodation model (see page 61). It might be the case that when children made their drawings related to the exhibit experience, they may not have integrated the new stimuli experienced in Launch Pad into their existing schemata, so they might not have perceived the new stimuli experienced while interacting with the exhibit as 'learning'.

The *Me & My Body* exhibition, at Eureka!, seems to have been more successful in arousing the children's positive feelings, probably due to its distinct child-orientated design (see Chapter 5, page 216). The *All Hands Gallery* seems to have been less successful in impacting on memory and feelings when compared to the other two galleries as there were more depictions of a generalised view of the museum visit in the drawings there than at the other two sites (see pages 216-17). It could be the case that, due to the fact that the *All Hands Gallery* has objects in showcases, the children's perceptions of the gallery as a distinct space in relation to the rest of the museum (that is, a space dedicated to children) was affected.

The observation findings suggest that the subject-matter of *All Hands* was more likely to attract adult males with boys, indicating a possible gender effect at this gallery (see Chapter 4, page 155, Table 4.2.4). At *Launch Pad*, the simple science experiments particularly attracted children. The lowering of adult engagement here (see page 155; 165) might be because this gallery lacks background information about the exhibits which parents can use in

'teaching' their children, in comparison to the other two galleries investigated and, also, the small font size and 'black and white' print are not particularly attractive. At *Me & My Body*, the colourful environment, including architecture, exhibits, and labels, seems to have attracted more children than adults, since the findings suggest that children felt confident and autonomous about interacting with the exhibits at this gallery (pages 155; 327).

The findings above suggest that a space exclusively designed for children and developing a single, conceptually connected 'theme' of interest to children has a more positive impact on children's learning, feelings, and experience, but may assign a more passive role to the adult. These findings are worthy of future investigations.

RESEARCH QUESTION 6: Which variables (personal, social, and museum aspects) may affect children's and adults' perceptions of learning in a children's gallery ?

The statistical findings indicate that four aspects are likely to encourage children's perceptions of their learning in a child-orientated gallery: the *time spent in the gallery* (p=.006), the *type of museum* (p=.02), *children's preference for the social context of the visit* (p=.04), and the *adult's relationship to the child* (p=.05) (see Chapter 7, page 307). Children were more likely to report that they *learned something in a gallery* when they spent *around one hour or more* in the gallery, when they were at *Eureka! The Museum for Children* (in an environment exclusively designed for children), and when they were with their *mothers* and *distant relatives* rather than with fathers (mothers in the sample were found to be more educated). Children who had '*no preference*' for the social context of the visit were less likely to say that they learned something, which might indicate that children who have a strong preference ('family' or 'school') might engage in social learning more than the ones who have 'no preference' (see pages 308-11). These findings strongly indicate that personal, social, and contextual aspects affect children's perception of learning and that, in order to enhance their perception of learning, children need to spend *time* in the galleries.

With regard to adults, their perception of their own learning is not, unlike that of children, affected by the *time spent* in the gallery (p=.28). The gender of

adults was found to be very likely to affect the perception of their learning (p=.006) (see pages 300-301). Female adults were much more likely to report that they learned something in the gallery than male adults, suggesting a differing attitude between male and female adults regarding their learning experiences in child-orientated galleries. This outcome could be linked to that which indicated that children were more likely to report that they learned something when they visited with their *mothers* and *distant relatives* (who were mainly females) rather than with fathers (see page 309). If *mothers* perceive an environment as a 'learning environment' they may communicate this perception and its implications to their children and so provide a 'learning framework' for the visit. Also, *mothers* in the sample were likely to be more educated than *fathers* (see page 297), so adult education might affect adults' attitude towards learning opportunities in children's galleries. The above findings can also be related to the study on family learning developed by Borun and others (PISEC, 1998). Their research indicated that adult females showed significantly higher performance indicators than adult males, suggesting that 'adult females are learning leaders', who facilitate the family's learning experience (PISEC, 1998:49).

RESEARCH QUESTION 7: Can age and gender affect the child and/or adult experience in a child-orientated gallery ?

Children's personal attributes, such as age and gender, were likely to affect the child and adult experience in a child-orientated gallery. The time spent in the gallery (p=.04), the way the child prefers to use hands-on exhibits (p=.02), and whether the adults used the hands-on exhibits with children (p=.04) are likely to be affected by the *age of the child* (see Chapter 7, page 312).

The statistical findings indicate that the younger children in the sample (age group 7-9) were likely to prefer to use exhibits with '*someone else*'. Accordingly, adults were *less likely* to use exhibits with older children (age group 10-11) than with the younger ones (age group 7-9) (pages 313-14). It is likely that younger children require more attention than older children when using hands-on exhibits. Dierking also found that families with young children engage in more attentional behaviours that those families with older children

(Dierking, 1987: 67). Furthermore, the present study indicates that families with children aged between 7 to 9 years old were more likely to *stay longer* in the galleries than children aged 10 to 11 years (see page 316). This might be related to the fact that younger children may need more time to master exhibits.

Regarding gender aspects affecting the child experience, *girls* preferred to use exhibits with 'someone else', while *boys* had 'no preference' (p=.04), suggesting that *boys* are likely to be more independent than *girls* in interactive galleries and that *girls* prefer to use hands-on exhibits in cooperation with someone else (see page 315). Similarly, Baker found that girls perform better in a non-competitive environment (Baker, 1994). There was also a *tendency* for *girls* to be likely to have more *negative or neutral feelings* at the exhibitions investigated than *boys* (p=.06) (see pages 318-19). Moreover, the statistical analysis indicated that *boys* were more likely to be taken to other children's galleries by their families than *girls* (p=.002) (see pages 333; 336-7).

These findings may be indirectly related. It might be that children's exhibitions might be believed to be more attractive to *boys* than *girls*, because *girls* might show less enthusiasm for hands-on exhibits than *boys*, but this hypotheses should be further explored. It might also be that some hands-on exhibits, due to their subject matter or physical nature of the activity, might be more attractive to *boys* than *girls* (for example, *boys* and *male adults* were more interested in firing a cannon at *All Hands* than were *girls* and *female adults* - see Appendix C, Table C2: Profiles of Family Behaviour at the All Hands Gallery).

RESEARCH QUESTION 8: Are the educational goals of the child-orientated exhibitions investigated being met ?

The findings indicate that the *Me & My Body* exhibition, at Eureka! The Museum for Children, has achieved its educational objectives, which include increase of children's understanding of how the body works and awareness of their own bodies (see Chapter 3, page 107), since the majority of the interviewed children thought they learned something in the gallery and could give examples of information they learned and/or aspects of the exhibition they could relate to themselves (see Chapter 6, pages 258-61).

The *All Hands Gallery*, National Maritime Museum, has also achieved most of its educational goals, which include not only learning but also provision of enjoyment, encouragement of social interactions and support for investigation skills (see page 105). The findings from the observation of family groups show that the *All Hands Gallery* elicited more joint-activities between family members than the other two galleries (see Chapter 4, page 157, Table 4.2.6) and the findings from the interviews indicate that children and adults had an enjoyable experience there (see Chapter 6, page 278). The findings from the children's drawings suggest, however, that children had greater difficulty in representing the outcome of exhibit interactions at the *All Hands Gallery* than at the other two galleries (see Chapter 5, page 212). This might suggest that the design elements and the outcomes of the *All Hands* exhibits were perhaps too complex for the children to represent in their entirety.

At *Launch Pad*, Science Museum, the educational goals are very 'general' (eg. to demonstrate aspects of science and technology which people may use in their everyday lives) and this was reflected in the children's perceptions of their learning, since a quarter of the children, when interviewed, had difficulty in specifying what they had learned (see Chapter 6, page 261). *Launch Pad* aims include that visitors should make connections between aspects of science and technology demonstrated at the exhibition and their day-to-day lives (see page 106), but few clear connections, with examples, are provided in the gallery interpretation in order to help visitors to make these connections with their lives. On the other hand, the findings from the children's drawings suggest that the science experiment type of exhibit, with its immediate and visible outcomes, strongly influenced the children's ability to recollect the exhibit characteristics and outcomes (see Chapter 5, page 215). It might be that these recollections could help in the making of connections later.

RESEARCH QUESTION 9: What exhibit elements can be considered successful in child-orientated exhibits ?

Nine attributes of attractive child-orientated exhibits were drawn from the observed exhibits (see Chapter 4, pages 128-31). They are:

- . element of fun
- . challenging situation
- . element of surprise (see a result)
- . child-sized exhibit design
- . imaginative design
- . opportunity for experiencing things
- . opportunity for role play
- . interactive game/machine
- . opportunity for teamwork

These elements were present in the observed exhibits chosen by children as their favourite, therefore these attributes are worthy of being taken into consideration by exhibition planners when designing exhibits for children.

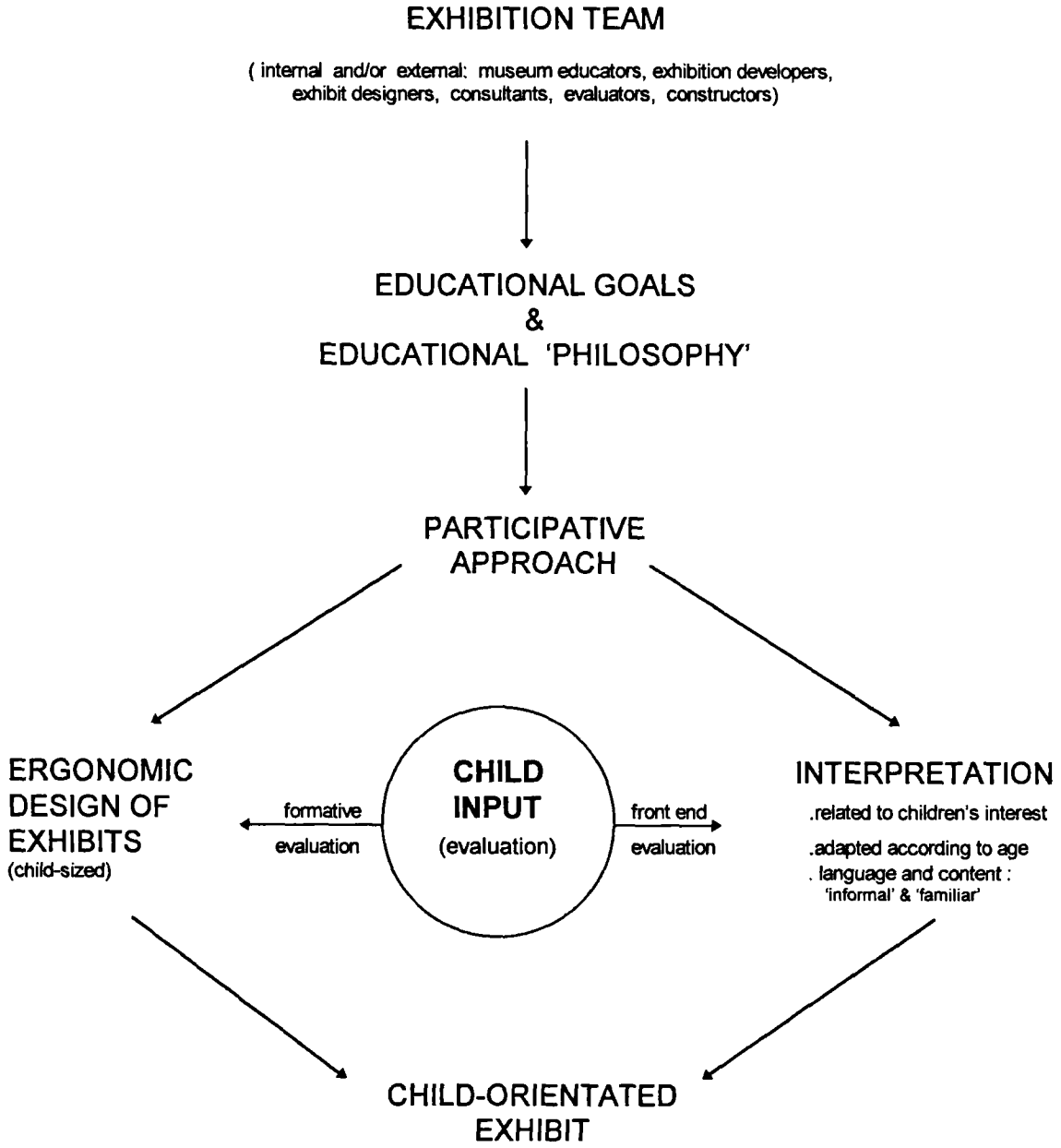
It might be a challenge for designers to incorporate all attributes. The present study indicates that attributes such as 'opportunities for teamwork' were found to be less frequently displayed in the design of the observed child-orientated exhibits at the sites investigated and could be incorporated more often, especially if it is desired to encourage females (see page 352).

8.3. IMPLICATIONS AND INSIGHTS FOR THE PLANNING OF CHILD-ORIENTATED MUSEUM EXHIBITIONS

a) A suggested framework for the development of a child-orientated exhibition

Based on the literature review (Miles, Alt & al.,1988; Bagchi & Cole, 1992; Sykes, 1994; Thomas G., 1994; Borun & Dritsas, 1997; Guichard, 1998; Hein G.,1998; Caulton, 1998) and on the present findings (Chapter 4, pages 132-150 and Chapter 6, pages 244-286), Figure 8.1 suggests a framework for the development of a child-orientated exhibition from an educational perspective (see next page). This framework offers a set of basic ideas and could be adapted to different museum situations, such as in-house projects or any external design companies which may be responsible for the development of the exhibits.

Figure 8.1:
A FRAMEWORK FOR THE DEVELOPMENT OF A CHILD-ORIENTATED EXHIBITION FROM AN EDUCATIONAL PERSPECTIVE



The model indicates the importance of a multidisciplinary exhibition team which will devise the exhibition learning goals, informed by learning theories and based on a participative approach, and the use of evaluation to ensure an appropriate interpretation and the satisfactory ergonomic design of exhibits. An exhibition team may be composed of internal and external professionals, such as museum educators, exhibition developers, exhibit designers, cognitive psychologists, consultants, evaluators and constructors. In the earlier stages of the process, the education goals have to be clearly defined in order to guide the exhibition project.

As stated in Chapter 2 (see pages 53-81), cognitive and learning theories developed by Piaget, Vygotsky, and Gardner, among others, may offer insights to the educational approaches taken in the design of the exhibits, such as encouraging problem solving by posing a challenge that is solved by making something happen (Piaget) (see Bagchi & Cole, 1992:99), by giving opportunities for the social use of exhibits (Vygotsky) (see page 98), and/or by providing different *learning entries* or *modalities* to approach the exhibit subject (Gardner) (see page 99). The participative approach is a key requirement of child-orientated exhibitions, in both design and interpretation (see Chapter 1). Here child input is essential, through front-end and formative evaluation. Front-end evaluation will ensure that the content of interpretation is related to the children's interest and adapted according to age (Thomas G., 1994). Formative evaluation will test, through prototypes, the use of exhibits by children and solve ergonomic problems which might arise. The consideration of these issues by the exhibition team is important in the development of successful child-orientated exhibits.

b) Implications for the design of child-orientated exhibits

The present findings indicate that a space exclusively designed for children, although other people may have access to it, containing conceptually connected exhibits, is likely to enhance the perception of learning of children aged 7 to 11 (see Chapter 7, pages 338-39).

The interview findings indicate that the design of some exhibits evoked *negative feelings* in 17% of children (n=25 out of 150) while they were interacting with exhibits, feelings associated with *self-image* (such as feeling 'nervous', 'embarrassed', 'stupid') and *problematic exhibit design* (such as exhibit is 'hard' or 'hurts' the child) (see Chapter 6, pages 255-57). It is important that this information is taken into account by exhibition planners and designers who should plan exhibits which avoid feelings of failure or embarrassment and pay particular attention to the ergonomics of exhibits which are to be used by children.

The analysis of the children's drawings indicates an acknowledgment by one-quarter of the drawings sample of the *relevance of language and text* in a child-orientated exhibition (see Chapter 5, pages 212; 225), so suggesting that words should be carefully considered by exhibition planners when designing exhibits for children aged 7 to 11. The findings from the observations suggest that the use of labels which talk about the purpose of the manipulation (rather than labels which give instructions), and give examples which may aid visitors to connect with their own experiences are strongly indicated for use at child-orientated exhibits, since they help the visitor to relate to the exhibit and may encourage further discussion with other members of the group as well as 'chatting' and 'explaining' types of conversation (see Chapter 4, pages 160-62; 170).

c) How can child-orientated exhibitions support family learning and foster the family social experience in museums ?

Child-orientated exhibitions can play an important role in the socialising experience of families. This is so important in the contemporary familial context, offering families the opportunity of spending some prime time together. Such places offer parents the opportunity to observe and follow their child's development and to share their experiences with them while offering children the opportunity to enjoy themselves with their relatives and to learn from them.

Within the three types of conversation recorded at the observed exhibits, there was a higher proportion of adult '*telling what to do*' and '*chatting*' types of conversation with the child rather than the '*explaining*' type (see Chapter 4, page 162). The '*tell what to do*' type of conversation gives the child less independence for exploring the exhibit on his/her own which may inhibit the child's learning and ability to solve problems on his/her own. For this reason, it would seem that child-orientated exhibits should aim to encourage the '*chatting*' and '*explaining*' types of conversation. These types of conversation can be encouraged through the content and language used in the labels, which should be informal, familiar, simple and clear, and can also incorporate 'questioning' and 'suggestions'.

Research with family groups carried out elsewhere (Please Touch Museum, 1998:54) has also shown that adult *indirect instruction* to the child (such as adult hints, reflexive questions) may create more opportunities for learning than *direct instructions* (such as adult directives to inform and/or physically show children how to solve problems). Therefore, child-orientated galleries are encouraged to inform adult relatives and carers about how different types of adult *scaffolding* may influence the amount of children's learning and engagement (Please Touch Museum, 1998:55). Previous studies have also stressed the importance of museums in 'educating' parents to maximise their children's informal learning experiences (Dierking, 1987:78).

d) Implications for family audience development strategy in museums

The present findings indicate that the families visiting the child-orientated exhibitions in the sample were likely to be frequent visitors to museums and to this type of exhibition (see Appendix F, Table F2).

The demographics indicate that, contrary to the 'general museum audience' which is said to be 'highly educated', child-orientated galleries have the potential to attract visitors from *all* levels of education since half of all the accompanying adults interviewed at the three child-orientated galleries left full-time education at 18 years of age or under. This finding suggests

that, in Britain, adults from differing levels of education are interested in providing learning opportunities for their children and that museums can play an important role through the provision of exhibitions geared to the child and family audience.

8.4. SUGGESTIONS FOR FURTHER RESEARCH

The present findings explore questions which could be further investigated: should child-orientated galleries be designed *exclusively* for children or should they aim to interest their adult relatives and carers as well ? Should exhibits be conceptually connected with each other, developing one single subject/idea, in order to enhance learning, or be conceptually independent ? How can unfamiliar subjects be introduced in child-orientated exhibitions in a way that may enhance the children's perceptions of learning ?

Research about how gender aspects may affect the child and adult experience in a child-orientated gallery is also worthy of investigation, since the present findings suggest that children's exhibitions might be more attractive to *boys* than *girls*. Are *girls* as enthusiastic as *boys* about hands-on exhibits ? Which exhibit attributes and/or subjects in a children's gallery do *girls* and *boys* prefer and why ?

Research on the application of learning theories to the design of child-orientated exhibits is also an exciting subject for further investigation.

Finally, since this study was one of the first to use drawings to explore *children's interactions with exhibits* in a child-orientated gallery, future research using the methodology applied in this study is welcome.

8.5. FINAL THOUGHT

A major motivation for this investigation was the assessment of the value and potential of child-orientated galleries as a specific resource for children and families in museums. The study offered several contributions to the fields of visitor studies and informal education in museums related to child and family audiences (see page 343) and provided original methodological approaches to analysis such as the analysis of children's drawings (see pages 180-227). It had a very open approach to examining child-orientated exhibitions exclusively from the point of view of their target audience (children and families).

The use of different methods of investigation and research instruments in the study of children's and their relatives' perceptions and behaviour in child-orientated galleries (interviews, observations, and drawings) allowed for the triangulation of the findings from the different approaches adopted, so giving to the present findings consistency.

As the study explored three distinct child-orientated museum exhibitions, its findings provide a broad view of both children's and their adult relatives' experiences in such exhibitions, the aspects which may affect their perceptions and behaviour in these environments, and how differences in child-orientated galleries affect the child and family museum experience.

This investigation has demonstrated that child-orientated exhibitions have features which positively affect the family experience, that children do perceive that they are learning in this environment, and that it can be a catalyst for family social activity. If designed with creativity; using a child-orientated framework; taking into account design aspects which are likely to affect family behaviour and learning; and integrated in the museum communication policy, such galleries can offer a singular space for family interaction and be an important museum provision for child and family audiences.

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APPENDIX A:

QUESTIONNAIRES USED IN THE INTERVIEWS WITH ADULTS AND CHILDREN

QUESTIONNAIRE FOR INTERVIEW WITH 'PARENTS / RELATIVES'

Museum: ..... **Exhibition:** .....
Weekday & Date: **time:**..... **am / pm** Family #.....
Visiting with:

Hello, my name is _____. I am doing a research at University College London about families' perceptions of children's galleries. It would help us a great deal if I could ask a few questions to you and then to your child(ren). 'We are making a collection of children's drawings about this gallery. Perhaps your child(ren) might like to do a drawing of his/her favourite exhibit here in the gallery while we are talking'.
To the child: *'Hello. Would you like to make a drawing about your favourite exhibit at the ...(name of gallery) ?'.*

Are you the child's: (relationship)
mother father grandmother grandfather other.....

SECTION A

1. How often do you visit museums with your child(ren) in a year ?

2. Why do you take your child(ren) to visit a museum ?

3. What made you decide to visit the .... [gallery] today ?

4. Have you been to this gallery before ? Y N

5. How long would you say you spent at the .....[gallery] today ? (read aloud options)
☐ less than 30 min. ☐ about 30 min. to 1 hour ☐ more than 1 hour

(continues...)

(...) INTERVIEW WITH 'PARENTS / RELATIVES'

SECTION B

6. How would you *describe* the .... [gallery] to another parent or person who might bring a child
here ?

7. How did you find the *atmosphere* of the .... [exhibition] ?

8. Could you tell me what aspects of the ... [exhibition] did **you yourself** like and dislike ?

Anything you disliked ? Y N

LIKED **(Why did you like it?)** DISLIKED **(Why did you dislike?)**

SECTION C

9. How would you describe the *involvement* of your child(ren) with the exhibits at the ...exhibition ?
Comment:

10. Was there anything you particularly enjoyed **seeing your child(ren) doing** at the [exhibition]
today?

11. Why was that?

(continues...)

(...) INTERVIEW WITH 'PARENTS / RELATIVES'

SECTION D

12. Did you and your child(ren) **use** some of the exhibits **together** ?
Y (continue) N (If No, go to 16)

SECTION E

13. What do you think your child(ren) gained with the visit to the ...[gallery] ?

14. Was there anything *in particular* that **you yourself** think you learned here in the [gallery] today? Y N ☐ not sure
Comment:

SECTION F

15. Have you visited other exhibitions especially designed for children in other museums ?
Y (continue) N (If No, go to 19)

16. [If Yes] Where ?

17. What do you think about the opportunity for your child(ren) to **interact with exhibits** in museums ?

That's all. Thank you for your help. Enjoy your visit to the museum.

(continues with 'self-completed' questionnaire)

INTERVIEW WITH 'PARENTS / RELATIVES'

Dear Visitor,
Please, answer the following questions in order to complement the interview that you have just done.
The information will be treated in a confidential way and only for academic and research purposes.

Thank you for your collaboration.

SECTION G: **Some questions about yourself...**

18. Are you the child's:
mother father grandmother grandfather other relative
(specify):.....

19. Who are you visiting the museum with today? (you may choose more than one option)
wife husband .....son(s) .....daughter(s) .....friend(s)
other.....

20. What is your age group ?
☐ 22-34 ☐ 35-44 ☐ 45-54 ☐ 55+

21. At what age did you leave full-time education ?
☐ under 16 ☐ 16 to 18 ☐ 19 to 22 ☐ 23 or older
☐ I am still in education (specify).....

22. Your occupation - are you:
☐ employed as.....
☐ self-employed as.....
☐ a student in full or part-time education
☐ concerned with home duties
(please state partner's occupation.....)
☐ unemployed
☐ retired, formerly occupied as.....

23. Town / county where you live: .....

QUESTIONNAIRE FOR INTERVIEW WITH 'CHILDREN'

Museum: ..... **Exhibition:** .....
Weekday & Date: **time:**..... **am / pm** Family #.....
Visiting with:

Hello, my name is _____. I would like to talk to you about your visit to the .... [gallery].

SECTION A

1. What is your name ? (gender)..... ☐ boy ☐ girl

2. How old are you ? (age) .....

SECTION B

[ ] Made the drawing: (a) About the gallery (b) About other part of the museum

[ ] Did not make the drawing - Reason:

3. (If Yes) **Tell me all about your drawing.** (pointing to the drawing the child did previously.)
(Prompt: What is this ? Who is this person?)

SECTION C

4. You visited the ...[gallery] for quite a while...
How would you **describe** the ...[gallery] to a friend? (P: What would say about the gallery to a friend?)

5. How did you find the **atmosphere** of this place? (P: How did you feel inside the gallery ?)

6. Think about the [gallery] ...
6.1. **What did you *like* about it ?** **6.2. Anything you disliked ?** Y N
LIKED **(Why did you like it?)** DISLIKED **(Why did you dislike it?)**

(continues...)

(...) INTERVIEW WITH 'CHILDREN'

SECTION D

7. Which was your **favourite exhibit** at the ...[gallery] ?

8. Why did you like it?

9. How did you ***feel*** while you were using your favourite exhibit ? [let the child answer]
(more than one answer is possible)

10. Do you like using an exhibit ***on your own*** or ***with someone*** who has come to the museum with you ?

☐ 1. on my own ☐ 2. with someone else.....
☐ 3. either way

11. **Why** do you like to use it .....(on my own) [or] (with someone) ?

SECTION E

12. Tell me about your favourite exhibit.
What did you **find out** when you used the ...[name of favourite exhibit] ?

13. What (*else*) did you learn while you were in this gallery today ?

☐ *learned something* ☐ *did not learn anything* ☐ *don't know /couldn't say*

(continues...)

(...) INTERVIEW WITH 'CHILDREN'

SECTION F

14. Do you like to touch and do things in museums? Y N don't know

15. Why do you like it? (or Why not?)

15. Have you visited other exhibitions for children in other museums ?

☐ yes .....

☐ never visited (Go to 17)

16. Is there anything you ***remember*** that you *particularly liked* during those visits to other children's exhibitions / museums ? (memories)

☐ yes ☐ don't remember

SECTION G

17. How many times have you been in a museum before this visit ?

☐ first time *(go to 24.1)* ☐ .....times

18. Have you already visited museums with your school ? **Y** **N** *(if no, exclude 20 and 21)*

☐ never visited with school

19. **Who** do you usually visit museums **with?** [let the child answer] *(more than one answer is possible)*

☐ school ☐ family ☐ other.....

20.Do you **prefer** to visit museums with ***school*** or with your ***family*** ? [let the child answer]:

☐ with school ☐ with my family ☐ with both of them ☐ never visited with school

21. **Why do you prefer** (or like) **to visit museums with** .....?

That's all. Thank you very much.

APPENDIX B: OBSERVATION SCHEDULE

OBSERVATION SCHEDULE FOR FAMILY GROUPS

Family #.....

Total time spent by family ..... : .....
(min. : sec.)

Family had to wait to use exhibit: yes no

Codes for group composition.
M male SM senior male
F female SF senior female
b boy
g girl
GS gallery staff

Type of conversation:
(E) explaining exhibit
(T) telling what to do
(C) chatting about exhibit

Proximity:
(1) touching each other
(2) close
(3) more than 1 meter apart

Signs
→ direction of the action
←→ interaction
Arrive late ( )
Come back ¬
1 first
2 second , .
yes
X no

group						
split						
manipulate						
use as intended						
read aloud						
joint activity						
type of conversation						

proximity: .....

OBSERVER'S COMMENTS:

VERBAL EXPRESSIONS:

Museum:_____

Exhibition:_____

Date:_____

APPENDIX C:
DESCRIPTION OF SAMPLE & BEHAVIOURAL FINDINGS FROM THE PROFILES OF FAMILY BEHAVIOUR AT THE NINE OBSERVED EXHIBITS

The description of the sample and the behavioural findings from the profiles of family behaviour at each observed exhibit are described below (see Tables C1, C2 and C3 for exhibits observed at the *All Hands Gallery*; Tables C4, C5 and C6 for exhibits observed at *Launch Pad*; and Tables C7, C8 and C9 for exhibits observed at the *Me & My Body* exhibition).

LOCATION 1:
ALL HANDS GALLERY, NATIONAL MARITIME MUSEUM

CARGO HANDLING EXHIBIT

Sample and group composition

One hundred and sixty-six individuals (totaling fifty family groups) were observed at the *Cargo Handling* exhibit. The percentage of adults (male and female) attending the exhibit was about the same (22%, n=36, and 24%, n=40, respectively), but the percentage of boys was greater than the percentage of girls (34%, n=57, and 20%, n=33, respectively). Sixty per cent of the family groups observed at this exhibit had more than one child in the group, suggesting that family interactions were likely to be between adult and children or between children only. The most frequent family group composition at this exhibit was likely to be '*couples with children*', particularly '*male-female-boy*' (see Tables C1 and C2 at the end of the All Hands Gallery section).

GUNNERY EXHIBIT

Sample and group composition

One hundred sixty-nine individuals were observed at the *Gunnery* exhibit out of 50 family groups. The percentage of male and female adults attending the exhibit was the same (24%, n=41, and 24%, n=40, respectively). The percentage of boys was greater than that of girls (32%, n=55, compared to 20%, n=33). More than half of family groups were attending the exhibit with more

than one child in the group (62%). The most frequent group composition was 'couples with children': *male-female-boy* and *male-female-boy-girl* (see Tables C1 and C2).

DIVING EXHIBIT

Sample and group composition

One-hundred and forty-eight individuals in 50 family groups were observed at the *Diving* exhibit. The percentage of male and female adults attending the exhibit was about the same (25%, n=36, and 21%, n=31, respectively) as was the percentage of boys and girls (28%, 42, and 26%, n=39, respectively). Forty-two per cent of the family groups observed at this exhibit had only one child in the group, suggesting that a number of family interactions were likely to be between an adult and a child. The most common group composition at the *Diving* exhibit was 'male adults and child(ren)', particularly *male-boy* (see Tables C1 and C2).

Table C1: Group composition at the three exhibits in the All Hands Gallery

Sample: 150 family groups (50 families observed at each exhibit)

'All Hands Gallery'

Exhibits	CARGO		GUNNERY		DIVING	
	%	n	%	n	%	n
Children in the group:						
Groups with *more* than one child	60%	30	62%	31	58%	29
Groups with one child	40%	20	38%	19	42%	21
Total of family groups	100%	50	100%	50	100%	50
Group composition:						
Couples with children:						
Couples w/ children total:	*50%*	*25*	*48%*	*24*	*30%*	*15*
M-F-b-g		7		11		3
M-F-g		4		2		3
M-F-b		14		11		9
Female adults with children:						
Females w/ children total:	*26%*	*13*	*24%*	*12*	*26%*	*13*
F-g		6		4		6
F-b		4		8		5
F-b-g		3		0		2
Male adults with children:						
Males w/ children total:	*24%*	*12*	*28%*	*14*	*44%*	*22*
M-b		6		6		10
M-g		4		5		8
M-b-g		2		3		4
Total of family groups	100%	50	100%	50	100%	50

Code: M= male adult; F= female adult; b= boy(s); g= girl(s) All Hands Gallery, National Maritime Museum

TABLE C2 : PROFILES OF FAMILY BEHAVIOUR AT THE ALL HANDS GALLERY

Total families observed: 150 (50 at each exhibit)

ALL HANDS GALLERY, NMM:	CARGO		GUNNERY		DIVING	
Total sample of individuals observed at each exhibit (attendance):						
Male adults	22%	36	24%	41	25%	36
Female adults	24%	40	24%	40	21%	31
Boys	34%	57	32%	55	28%	42
Girls	20%	33	20%	33	26%	39
Total sample at each exhibit:	*100%*	*166*	*100%*	*169*	*100%*	*148*
Time spent at exhibits:						
Average time	8min.24sec.		4min.07sec.		2min.28sec.	
Mode time	5min.27sec.		3min.35sec.		1min.52sec.	
Maximum	24min.56sec.		14min.48sec.		8min.01sec.	
Minimum	1min.07sec.		- 51sec.		- 30sec.	
Manipulation of exhibits by family members:						
Male adults	53%	19	58%	24	69%	25
Female adults	57%	23	17%	7	42%	13
Boys	88%	50	96%	53	88%	37
Girls	97%	32	64%	21	85%	33
Total individuals who manipulated:	*75%*	*124*	*62%*	*105*	*73%*	*108*
Families using exhibit appropriately:	88%	44 (out of 50)	92%	46 (out of 50)	86%	43 (out of 50)
Splitting behaviour:						
Male adults	44%	16	17%	7	19%	7
Female adults	37%	15	23%	9	39%	12
Boys	17%	10	5%	3	19%	8
Girls	24%	8	18%	6	33%	13
Total individuals who split:	*30%*	*49*	*15%*	*25*	*27%*	*40*
Families in which 'splitting' occurred:	56%	28 (out of 50)	36%	18 (out of 50)	50%	25 (out of 50)
Joint-activity compositions:						
Female-boy	12%	10	5%	2	17%	5
Female-girl	10%	8	12%	5	17%	5
Male-boy	15%	13	31%	13	41%	12
Male-girl	6%	5	17%	7	17%	5
Boy-boy	18%	15	24%	10	0%	0
Boy-girl	12%	10	9%	4	4%	1
Girl-girl	2%	2	0%	0	4%	1
Gall.staff-boy	13%	11	2%	1	0%	0
Gall.staff-girl	12%	10	0%	0	0%	0
Total of joint-activities:	*100%*	*84*	*100%*	*42*	*100%*	*29*
Proximity between family members:						
'Touching'	24%	12	40%	20	46%	23
'Close'	34%	17	46%	23	30%	15
'More than 1 metre apart'	42%	21	14%	7	24%	12
Total of families:	*100%*	*50*	*100%*	*50*	*100%*	*50*
Reading aloud behaviour:						
Male adults	22%	8	7%	3	8%	3
Female adults	15%	6	18%	7	32%	10
Boys	17%	10	0%	0	2%	1
Girls	3%	1	0%	0	0%	0
Total individuals who read aloud	*15%*	*25*	*6%*	*10*	*9%*	*14*
Talking *(see also 'type of conversation' table):*						
Families in which 'talking' occurred:	98%	49 (out of 50)	98%	49 (out of 50)	90%	45 (out of 50)

(Note: percentages of individuals' behaviour in each category was calculated in relation to the 'total sample'); percentages of families' behaviour refer to families observed at each exhibit (n=50); percentages of joint-activities refer to the total number of joint-activities.)

TABLE C3: Individuals who engaged in talking at the three exhibits at the All Hands Gallery according to the frequency of type of conversation

Sample: 150 family groups (50 at each exhibit)

Individuals at each exhibit:
Cargo Hand.: males adults, n=36; females adults, n=40; boys, n=57; girls, n=33; gallery staff, n=30
Gunnery: males adults, n= 41; females adults, n=40; boys, n=55; girls, n=33; gallery staff, n=9
Diving: males adults, n= 36; females adults, n=31; boys, n=42; girls, n=39; gallery staff, n=3

ALL HANDS GALLERY

Exhibits	CARGO							GUNNERY							DIVING						
Individuals who engaged in conversation:		Types of Conversation							Types of Conversation							Types of Conversation					
		Telling		***Explaining***		***Chatting***			***Telling***		***Explaining***		***Chatting***			***Telling***		***Explaining***		***Chatting***	
	Talked	n	%	n	%	n	%	Talked	n	%	n	%	n	%	Talked	n	%	n	%	n	%
male	(19)	11	58%	8	42%	9	47%	(33)	24	73%	16	48%	17	51%	(27)	9	33%	7	26%	16	59%
female	(21)	9	43%	12	57%	11	52%	(18)	16	89%	8	44%	8	44%	(21)	4	19%	13	62%	14	67%
boy	(22)	12	55%	1	4%	13	59%	(22)	3	14%	3	14%	17	77%	(14)	1	7%	0	–	14	100%
girl	(8)	1	12%	0	–	8	100%	(8)	2	25%	1	12%	6	75%	(14)	0	–	1	7%	13	93%
gallery staff	(26)	1	4%	24	92%	5	19%	(9)	1	11%	9	100%	1	11%	(3)	1	33%	2	67%	0	–

(Note: 'Talked' refers to the total of individuals who engaged in conversations; 'n' refers to individuals who engaged in each type of conversation; percentages refer to 'Talked'. More than one type of conversation was possible by same individual, so percentages add to more than 100.)

LOCATION 2:
LAUNCH PAD, SCIENCE MUSEUM

TURNTABLE EXHIBIT

Sample and group composition

One hundred sixty-one individuals (from fifty family groups) were observed at the *Turntable* exhibit. The percentages of adults (male and female) and children (boys and girls) were about the same (22% compared to 26%, and 23% compared to 29%, respectively). Slightly more than half of the families were attending the exhibit with more than one child in the group (58%). The most frequent group composition was 'couples with children', particularly *male-female-girl* (see Tables C5 and C6 at the end of Launch Pad section).

'SHADOW BOX' EXHIBIT

Sample and group composition

One hundred forty-five individuals in 50 family groups were observed at the Shadow Box exhibit. The percentage of female adults attending the exhibit was much higher than that of male adults (28%, n=40, compared to 13%, n=19, respectively). The percentage of children (boys and girls) was about the same (28%, n=41, and 31%, n=45). Sixty per cent of the family groups observed were attending the exhibit with more than one child. The most frequent group composition was 'female adult and children' (62%): *female-boy-girl*, *female-girl*, and *female-boy* (see Tables C4 and C5).

'SLOW BUBBLES' EXHIBIT

Sample and group composition

One hundred thirty individuals in 50 family groups were observed at the *Slow Bubbles* exhibit. The percentages of male and female adults attending the exhibit were about the same (22%, n=29, and 27%, n=34, respectively). Regarding children, the percentage of boys were slightly greater than that of girls (29%, n=38, compared to 22%, n=29, respectively). The percentage of family groups attending the exhibit with one child only was very high (70%). It might be that the

nature of the exhibit (manipulation by one person at a time) influenced this situation. The most frequent group compositions were *female adult-girl*, *female adult-boy*, and *male adult-boy* (see Tables C4 and C5).

Table C4: Group composition at the three exhibits in Launch Pad
Sample: 150 family groups (50 families observed at each exhibit)

'Launch Pad'

Exhibits	TURNTABLE %	n	SHADOW BOX %	n	SLOW BUBBLES %	n
Children in the group:						
Groups with more than one child	58%	29	60%	30	30%	15
Groups with one child only	42%	21	40%	20	70%	35
Total of family groups	100%	50	100%	50	100%	50
Group composition:						
Couples with children:						
Couples w/ children total:	*42%*	*21*	*16%*	*8*	*22%*	*11*
M-F-b-g		5		2		2
M-F-g		10		4		4
M-F-b		6		2		5
Female adults with children:						
Females w/ children total:	*34%*	*17*	*62%*	*31*	*44%*	*22*
F-g		6		10		10
F-b		4		10		10
F-b-g		7		11		2
Male adults with children:						
Males w/ children total:	*24%*	*12*	*22%*	*11*	*34%*	*17*
M-b		4		3		11
M-g		5		7		2
M-b-g		3		1		4
Total of family groups	100%	50	100%	50	100%	50

Code: M= male adult; F= female adult; b= boy(s); g= girl(s) Launch Pad, Science Museum

TABLE C5 : PROFILES OF FAMILY BEHAVIOUR AT LAUNCH PAD

Total families observed: 150 (50 at each exhibit)

LAUNCH PAD, Science Museum:	TURNTABLE		SHADOW BOX		SLOW BUBBLES	
Total sample of individuals observed at each exhibit (attendance):						
Male adults	22%	35	13%	19	22%	29
Female adults	26%	42	28%	40	27%	34
Boys	23%	37	28%	41	29%	38
Girls	29%	47	31%	45	22%	29
Total sample at each exhibit:	*100%*	*161*	*100%*	*145*	*100%*	*130*
Time spent at exhibits:						
Average time	1min.48sec.		1min.03sec.		- 58sec.	
Mode time	1min.03sec.		- 31sec.		1min.22sec.	
Maximum	13min.15sec.		7min.44sec.		2min.35sec.	
Minimum	- 33sec.		- 17sec.		- 9sec.	
Manipulation of exhibits by family members:						
Male adults	17%	6	11%	2	38%	11
Female adults	7%	3	23%	9	26%	9
Boys	81%	30	93%	38	100%	38
Girls	89%	42	80%	36	83%	24
Total individuals who manipulated:	*50%*	*81*	*59%*	*85*	*63%*	*82*
Families using exhibit appropriately:	100%	50 (out of 50)	94%	47 (out of 50)	100%	50 (out of 50)
Splitting behaviour:						
Male adults	9%	3	0%	0	24%	7
Female adults	5%	2	8%	3	21%	7
Boys	8%	3	7%	3	11%	4
Girls	4%	2	2%	1	17%	5
Total individuals who split:	*6%*	*10*	*5%*	*7*	*18%*	*23*
Families in which 'splitting' occurred:	14%	7 (out of 50)	14%	7 (out of 50)	38%	19 (out of 50)
Joint-activity compositions:						
Female-boy	4%	1	21%	7	27%	4
Female-girl	7%	2	12%	4	13%	2
Male-boy	11%	3	3%	1	27%	4
Male-girl	19%	5	3%	1	27%	4
Boy-boy	0%	0	18%	6	0%	0
Boy-girl	7%	2	25%	8	0%	0
Girl-girl	0%	0	18%	6	6%	1
Gall.staff-boy	38%	10	0%	0	0%	0
Gall.staff-girl	14%	4	0%	0	0%	0
Total of joint-activities:	*100%*	*27*	*100%*	*33*	*100%*	*15*
Proximity between family members:						
'Touching'	30%	15	44%	22	40%	20
'Close'	32%	16	38%	19	32%	16
'More than 1 metre apart'	38%	19	18%	9	28%	14
Total of families:	*100%*	*50*	*100%*	*50*	*100%*	*50*
Reading aloud behaviour:						
Male adults	0%	0	0%	0	17%	5
Female adults	0%	0	10%	4	21%	7
Boys	0%	0	0%	0	0%	0
Girls	0%	0	0%	0	3%	1
Total individuals who read aloud:	*0%*	*0*	*3%*	*4*	*10%*	*13*
Talking *(see also 'type of conversation' table)*:						
Families in which 'talking' occurred:	68%	34 (out of 50)	90%	45 (out of 50)	74%	37 (out of 50)

(Note: percentages of individuals' behaviour in each category was calculated in relation to the 'total sample'); percentages of families' behaviour refer to families observed at each exhibit (n=50); percentages of joint-activities refer to the total number of joint-activities.)

TABLE C6: Individuals who engaged in talking at the three exhibits at Launch Pad according to the frequency of type of conversation

Sample: 150 family groups (50 at each exhibit)

Individuals at each exhibit:
Turntable: males adults, n=35; females adults, n=42; boys, n=37; girls, n=47; gallery staff, n=16
Shadow Box: males adults, n=19; females adults, n=40; boys, n=41; girls, n=45; gallery staff, n= 0
Slow Bubbles : males adults, n=29; females adults, n=34; boys, n=38; girls, n=29; gallery staff, n= 0

LAUNCH PAD

Exhibits	TURNTABLE							SHADOW BOX							SLOW BUBBLES						
Individuals who engaged in conversation:		Types of Conversation							Types of Conversation							Types of Conversation					
		Telling		***Explaining***		***Chatting***			***Telling***		***Explaining***		***Chatting***			***Telling***		***Explaining***		***Chatting***	
	Talked	n	%	n	%	n	%	Talked	n	%	n	%	n	%	Talked	n	%	n	%	n	%
male	(19)	15	79%	1	5%	3	16%	(11)	7	64%	1	9%	5	45%	(18)	5	28%	8	44%	10	56%
female	(17)	12	71%	-	-	5	29%	(35)	19	54%	1	3%	18	51%	(19)	4	21%	4	21%	16	84%
boy	(4)	3	75%	-	-	1	25%	(7)	-	-	-	-	7	100%	(11)	1	9%	-	-	10	90%
girl	(4)	1	25%	-	-	3	75%	(5)	-	-	-	-	5	100%	(7)	-	-	-	-	7	100%
gallery staff	(12)	-	-	7	58%	5	42%	(0)	-	-	-	-	-	-	(0)	-	-	-	-	-	-

(Note: 'Talked' refers to the total of individuals who engaged in conversations; 'n' refers to individuals who engaged in each type of conversation; percentages refer to 'Talked'. More than one type of conversation was possible by same individual, so percentages add to more than 100.)

LOCATION 3:
ME & MY BODY, EUREKA! THE MUSEUM FOR CHILDREN

'WHERE'S THE SKELETON?'

Sample and group composition

One hundred and fifty-two individuals (from 50 family groups) were observed at the *Skeleton* exhibit. The percentage of female adults attending the exhibit was greater than that of male adults (31%, n=47, compared to 16%, n=24, respectively). This general pattern was repeated for the other two exhibits, indicating that, in the sample observed at the Me & My Body exhibition, there were more female adults accompanying their children than male adults. The percentage of girls at the *Skeleton* exhibit was slightly greater than that of boys (29%, n=44, and 24%, n=37, respectively).

Half of the families attended the exhibit with more than one child in the group. The most frequent group compositions were female adult with children, particularly *female adult-girl*. Also frequent was *female adult-boy* and *male-female-boy-girl*. Group compositions of male adults and children were the least frequent ones. This pattern was repeated at the other two exhibits in Me & My Body (see Tables C7 and C8 at the end of Me & My Body section).

'WHAT IF YOU COULDN'T'

Sample and group composition

One hundred and sixty-nine individuals in 50 family groups were observed at the exhibit on *Disability*. There were more female adults attending this exhibit than male adults (26%, n=44, compared to 14%, n=24, respectively). The percentage of boys and girls was the same (30%, n=51, and 30%, n=50, respectively).

Three-quarter of the families observed had more than one child in the group, indicating that children were likely to attend this exhibit with other children and adults. In fact, this exhibit allows its use by many children at a time. About half of the family groups observed consisted of female adults with children. The commonest group compositions were *female-boy-girl*, *female-girl*, and *male-female-boy-girl*. No *male-girl* group composition was observed (see Tables C7 and C8).

'FEED ME!'

Sample and group composition

One hundred and thirty-seven individuals in 50 family groups were observed at the *Feed Me!* exhibit. The percentage of female adults attending this exhibit was much greater than the percentage of male adults (34%, n=47, compared to 13%, n=17, respectively). The number of boys and girls was about the same (n=37 an n=36, respectively).

More than half of the families observed were attending the exhibit with one child (58%, n=29 family groups), suggesting that a number of children attended the exhibit with adults only in the group. Almost seven in ten family groups consisted of 'female adults with children' (66%, n=33). The most frequent group compositions were *female-girl* and *female-boy*. 'Male adults with children' were the least frequent group compositions (n=5 out of 50) (see Table C7 and C8).

Table C7: Group composition at the three exhibits in the Me & My Body exhibition
Sample: 150 family groups (50 families observed at each exhibit)

'Me & My Body'

Exhibits	SKELETON %	SKELETON n	DISABILITY %	DISABILITY n	FEED ME! %	FEED ME! n
Children in the group:						
Groups with more than one child	52%	26	74%	37	42%	21
Groups with one child only	48%	24	26%	13	58%	29
Total of family groups	100%	50	100%	50	100%	50
Group composition:						
Females with children: *Females w/ children total:*	*54%*	*27*	*52%*	*26*	*66%*	*33*
F-g		13		9		14
F-b		9		8		12
F-b-g		5		9		7
Couples with children: *Couples w/ children total:*	*32%*	*16*	*34%*	*17*	*24%*	*12*
M-F-b-g		9		9		2
M-F-g		4		6		4
M-F-b		3		2		6
Males with children: *Males w/ children total:*	*14%*	*7*	*14%*	*7*	*10%*	*5*
M-b		2		5		2
M-g		4		0		3
M-b-g		1		2		0
Total of family groups	100%	50	100%	50	100%	50

Code: M= male adult; F= female adult; b= boy(s); g= girl(s) Me & My Body exhibition, Eureka! The Museum for Children

TABLE C8 : PROFILES OF FAMILY BEHAVIOUR AT THE ME & MY BODY EXHIBITION

Total families observed: 150 (50 at each exhibit)

ME & MY BODY, Eureka!:	**SKELETON**		**DISABILITY**		**FEED ME!**	
Total sample of individuals observed at each exhibit (attendance):						
Male adults	16%	24	14%	24	13%	17
Female adults	31%	47	26%	44	34%	47
Boys	24%	37	30%	51	27%	37
Girls	29%	44	30%	50	26%	36
Total sample at each exhibit:	*100%*	*152*	*100%*	*169*	*100%*	*137*
Time spent at exhibits:						
Average time	-	59sec.	3min.	16sec.	1min.	20sec.
Mode time	1min.	10sec.	2min.	36sec.	1min.	25sec.
Maximum	3min.	05sec.	10min.	25sec.	4min.	30sec.
Minimum	-	21sec.	-	25sec.	-	17sec.
Manipulation of exhibits by family members:						
Male adults	8%	2	16%	4	29%	5
Female adults	4%	2	5%	2	23%	11
Boys	86%	32	96%	49	76%	28
Girls	89%	39	94%	47	86%	31
Total individuals who manipulated:	*49%*	*75*	*60%*	*102*	*55%*	*75*
Families using exhibit appropriately:	100%	50 (out of 50)	94%	47 (out of 50)	82%	41 (out of 50)
Splitting behaviour:						
Male adults	25%	6	46%	11	24%	4
Female adults	13%	6	45%	20	19%	9
Boys	0%	0	4%	2	8%	3
Girls	5%	2	4%	2	14%	5
Total individuals who split:	*9%*	*14*	*21%*	*35*	*15%*	*21*
Families in which 'splitting' occurred:	22%	11 (out of 50)	48%	24 (out of 50)	36%	18 (out of 50)
Joint-activity compositions:						
Female-boy	25%	1	11%	1	33%	5
Female-girl	0%	0	33%	3	27%	4
Male-boy	50%	2	23%	2	13%	2
Male-girl	0%	0	11%	1	13%	2
Boy-boy	25%	1	11%	1	0%	0
Boy-girl	0%	0	11%	1	7%	1
Girl-girl	0%	0	0%	0	7%	1
Gall.staff-boy	0%	0	0%	0	0%	0
Gall.staff-girl	0%	0	0%	0	0%	0
Total of joint-activities:	*100%*	*4*	*100%*	*9*	*100%*	*15*
Proximity between family members:						
'Touching'	18%	9	20%	10	44%	22
'Close'	68%	34	52%	26	32%	16
'More than 1 metre apart'	14%	7	28%	14	24%	12
Total of families:	*100%*	*50*	*100%*	*50*	*100%*	*50*
Reading aloud behaviour:						
Male adults	0%	0	0%	0	18%	3
Female adults	0%	0	0%	0	40%	19
Boys	0%	0	0%	0	3%	1
Girls	0%	0	0%	0	8%	3
Total individuals who read aloud	*0%*	*0*	*0%*	*0*	*19%*	*26*
Talking *(see also 'type of conversation' table)*:						
Families in which 'talking' occurred:	58%	29 (out of 50)	68%	34 (out of 50)	76%	38 (out of 50)

(Note: percentages of individuals' behaviour in each category was calculated in relation to the 'total sample'); percentages of families' behaviour refer to families observed at each exhibit (n=50); percentages of joint-activities refer to the total number of joint-activities.)

TABLE C9: Individuals who engaged in talking at the three exhibits at the Me & My Body exhibition according to the frequency of type of conversation

Sample: 150 family groups (50 at each exhibit)

Individuals at each exhibit:
All Hands: males adults, n=24; females adults, n=47; boys, n=37; girls, n=44; gallery staff, n= 0
Launch Pad: males adults, n=24; females adults, n=44; boys, n=51; girls, n=51; gallery staff, n= 0
Me & My Body: males adults, n=17; females adults, n=47; boys, n=37; girls, n=36; gallery staff, n = 0

ME & MY BODY

Exhibits	SKELETON							DISABILITY							FEED ME!						
Individuals who engaged in conversation:		Types of Conversation							Types of Conversation							Types of Conversation					
		Telling		***Explaining***		***Chatting***			***Telling***		***Explaining***		***Chatting***			***Telling***		***Explaining***		***Chatting***	
	Talked	n	%	n	%	n	%	Talked	n	%	n	%	n	%	Talked	n	%	n	%	n	%
male	(12)	3	25%	1	8%	8	66%	(10)	4	40%	1	10%	8	80%	(7)	3	43%	2	29%	4	57%
female	(22)	7	32%	1	4%	16	73%	(26)	8	31%	5	19%	18	69%	(30)	21	70%	11	37%	6	20%
boy	(11)	-	-	-	-	11	100%	(9)	6	66%	-	-	3	33%	(0)	-	-	-	-	-	-
girl	(6)	-	-	-	-	6	100%	(17)	4	24%	-	-	13	76%	(7)	-	-	2	29%	5	71%

(Note: 'Talked' refers to the total of individuals who engaged in conversations; 'n' refers to individuals who engaged in each type of conversation; percentages refer to 'Talked'. More than one type of conversation was possible by same individual, so percentages add to more than 100.)

APPENDIX D:

DESCRIPTION OF THE MAIN EXHIBIT ELEMENTS OF THE DISPLAYS DEPICTED IN THE CHILDREN'S DRAWINGS

DESCRIPTION OF MAIN EXHIBIT ELEMENTS
National Maritime Museum - 'All Hands Gallery'

Cargo Handling
Manipulative element(s): crank
Main elements: crane, boat, boxes
Outcome/process: load the boat - safely (balance it)
main colour: red (magenta)

Diving
Manipulative element(s): gloves/arm
Main elements: gloves, pipes, valves, water
Outcome/process: close valves to stop air (bubbles) coming from the pipes.
main colour: yellow / dark gray (metal)

Gunnery
Manipulative element(s): two wheels (to move cannon), 'fire' button
Main elements: cannon, 'target' screen, 'trajectory' screen
Outcome/process: destroy target (screen 1); trajectory of shot (screen 2)
main colour: dark gray (metal)

Pilotage
Manipulative element(s): wheel, gear
Main elements: screens (with ship/harbor), wheel/gear
Outcome/process: ship movement
main colour: dark blue

Morse code
Manipulative element(s): morse code button and microphone
Main elements: morse code button, speakers, information
Outcome/process: sound (message)
main colour: green

Propulsion
Manipulative element(s): fan, round metal structure
Main elements: boat, wind
Outcome/process: movement of boat with wind
main colour: white (boat), gray (metal structure)

DESCRIPTION OF MAIN EXHIBIT ELEMENTS
Science Museum - 'Launch Pad'

Sound dishes
Manipulative element(s): speakers (dishes)
Main elements: speakers (dishes), stairs
Outcome/process: sound
main colour: yellow

Slow Bubbles
Manipulative element(s): pump
Main elements: structure, pump, bubbles
Outcome/process: bubbles
main colour: yellow

Turntable
Manipulative element(s): turntable
Main elements: platform, turntable
Outcome/process: movement
main colour: yellow/red

Shadow box
Manipulative element(s): button
Main elements: shadow in screen
Outcome/process: shadow
main colour: black (house), dark

Grain pit
Manipulative element(s): wheels
Main elements: wheels, ramps, grains
Outcome/process: movement of grains
main colour: red/black/yellow

Shake hands
Manipulative element(s): yourself in the mirror
Main elements: mirror, reflex
Outcome/process: own reflex
main colour: mirror (dark)

Computer effects
Manipulative element(s): buttons
Main elements: screen, buttons
Outcome/process: 'constructed' image
main colour: yellow (structure), metal, coloured buttons

Laser disks
Manipulative element(s): buttons
Main elements: structure, laser image
Outcome/process: laser image on the wall
main colour: yellow

Laser Ball
Manipulative element(s): ball
Main elements: ball, laser point (inside)
Outcome/process: laser light
main colour: dark violet and gray

DESCRIPTION OF MAIN EXHIBIT ELEMENTS
Eureka! - 'Me and My body' exhibition

Digestion (Fish)
Manipulative element(s): ball (food)
Main elements: mouth, body (representing the stages of digestion)
Outcome/process: the digestive process
main colour: dark green/brown

Big Mouth
Manipulative element(s): wobbly tooth, tongue (step inside)
Main elements: big mouth, teeth, tongue
Outcome/process: finding the wobbly tooth
main colour: pink, white

Skeleton
Manipulative element(s): bicycle chair
Main elements: skeleton in the mirror, bicycle chair
Outcome/process: movement of bones (skeleton)
main colour: cream (skeleton)

Disable experience
Manipulative element(s): crutches, wheel chair
Main elements: path, crutches and/or wheel chair
Outcome/process: walking with crutches and/or wheel chair
main colour: yellow/red, blue (path)

Pregnant woman
Manipulative element(s): tummy
Main elements: pregnant women and its tummy
Outcome/process: movement of tummy (baby)
main colour: blue (denin), yellow (hair)

Sound effects
Manipulative element(s): buttons
Main elements: screen, buttons, images
Outcome/process: sound
main colour: coloured

Tongue (tastes)
Manipulative element(s): buttons
Main elements: tongue
Outcome/process: different colours representing where taste buds are.
main colour: red & coloured lights, yellow (label)

Nose
Manipulative element(s): hairs inside the nose
Main elements: nose, hairs inside the nose
Outcome/process: noticing that nose has hairs that filters the air
main colour: skin colour (pink & yellow)

Skull
Manipulative element(s): skull (bone)
Main elements: skull
Outcome/process: touch the skull, go inside it, and listen
main colour: white

Feel objects
Manipulative element(s): objects inside the holes
Main elements: holes
Outcome/process: hands inside the holes in order to feel objects
main colour: coloured

Computer (draw your face)
Manipulative element(s): computer
Main elements: screen, choices
Outcome/process: draw a face
main colour: gray (metal)

Robot
Interactive element(s): talking
Main elements: robot head & body
Outcome/process: robot speaks (tells a story)
main colour: gray (metal) and yellow

APPENDIX E:
DEMOGRAPHICS FROM INTERVIEW SAMPLE

Adults demographics

From the total sample of adults interviewed (n=150), 41% were *mothers* (n=61), 38% were *fathers* (n=57), and 21% were *other relatives*, such as grandparents, uncle/aunt, and godfather/mother (n=32), indicating that there were more parents leading visits to the galleries with children than other relatives (see Table E1).

Half of the accompanying adults interviewed were aged between *35 and 44 years* old (50%, n=75). Around a quarter of them were in *age group 45-54* (22%, n=33), 15% of them were in *age group 55 or older* (n=23), and the smallest percentage of interviewed adults was in *age group 22-34* (13%, n=19).

Overall, the proportions of *mothers* and *fathers* interviewed were similar (41% and 38%, respectively), so male adults bringing children to visit a museum were well represented. This finding may suggest that fathers, as well as mothers, take an active role in bringing their child(ren) to visit a museum. Regarding the distribution of relatives in the age groups, the number of interviewed *mothers* in age group 35-44 was much higher than in the other age groups. The majority of interviewed *fathers* were aged between 35 and 54 years, and the majority of *'other relatives'* interviewed were from age group 55 years or more (Table E1).

Adult level of education was coded in two categories: adults who left full time education at *18 years of age or younger* or *19 years of age or older*. Overall, the proportion of adults in the sample who left education at *age 18 years or younger* (indicating that those adults did not go on to higher education) was slightly greater than that of adults who left education at age *19 years or older* : 56% (n=84) compared to 44% (n=66) respectively, suggesting that the locations investigated attracted visitors from different education levels and that children's galleries may attract a family audience that does not necessarily have a high level of education among the adults (Table E1).

TABLE E1:
RELATIVE STATUS, EDUCATION, AND SOCIAL CLASS BY ADULT AGE GROUP
Sample: 150 adults

	ADULTS' AGE GROUPS (YEARS)					
	22-34 n %	35-44 n %	45-54 n %	55 or more n %	All ages n	%
Relative:						
Father/step	4	30	20	3	57	38%
Mother/step	11	40	10	0	61	41%
Other relatives	4	5	3	20	32	21%
Totals	*19 (13%)*	*75 (50%)*	*33 (22%)*	*23 (15%)*	*150*	*100%*
Full-time education (left with):						
18 or younger	12	45	11	16	84	56%
19 or older	7	30	22	7	66	44%
Totals	*19 (13%)*	*75 (50%)*	*33 (22%)*	*23 (15%)*	*150*	*100%*
Social classes:						
A / B	4	14	10	8	36	24%
C1	8	43	14	11	76	51%
C2 / D / E	7	18	9	4	38	25%
Totals	*19 (13%)*	*75 (50%)*	*33 (22%)*	*23 (15%)*	*150*	*100%*

Sites: National Maritime Museum (N.M.M.), Science Museum, Eureka! The Museum for Children

Adults' social classes were coded according to the occupation of the adult interviewed. Social classes were collapsed into three categories for the purpose of the statistical tests: A/B; C1; and C2/D/E. Social classes A/B included, among other positions, directors, managers, principal officers, and retired people previously in grade A or B; social class C1 included, for example, junior management and jobs with varied responsibilities / education requirements; and social classes C2/D/E included manual workers (skilled and unskilled), casual workers, and unemployed (Market Research Society, 1990). Overall, there were more adults interviewed from the social class C1 (51%, n=76) than from the other classes. Around a quarter of the adults were from the social classes A/B (24%, n=36), and a quarter of them were from the social classes C2/D/E (25%, n=38) (see Table E1).

Child demographics

From the total of children interviewed (n=150), the proportions of boys and girls in the sample were relatively balanced (53%, n=79 boys and 47%, n=71 girls). Children's ages were collapsed into two age groups for the purpose of the statistical analysis: 7-9 years and 10-11 years. Since age group 7-9 covers three years and age group 10-11 covers two years, there were more children in age group 7-9 (61%, n=92) than in age group 10-11 (39%, n=58). As the sample was randomly selected, the proportions of boys and girls were not likely to be exactly the same. The proportion of boys in age group 10-11 was greater than the proportion of girls (60% and 40%, respectively), but in age group 7-9 the proportions of boys and girls were balanced (48% and 52%, respectively) (see Table E2).

TABLE E2: CHILDREN'S GENDER BY CHILDREN'S AGE GROUP
Sample: 150 children

	CHILDREN'S AGE GROUP (YEARS)					
	Seven - Nine		**Ten - Eleven**		**All ages**	
	n	**%**	**n**	**%**	**n**	**%**
BOYS (n)	44	48%	35	60%	79	53 %
GIRLS (n)	48	52%	23	40%	71	47 %
Totals	92	100%	58	100%	150	100 %
	(61%, n=92 out of 150)		*(39%, n=58 out of 150)*			

Sites: National Maritime Museum (N.M.M.), Science Museum, Eureka! The Museum for Children

Group composition

The family groups interviewed varied greatly in their group composition. The basic *family components* constituting the groups interviewed were: father, mother, son, daughter, and other relative/carer, such as grandmother, grandfather, uncle, aunt, godfather/mother, or family friend.

There were slightly more family groups made up of adult(s) with 'more than one child' in the group than adult(s) with 'one child only' visiting the galleries (58%, n=87, compared to 42%, n=63, respectively) (see Appendix F).

Locality of residence

Regarding adult residence, overall, most interviewed adults were from towns other than the museum town (71%). For the National Maritime Museum and the Science Museum, which are both in London, the proportions of adults were about the same in all categories (there were slightly more adults from the 'same town as museum' at the NMM and slightly more adults from abroad at the Science Museum). At Eureka! The Museum for Children, a regional museum located in Halifax, the large majority of interviewed adults were from towns other than the museum town (only 6% of adults were from Halifax) and there were no interviewed adults from Scotland, Wales, and Ireland, or abroad, at this museum (see Table E3). The findings show that most interviewed adults in the sample live in the UK, indicating that this study will adequately reflect the thoughts and experiences of children and adults living in the UK.

TABLE E3: TOWN OF RESIDENCE FROM INTERVIEWED ADULTS WHO WERE VISITING THE GALLERIES WITH CHILDREN (FAMILY GROUPS)
Sample: 150 adults
Sites: National Maritime Museum (N.M.M.), Science Museum, Eureka! The Museum for Children

	ALL		N.M.M. (London)		Science M. (London)		Eureka! (Halifax)	
	n	%	n	%	n	%	n	%
Same town as museum:	30	20%	15	30%	12	24%	3	6%
Other towns/counties in England:	107	71%	30	60%	30	60%	47	94%
Scotland, Wales, & Ireland:	5	3%	2	4%	3	6%	0	0%
Abroad:	8	6%	3	6%	5	10%	0	0%
Totals	150	100%	50	100%	50	100%	50	100%

(N.M.M.) Other towns/counties include: Bucks, Cambridgeshire, Essex, Herts, Isle of Wight, Kent, Midlands, Norwich, Surrey, West Midlands. Countries abroad include: United States

(Science M.) Other towns/counties include: Bucks, Birmingham, Chester, Devon, Dorset, Essex, Hampshire, Isle of Wight, Kent, Lancs., Middx., Portsmouth, Reading, Salisbury, Suffolk, Sussex, Worcester, Yorkshire. Countries abroad include: United States, Switzerland, Netherlands, U.A.E (Dubai)

(Eureka!) Other towns/counties include: Altrincham, Ashton-U-Lyne, Barnsley, Bedfordshire, Birmingham, Blackpool, Bradford, Canterbury, Cheshire, Derbyshire, Doncaster, Dronfield, Harrodgate, Hull, Kent, Leeds, Mansfield, Norwich, Nottingham, Peterborough, Sheffield, St. Annes, Stoke-on-Trent, Todmorden, Wigan, Worksop, York.

APPENDIX F:
LIST OF VARIABLES USED IN THE STATISTICAL ANALYSIS AND OVERALL FREQUENCY OF RESPONSES TO CLOSED QUESTIONS

TABLE F1: LIST OF VARIABLES SUBJECTED TO STATISTICAL ANALYSIS

Number of variables: 20

Variables names:

1. **Relative status of accompanying adult interviewed**
   - 1 father / stepfather
   - 2 mother / stepmother
   - 3 other relatives / carers

2. **Adult gender**
   - 1 male
   - 2 female

3. **Adult age group**
   - 1 22-34
   - 2 35-44
   - 3 45-54
   - 4 55 or older

4. **Adult education (age in which the adult left full-time education)**
   - 1 18 years or younger
   - 2 19 years or older

5. **Adult occupation grade (social class)**
   - 1 A / B
   - 2 C1
   - 3 C2 / D / E

6. **Adult's use of interactive exhibits with their children**
   - 1 no
   - 2 yes

7. **Adults' perception of their learning in the gallery**
   - 1 no / not sure
   - 2 yes

8. **Child gender**
   - 1 boy
   - 2 girl

9. **Child age group**
   - 1 7 - 9 years
   - 2 10 -11 years

10. **Group composition**
    - 1 adult (s) + one child only
    - 2 adult (s) + more than one child

11. **Way child likes to use exhibits**
    - 1 on his/her own
    - 2 with someone else
    - 3 no preference (either way)

12. Children's perception of their learning in the gallery
1 learned something
2 did not perceive any learning / don't know

13. Child's preferences for the social context of the visit
1 family
2 both family & school
3 school
4 never visited with school *(not considered for cross-tabulation)*

14. Child's feelings while interacting with exhibits
1 Positive / enthusiastic / fun
2 Negative / neutral / don't know

15. Child's memories from other visits to similar exhibitions
1 don't remember
2 remember
3 never visited *(not considered for cross-tabulation)*

16. Estimated time spent in the gallery
1 less than 30 minutes
2 about 30 -1 hour
3 more than 1 hour

17. Type of museum (sites investigated)
1 National Maritime Museum
2 Science Museum, London
3 Eureka, The Museum for Children

18. Annual frequency of family museum visits
1 1-2 times p.a. or 'rarely'
2 3-5 times p.a. or 'on school holidays'
3 6-30 times p.a. or 'often; very often'

19. Whether the family had already visited the gallery before
1 no
2 yes

20. Visits to other child-orientated exhibitions elsewhere
1 no
2 yes

OVERALL FREQUENCY OF RESPONSE CATEGORIES DERIVED FROM CLOSED QUESTIONS DRAWN FROM ADULTS' AND CHILDREN'S INTERVIEWS

Tables F2 and F3 illustrate, respectively, the frequency of adults' and children's responses in the interview variable categories used in the statistical analysis at each site and at 'all' sites.

Adults' interview

Categories related to adults' demographics were described in Appendix E.

Regarding the annual frequency of 'family' museum visits, around half of the interviewed adults said they visit museums with their children once or twice a year (48%, n=73), around a quarter of them visit 3-5 times a year (27%, n=40), and a quarter of them were frequent museum visitors, visiting museums 6 times or more in a year (25%, n=37) (see Table F2).

Overall, 62% of the families interviewed (n=93 out of 150) had never visited the galleries they were interviewed in before, but many of them had visited child-orientated exhibitions elsewhere (63%, n=95). The proportion of interviewed families who said they had already visited the children's gallery before were greater at Eureka! The Museum for Children (52%) than at the other two museums (40% at the Science Museum and 22% at the National Maritime Museum).

The majority of the families interviewed spent about *30 minutes to 1 hour* in the galleries (69%, n=103 out of 150). Seventeen per cent of them spent *more than 1 hour* in the galleries, and 14% of the families spent *less than 30 minutes*. Analysing the three museums separately, the percentage of families who spent '*more than one hour*' in the galleries was twice as large at Eureka! Children's Museum (28%) when compared to the other two museums. The percentage of families who said they spent *'less than 30 minutes'* in the gallery was half the size at Eureka! (8%) when compared to the other two museums. The percentages of families who said that they stayed in the children's galleries '*between 30 minutes to one hour*' were relatively balanced between the three museums (72% at the Science Museum, 70% at the National Maritime Museum, and 64% at Eureka!).

Regarding adults' behaviour and perceptions at the children's galleries investigated, most of them said they used the hands-on exhibits together with their children (91%, n=136 out of 150), but slightly more than a half of them (53%, n=80) said that they thought that they *did not learn anything* in the galleries. Comparing the three museums, the proportion of adults who said they 'did not learn anything' in the children's gallery was slightly larger at the National Maritime Museum (60%) and slightly smaller at Eureka! (46%). Similarly, the proportion of adults who said

they *did not* use the exhibits with their children were slightly larger at the National Maritime Museum (12%) than in the Science Museum (8%) and Eureka! (8%).

Children's interview

Categories related to children's demographics were described in Appendix E.

Regarding children's perceptions and preferences in the child-orientated exhibitions investigated, the majority of the interviewed children said they *learned something* in the galleries (72%, n=108 out of 150) (only responses related to learning *in* the children's galleries were coded in this category).

Comparing the responses at the three museums, more children said they learned something at the 'Me and My Body' exhibition at Eureka! (82%) and at the National Maritime Museum (All Hands Gallery) (76%) than at 'Launch Pad' at the Science Museum (58%) (see Table F3). It can be seen that children's perception of their learning differs markedly from that of the adults accompanying them.

Most children said they prefer to use exhibits with 'someone else' (66%, n=98), and 13% of them said they prefer to use exhibits 'on their own' (n=20). Comparing the three museums, more children said they liked to use exhibits 'on their own' at Eureka! (22%) than in the other two museums (12% of children at the Science Museum and 6% at the National Maritime Museum).

A large proportion of children had 'positive feelings' while using the interactive exhibits (73%, n=110), but 27% of them (n=40) had 'negative or neutral feelings' while interacting with the exhibits, or did not know to describe their feelings.

Overall, the majority of children said they prefer to visit museums with their 'families' (61%, n=91 out of 150) rather than with 'school' (9%, n=13), indicating a strong preference for the social context of a visit to museums with 'family'. The reasons given by children for this preference included statements such as *assistance, attention and help from parents, freedom to make choices, more fun,* and freedom from some drawbacks of visiting museums with school such as *'you have to queue', 'to hurry', 'to do worksheets'* (see analysis of open-ended questions, Chapter 6).

Regarding children's memories of visits to other children's galleries, 21% of them could not remember the gallery and 37% of them said they had never visited one before.

TABLE F2: FREQUENCIES OF CATEGORIES RELATED TO INTERVIEWED ADULTS

Sample: 150 adults (50 adults at each museum)
Sites: National Maritime Museum (N.M.M.), Science Museum, and Eureka! The Museum for Children)

	ALL		N.M.M.		SCIENCE M.		EUREKA!	
Individuals per museum	n	%	n	%	n	%	n	%
Relative								
father/stepfather	57	38%	25	50%	18	36%	14	28%
mother/stepmother	61	41%	19	38%	21	42%	21	42%
other relatives/carer	32	21%	6	12%	11	22%	15	30%
totals	150	100%	50	100%	50	100%	50	100%
Adult gender								
male	67	45%	26	52%	24	48%	17	34%
female	83	55%	24	48%	26	52%	33	66%
totals	150	100%	50	100%	50	100%	50	100%
Adult age group								
22-34	19	13%	4	8%	5	10%	10	20%
35-44	75	50%	24	48%	22	44%	29	58%
45-54	33	22%	15	30%	13	26%	5	10%
55 or more	23	15%	7	14%	10	20%	6	12%
totals	150	100%	50	100%	50	100%	50	100%
Adult education (left full time education with:)								
18 or younger	84	56%	28	56%	26	52%	30	58%
19 or older	66	44%	22	44%	24	48%	20	42%
totals	150	100%	50	100%	50	100%	50	100%
Adult occupation grade (social class)								
A / B	36	24%	10	20%	15	30%	11	22%
C 1	76	51%	27	54%	25	50%	24	48%
C2 / D / E	38	25%	13	26%	10	20%	15	30%
totals	150	100%	50	100%	50	100%	50	100%
Annual frequency of family museum visits								
1-2 times a year	73	48%	18	36%	27	54%	28	56%
3-5 times a year	40	27%	17	34%	11	22%	12	24%
6 or more times	37	25%	15	30%	12	24%	10	20%
totals	150	100%	50	100%	50	100%	50	100%
Visited the gallery before								
yes	57	38%	11	22%	20	40%	26	52%
no	93	62%	39	78%	30	60%	24	48%
totals	150	100%	50	100%	50	100%	50	100%
Visits to other children's exhibition								
yes	95	63%	39	78%	31	62%	25	50%
no	55	37%	11	22%	19	38%	25	50%
totals	150	100%	50	100%	50	100%	50	100%
Estimated time spent at the gallery								
less than 30 minutes	21	14%	9	18%	8	16%	4	8%
about 30 min. to 1 hour	103	69%	35	70%	36	72%	32	64%
more than 1 hour	26	17%	6	12%	6	12%	14	28%
totals	150	100%	50	100%	50	100%	50	100%
Adults' use of exhibits with their children								
used together	136	91%	44	88%	46	92%	46	92%
did not use	14	9%	6	12%	4	8%	4	8%
totals	150	100%	50	100%	50	100%	50	100%
Adults' perception of their learning								
learned something	70	47%	20	40%	23	46%	27	54%
did not learn / not sure	80	53%	30	60%	27	54%	23	46%
totals	150	100%	50	100%	50	100%	50	100%

TABLE F3: FREQUENCIES OF CATEGORIES RELATED TO INTERVIEWED CHILDREN

Sample: 150 children (50 children at each museum)
Sites: National Maritime Museum (N.M.M.), Science Museum, and Eureka! The Museum for Children)

	ALL		N.M.M.		SCIENCE M.		EUREKA!	
Individuals per museum	n	%	n	%	n	%	n	%
Child gender								
boys	79	53%	30	60%	23	46%	26	52%
girls	71	47%	20	40%	27	54%	24	48%
totals	150	100%	50	100%	50	100%	50	100%
Child age group								
7 - 9 years	92	61%	28	56%	33	66%	31	62%
10 - 11 years	58	39%	22	44%	17	34%	19	38%
totals	150	100%	50	100%	50	100%	50	100%
Group composition								
adult(s) + one child only	63	42%	29	58%	29	58%	5	10%
adult(s) + more children	87	58%	21	42%	21	42%	45	90%
totals	150	100%	50	100%	50	100%	50	100%
Children's perceptions of their learning								
learned something	108	72%	38	76%	29	58%	41	82%
did not learn / don't know	42	28%	12	24%	21	42%	9	18%
totals	150	100%	50	100%	50	100%	50	100%
Way child likes to use exhibits								
on his/her own	20	13%	3	6%	6	12%	11	22%
with someone else	98	66%	32	64%	33	66%	33	66%
either way	32	21%	15	30%	11	22%	6	12%
totals	150	100%	50	100%	50	100%	50	100%
Child's feelings while interacting with exhibits								
positive / enthusiastic	110	73%	33	66%	34	68%	43	86%
negative / neutral / d. know	40	27%	17	34%	16	32%	7	14%
totals	150	100%	50	100%	50	100%	50	100%
Children's preferences for social context								
family	91	61%	33	66%	25	50%	33	66%
school	13	9%	2	4%	6	12%	5	10%
both family & school	25	16%	8	16%	10	20%	7	14%
never visited with school	21	14%	7	14%	9	18%	5	10%
totals	150	100%	50	100%	50	100%	50	100%
Children's memories from other visits to children's exhibitions								
don't remember	31	21%	12	24%	14	28%	5	10%
remember	63	42%	27	54%	21	42%	15	30%
never visited	56	37%	11	22%	15	30%	30	60%
totals	150	100%	50	100%	50	100%	50	100%

APPENDIX G:
SPSS TABLES FROM THE STATISTICAL ANALYSES

The software used in the statistical analyses of the interviews (Chapter 7) was the 'Statistical Package for the Social Sciences' (SPSS, version 6.1) (see Norusis, 1994).

SECTION A: ASSOCIATIONS BETWEEN ADULT VARIABLES AND THE FAMILY EXPERIENCE IN THE GALLERIES

A1. Relative by Adult education

Count / Exp Val / Row Pct / Col Pct	18 or under 1	19 or older 2	Row Total
1 father/stepfather	36 31.9 63.2% 42.9%	21 25.1 36.8% 31.8%	57 38.0%
2 mother/stepmother	27 34.2 44.3% 32.1%	34 26.8 55.7% 51.5%	61 40.7%
3 other relatives/	21 17.9 65.6% 25.0%	11 14.1 34.4% 16.7%	32 21.3%
Column Total	84 56.0%	66 44.0%	

Chi-Square	Value	DF	Significance
Pearson	5.79915	2	.05505
Likelihood Ratio	5.81204	2	.05469
Linear-by-Linear Association	.04752	1	.82743

Minimum Expected Frequency - 14.080

Number of Missing Observations: 0

A2. Adult gender by Estimated time spent at the gallery

Count / Exp Val / Row Pct	less than 30 min 1	about 30 min-1 hour 2	more than 1 hour 3	Total
1 male	16 9.4 23.9%	41 46.0 61.2%	10 11.6 14.9%	67 44.7%
2 female	5 11.6 6.0%	62 57.0 74.7%	16 14.4 19.3%	83 55.3%
Column Total	21 14.0%	103 68.7%	26 17.3%	

Chi-Square	Value	DF	Significance
Pearson	9.83329	2	.00732
Likelihood Ratio	10.05843	2	.00654
Linear-by-Linear Association	5.81729	1	.01587

Minimum Expected Frequency - 9.380

Number of Missing Observations: 0

A2. Relative by Estimated time spent at the gallery

Count / Exp Val / Row Pct	less tha 30 min	about 30 min -1 hour	more tha 1 hour	Total
1 father/stepfathe	16 8.0 28.1%	33 39.1 57.9%	8 9.9 14.0%	57 38.0%
2 mother/stepmothe	5 8.5 8.2%	46 41.9 75.4%	10 10.6 16.4%	61 40.7%
3 other relatives/	0 4.5 .0%	24 22.0 75.0%	8 5.5 25.0%	32 21.3%
Column Total	21 14.0%	103 68.7%	26 17.3%	

Chi-Square	Value	DF	Significance
Pearson	17.03561	4	.00190
Likelihood Ratio	19.86604	4	.00053
Linear-by-Linear Association	10.62686	1	.00111

Minimum Expected Frequency - 4.480
Cells with Expected Frequency < 5 - 1 of 9 (11.1%)

Number of Missing Observations: 0

A3. Adult gender by Adults' perception of their learning

Count / Exp Val / Row Pct	no/not sure 0	yes 1	Row Total
1 male	44 35.7 65.7%	23 31.3 34.3%	67 44.7%
2 female	36 44.3 43.4%	47 38.7 56.6%	83 55.3%
Column Total	80 53.3%	70 46.7%	150 100.0%

Chi-Square	Value	DF	Significance
Pearson	7.40617	1	.00650
Continuity Correction	6.53736	1	.01056
Likelihood Ratio	7.48930	1	.00621
Linear-by-Linear Association	7.35680	1	.00668
Fisher's Exact Test:			
One-Tail			.00512
Two-Tail			.00840

Minimum Expected Frequency - 31.267

Number of Missing Observations: 0

A3. Relative by Adults' perceptions of their learning

Count / Exp Val / Row Pct	no / not sure 0	yes 1	Row Total
1 father/stepfathe	39 30.4 68.4%	18 26.6 31.6%	57 38.0%
2 mother/stepmothe	26 32.5 42.6%	35 28.5 57.4%	61 40.7%
3 other relatives/	15 17.1 46.9%	17 14.9 53.1%	32 21.3%
Column Total	80 53.3%	70 46.7%	

Chi-Square	Value	DF	Significance
Pearson	8.56109	2	.01384
Likelihood Ratio	8.71277	2	.01282
Linear-by-Linear Association	5.35279	1	.02069

Minimum Expected Frequency - 14.933

Number of Missing Observations: 0

A4. Relative by Child's preference for social context

Count / Exp Val / Row Pct / Col Pct	family 1	school 2	both family & school 3	Total
1 father/stepfathe	38 35.3 76.0% 41.8%	1 5.0 2.0% 7.7%	11 9.7 22.0% 44.0%	50 38.8%
2 mother/stepmothe	30 35.3 60.0% 33.0%	8 5.0 16.0% 61.5%	12 9.7 24.0% 48.0%	50 38.8%
3 other relatives/	23 20.5 79.3% 25.3%	4 2.9 13.8% 30.8%	2 5.6 6.9% 8.0%	29 22.5%
Column Total	91 70.5%	13 10.1%	25 19.4%	

Chi-Square	Value	DF	Significance
Pearson	9.74945	4	.04487
Likelihood Ratio	11.80153	4	.01889
Linear-by-Linear Association	.46353	1	.49598

Minimum Expected Frequency - 2.922
Cells with Expected Frequency < 5 - 1 of 9 (11.1%)

Number of Missing Observations: 0

A4. Adult gender by Child's preference for social context

Count / Exp Val / Row Pct / Col Pct	family 1	school 2	both family & school 3	Total
1 male	46 41.6 78.0% 50.5%	2 5.9 3.4% 15.4%	11 11.4 18.6% 44.0%	59 45.7%
2 female	45 49.4 64.3% 49.5%	11 7.1 15.7% 84.6%	14 13.6 20.0% 56.0%	70 54.3%
Column Total	91 70.5%	13 10.1%	25 19.4%	

Chi-Square	Value	DF	Significance
Pearson	5.70526	2	.05769
Likelihood Ratio	6.29216	2	.04302
Linear-by-Linear Association	1.12670	1	.28848

Minimum Expected Frequency - 5.946

Number of Missing Observations: 0

A5. Relative by Group composition

Count / Exp Val / Row Pct / Col Pct	adult (s) only 1	adult(s) +child(r 2	Row Total
1 father/stepfathe	30 23.9 52.6% 47.6%	27 33.1 47.4% 31.0%	57 38.0%
2 mother/stepmothe	19 25.6 31.1% 30.2%	42 35.4 68.9% 48.3%	61 40.7%
3 other relatives/	14 13.4 43.8% 22.2%	18 18.6 56.3% 20.7%	32 21.3%
Column Total	63 42.0%	87 58.0%	

Chi-Square	Value	DF	Significance
Pearson	5.63426	2	.05978
Likelihood Ratio	5.69300	2	.05805
Linear-by-Linear Association	1.45404	1	.22788

Minimum Expected Frequency - 13.440

Number of Missing Observations: 0

SECTION B: ASSOCIATIONS REGARDING CHILDREN'S EXPERIENCE AND PERCEPTIONS IN THE GALLERIES

B1. Time spent in the gallery
by Children's perceptions of their learning

Count / Exp Val / Row Pct / Col Pct	learned somethin 1	did not learn / 2	Row Total
1 less than 30 min	10 15.1 47.6% 9.3%	11 5.9 52.4% 26.2%	21 14.0%
2 about 30-1 hour	76 74.2 73.8% 70.4%	27 28.8 26.2% 64.3%	103 68.7%
3 more than 1 hour	22 18.7 84.6% 20.4%	4 7.3 15.4% 9.5%	26 17.3%
Column Total	108 72.0%	42 28.0%	150 100.0%

Chi-Square	Value	DF	Significance
Pearson	8.40754	2	.01494
Likelihood Ratio	7.98914	2	.01842
Linear-by-Linear Association	7.42349	1	.00644

Minimum Expected Frequency - 5.880

Number of Missing Observations: 0

B2. Relative by Children's perceptions of their learning

Count / Exp Val / Row Pct / Col Pct	learned somethin 1	did not learn / 2	Row Total
1 father/stepfathe	35 41.0 61.4% 32.4%	22 16.0 38.6% 52.4%	57 38.0%
2 mother/stepmothe	46 43.9 75.4% 42.6%	15 17.1 24.6% 35.7%	61 40.7%
3 other relatives/	27 23.0 84.4% 25.0%	5 9.0 15.6% 11.9%	32 21.3%
Column Total	108 72.0%	42 28.0%	150 100.0%

Chi-Square	Value	DF	Significance
Pearson	5.95735	2	.05086
Likelihood Ratio	6.07076	2	.04806
Linear-by-Linear Association	5.80815	1	.01595

Minimum Expected Frequency - 8.960

Number of Missing Observations: 0

B3. Child's preference for social context
by Children's perceptions of their learning

Count / Exp Val / Row Pct / Col Pct	learned somethin 1	did not learn / 2	Row Total
1 family	68 66.3 74.7% 72.3%	23 24.7 25.3% 65.7%	91 70.5%
2 school	12 9.5 92.3% 12.8%	1 3.5 7.7% 2.9%	13 10.1%
3 both family & sc	14 18.2 56.0% 14.9%	11 6.8 44.0% 31.4%	25 19.4%
Column Total	94 72.9%	35 27.1%	

Chi-Square	Value	DF	Significance
Pearson	6.24157	2	.04412
Likelihood Ratio	6.57975	2	.03726
Linear-by-Linear Association	2.12956	1	.14448

Minimum Expected Frequency - 3.527
Cells with Expected Frequency < 5 - 1 of 6 (16.7%)

Number of Missing Observations: 0

B4. Child age group 7-9 & 10-11
by Way child prefers to use exhibitis

Count / Exp Val / Row Pct / Col Pct	on his/h er own 1	with som eone els 2	both way s 3	Total
1 7-9	13 12.3 14.1% 65.0%	66 60.1 71.7% 67.3%	13 19.6 14.1% 40.6%	92 61.3%
2 10-11	7 7.7 12.1% 35.0%	32 37.9 55.2% 32.7%	19 12.4 32.8% 59.4%	58 38.7%
Column Total	20 13.3%	98 65.3%	32 21.3%	

Chi-Square	Value	DF	Significance
Pearson	7.39415	2	.02480
Likelihood Ratio	7.23040	2	.02691
Linear-by-Linear Association	4.44536	1	.03500

Minimum Expected Frequency - 7.733

Number of Missing Observations: 0

B5. Child age group by Adults' use of exhibits with children

Count / Exp Val / Row Pct / Col Pct	no 0	yes 1	Row Total
1 7-9	5 8.6 5.4% 35.7%	87 83.4 94.6% 64.0%	92 61.3%
2 10-11	9 5.4 15.5% 64.3%	49 52.6 84.5% 36.0%	58 38.7%
Column Total	14 9.3%	136 90.7%	150 100.0%

Chi-Square	Value	DF	Significance
Pearson	4.27340	1	.03871
Continuity Correction	3.16498	1	.07523
Likelihood Ratio	4.14519	1	.04175
Linear-by-Linear Association	4.24491	1	.03937
Fisher's Exact Test:			
One-Tail			.03920
Two-Tail			.04713

Minimum Expected Frequency - 5.413

Number of Missing Observations: 0

B6. Child gender by Way child prefers to use exhibits

Count / Exp Val / Row Pct	on his/her own 1	with some one else 2	both ways 3	Total
boys 1	8	48	23	79
	10.5	51.6	16.9	52.7%
	10.1%	60.8%	29.1%	
girls 2	12	50	9	71
	9.5	46.4	15.1	47.3%
	16.9%	70.4%	12.7%	
Column Total	20	98	32	150
	13.3%	65.3%	21.3%	100.0%

Chi-Square	Value	DF	Significance
Pearson	6.55780	2	.03767
Likelihood Ratio	6.75647	2	.03411
Linear-by-Linear Association	5.88194	1	.01530

Minimum Expected Frequency - 9.467

Number of Missing Observations: 0

B7. Child age group by Estimated time spent at the gallery

Count / Exp Val / Row Pct	less 30 min 1	30 min. to 1 hour 2	more than 1 hour 3	Row Total
7-9 1	10	62	20	92
	12.9	63.2	15.9	61.3%
	10.9%	67.4%	21.7%	
10-11 2	11	41	6	58
	8.1	39.8	10.1	38.7%
	19.0%	70.7%	10.3%	
Column Total	21	103	26	
	14.0%	68.7%	17.3%	

Chi-Square	Value	DF	Significance
Pearson	4.38633	2	.11156
Likelihood Ratio	4.53834	2	.10340
Linear-by-Linear Association	4.29923	1	.03813

Minimum Expected Frequency - 8.120

Number of Missing Observations: 0

B8 Child gender
by Children's feelings at exhibits

Count / Exp Val / Row Pct	Positive 1	Negative /neutral 2	Row Total
boys 1	63	16	79
	57.9	21.1	52.7%
	79.7%	20.3%	
girls 2	47	24	71
	52.1	18.9	47.3%
	66.2%	33.8%	
Column Total	110	40	
	73.3%	26.7%	

Chi-Square	Value	DF	Significance
Pearson	3.51059	1	.06098
Continuity Correction	2.85190	1	.09127
Likelihood Ratio	3.51952	1	.06065
Linear-by-Linear Association	3.48719	1	.06185
Fisher's Exact Test:			
One-Tail			.04556
Two-Tail			.06718

Minimum Expected Frequency - 18.933

Number of Missing Observations: 0

SECTION C: ASSOCIATIONS REGARDING THE 'TYPE OF MUSEUM'

C1. Group composition by Museum

Count / Exp Val / Row Pct / Col Pct	National Maritime 1	Science Museum 2	Eureka! 3	Row Total
1 adult (s) only	29 21.0 46.0% 58.0%	29 21.0 46.0% 58.0%	5 21.0 7.9% 10.0%	63 42.0%
2 adult(s)+child(r	21 29.0 24.1% 42.0%	21 29.0 24.1% 42.0%	45 29.0 51.7% 90.0%	87 58.0%
Column Total	50 33.3%	50 33.3%	50 33.3%	150 100.0%

Chi-Square	Value	DF	Significance
Pearson	31.52709	2	.00000
Likelihood Ratio	35.52090	2	.00000
Linear-by-Linear Association	23.48768	1	.00000

Minimum Expected Frequency - 21.000

Number of Missing Observations: 0

C2. Museum by Children's perceptions of their learning

Count / Exp Val / Row Pct	learned somethin 1	did not learn / 2	Row Total
1 National Maritim	38 36.0 76.0%	12 14.0 24.0%	50 33.3%
2 Science Museum	29 36.0 58.0%	21 14.0 42.0%	50 33.3%
3 Eureka!	41 36.0 82.0%	9 14.0 18.0%	50 33.3%
Column Total	108 72.0%	42 28.0%	

Chi-Square	Value	DF	Significance
Pearson	7.73810	2	.02088
Likelihood Ratio	7.60945	2	.02227
Linear-by-Linear Association	.44345	1	.50546

Minimum Expected Frequency - 14.000

Number of Missing Observations: 0

C3. Museum by Children's feelings at exhibits

Count / Exp Val / Row Pct	Positive 1	Negative / neutr 2	Row Total
1 National Maritim	33 36.7 66.0%	17 13.3 34.0%	50 33.3%
2 Science Museum	34 36.7 68.0%	16 13.3 32.0%	50 33.3%
3 Eureka!	43 36.7 86.0%	7 13.3 14.0%	50 33.3%
Column Total	110 73.3%	40 26.7%	

Chi-Square	Value	DF	Significance
Pearson	6.20455	2	.04495
Likelihood Ratio	6.68771	2	.03530
Linear-by-Linear Association	5.07955	1	.02421

Minimum Expected Frequency - 13.333

Number of Missing Observations: 0

C4. Way child prefers to use exhibits by Museum

Count / Exp Val / Row Pct / Col Pct	National Maritim 1	Science Museum 2	Eureka! 3	Total
1 on his/her own	3	6	11	20
	6.7	6.7	6.7	13.3%
	15.0%	30.0%	55.0%	
	6.0%	12.0%	22.0%	
2 with someone els	32	33	33	98
	32.7	32.7	32.7	65.3%
	32.7%	33.7%	33.7%	
	64.0%	66.0%	66.0%	
3 both ways	15	11	6	32
	10.7	10.7	10.7	21.3%
	46.9%	34.4%	18.8%	
	30.0%	22.0%	12.0%	
Column Total	50	50	50	
	33.3%	33.3%	33.3%	

Chi-Square	Value	DF	Significance
Pearson	8.73291	4	.06813
Likelihood Ratio	8.98257	4	.06154
Linear-by-Linear Association	8.43672	1	.00368

Minimum Expected Frequency - 6.667

Number of Missing Observations: 0

C5. Museum by Previous visit to the gallery

Count / Exp Val / Row Pct / Col Pct	no 0	yes 1	Row Total
1 National Maritim	39	11	50
	31.0	19.0	33.3%
	78.0%	22.0%	
	41.9%	19.3%	
2 Science Museum	30	20	50
	31.0	19.0	33.3%
	60.0%	40.0%	
	32.3%	35.1%	
3 Eureka!	24	26	50
	31.0	19.0	33.3%
	48.0%	52.0%	
	25.8%	45.6%	
Column Total	93	57	
	62.0%	38.0%	

Chi-Square	Value	DF	Significance
Pearson	9.67742	2	.00792
Likelihood Ratio	9.99258	2	.00676
Linear-by-Linear Association	9.48642	1	.00207

Minimum Expected Frequency - 19.000

Number of Missing Observations: 0

C6. Museum by Visited similar galleries elsewhere

Count / Exp Val / Row Pct	no 0	yes 1	Row Total
1 National Maritime	11	39	50
	18.3	31.7	33.3%
	22.0%	78.0%	
2 Science Museum	19	31	50
	18.3	31.7	33.3%
	38.0%	62.0%	
3 Eureka!	25	25	50
	18.3	31.7	33.3%
	50.0%	50.0%	
Column Total	55	95	150
	36.7%	63.3%	100.0%

Chi-Square	Value	DF	Significance
Pearson	8.49761	2	.01428
Likelihood Ratio	8.73540	2	.01268
Linear-by-Linear Association	8.38392	1	.00379

Minimum Expected Frequency - 18.333

Number of Missing Observations: 0

SECTION D: ASSOCIATIONS REGARDING FAMILY VISITING TO CHILD-ORIENTATED GALLERIES

D1. Adult education
by Visited similar galleries elsewhere

Count / Exp Val / Row Pct	no 0	yes 1	Row Total
1 18 or under	39 / 30.8 / 46.4%	45 / 53.2 / 53.6%	84 / 56.0%
2 19 or older	16 / 24.2 / 24.2%	50 / 41.8 / 75.8%	66 / 44.0%
Column Total	55 / 36.7%	95 / 63.3%	

Chi-Square	Value	DF	Significance
Pearson	7.83415	1	.00513
Continuity Correction	6.90789	1	.00858
Likelihood Ratio	8.01825	1	.00463
Linear-by-Linear Association	7.78192	1	.00528
Fisher's Exact Test:			
One-Tail			.00400
Two-Tail			.00629

Minimum Expected Frequency - 24.200

Number of Missing Observations: 0

D1. Social class by Visited similar galleries elsewhere

Count / Exp Val / Row Pct	no 0	yes 1	Row Total
1 A / B	7 / 13.2 / 19.4%	29 / 22.8 / 80.6%	36 / 24.0%
2 C1	28 / 27.9 / 36.8%	48 / 48.1 / 63.2%	76 / 50.7%
3 C2 / D / E	20 / 13.9 / 52.6%	18 / 24.1 / 47.4%	38 / 25.3%
Column Total	55 / 36.7%	95 / 63.3%	

Chi-Square	Value	DF	Significance
Pearson	8.76983	2	.01246
Likelihood Ratio	9.07327	2	.01071
Linear-by-Linear Association	8.70100	1	.00318

Minimum Expected Frequency - 13.200

Number of Missing Observations: 0

D2. Visited similar galleries elsewhere
by Annual frequency of family museum visits

Count / Exp Val / Row Pct / Col Pct	1-2 time s p.a. 1	3-5 time s p.a. 2	6-30 tim es p.a. 3	Total
0 no	37 26.8 67.3% 50.7%	10 14.7 18.2% 25.0%	8 13.6 14.5% 21.6%	55 36.7%
1 yes	36 46.2 37.9% 49.3%	30 25.3 31.6% 75.0%	29 23.4 30.5% 78.4%	95 63.3%
Column Total	73 48.7%	40 26.7%	37 24.7%	

Chi-Square	Value	DF	Significance
Pearson	12.12842	2	.00232
Likelihood Ratio	12.34102	2	.00209
Linear-by-Linear Association	10.53510	1	.00117

Minimum Expected Frequency - 13.567

Number of Missing Observations: 0

D3. Child gender
by Visited similar galleries elsewhere

Count / Exp Val / Row Pct	no 0	yes 1	Row Total
1 boys	20 29.0 25.4%	59 50.0 74.6%	79 52.7%
2 girls	35 26.0 49.3%	36 45.0 50.7%	71 47.3%
Column Total	55 36.7%	95 63.3%	150 100.0%

Chi-Square	Value	DF	Significance
Pearson	9.25900	1	.00234
Continuity Correction	8.25519	1	.00406
Likelihood Ratio	9.34046	1	.00224
Linear-by-Linear Association	9.19727	1	.00242
Fisher's Exact Test:			
One-Tail			.00197
Two-Tail			.00373

Minimum Expected Frequency - 26.033

Number of Missing Observations: 0

Adult education
by Family museum visits per annum

Count / Exp Val / Row Pct / Col Pct	1-2 time p.a. 1	3-5 time p.a. 2	6-30 tim p.a. 3	Row Total
1 18 or under	51 40.9 60.7% 69.9%	19 22.4 22.6% 47.5%	14 20.7 16.7% 37.8%	84 56.0%
2 19 or older	22 32.1 33.3% 30.1%	21 17.6 31.8% 52.5%	23 16.3 34.8% 62.2%	66 44.0%
Column Total	73 48.7%	40 26.7%	37 24.7%	150 100.0%

Chi-Square	Value	DF	Significance
Pearson	11.81994	2	.00271
Likelihood Ratio	11.99063	2	.00249
Linear-by-Linear Association	11.27903	1	.00078

Minimum Expected Frequency - 16.280

Number of Missing Observations: 0