Museum Personalized
The Impact of Floor Staff on an Exhibition –
A Holistic Approach
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Abstract

The current paper presents a study conducted at The National Museum of Science and Technology in Stockholm to investigate the exhibition “Antarctica – that’s cool” from its first concept to the first workshop that is held in the exhibition. The focus is on the influence of floor staff on an exhibition and workshops as learning facilities in museums. Findings, based on visitor observation and the exhibition building process, go into the characteristics of low-budget productions and discuss the importance of staff on the exhibition floor for museums as life-long learning facilities. The holistic approach of the study provides deep insights into the complex interplay of visitors, staff and exhibitions. The results can be used for future exhibition building processes and educational programs in museums and should strengthen the museum’s position as life-long learning facility in nowadays society.

Keywords: museum, floor staff, workshop, exhibition building, visitor observation, interactivity, life-long learning
1. Introduction

In times of shrinking budget for art and culture; in a society that is increasingly characterized by computer, Internet and anonymity; in a world that accomplishes globalisation every day; discussions about human capital and its relevance, tasks and duties, gain in importance. Contrary to factories that raise their efficiency by the use of multi-tasking machines; museums as the major institutions that preserve and depict the human culture in all its facets, are dependent on museum personnel that is highly engaged in the museums’ aims and tasks. In the last century much research had been done on the behaviour of visitors on the exhibition floor, but only a few illustrate the impact of floor staff on museum visitors. When museums think about providing free entrance in a museum instead of recruiting cash personal for reasons of saving money, is it then not about time to strengthen the museum staff’s importance, or at least to start discussing it?

This thesis sets its focus on museum staff on the exhibition floor and its impact on exhibitions and visitors. Not often do we get the chance to take part in the development and constructing process of an exhibition, and at the same time having the chance and time for a workshop and research on the same exhibition. The National Museum for Science and Technology offered this opportunity between April and July 2005, and the exhibition “Antarctica – that’s cool!” became research object and the target of the author’s cogitations during an internship. Being part of the museum staff was a crucial condition for the results of the study. This research paper provides the reader a holistic approach to an exhibition from the first words of its concept until the first months of the exhibition, including a workshop that was held there for 4 weeks. In order to secure the holism of this study, the reader will find a description of the exhibition building process, a detailed description of the exhibition “Antarctica – that’s cool” as well as its evaluation. The road leading to the conclusions can be divided into two parts: on the one hand the picture of the exhibition that is drawn in all its facets, enables the reader to get an entire understanding of the intended and expected visitors’ behaviour and the behaviour in reality; on the other hand the description and evaluation of the workshop converges the interaction between visitors and floor staff.

The thesis consists of two major parts; firstly, the frame describes the place of the internship, the exhibition “Antarctica – that’s cool!” and delivers insights in theories and previous studies about museum staff on exhibition floor. Secondly, the study, consisting of two parts, namely the workshop and its evaluation, and the visitor observation in the exhibition, is described and the results are presented. Minor discussions are conducted in the flow of the paper, but overall conclusions are drawn in the last part of the thesis. The appendix offers last materials to fulfil the claims of a holistic study.

I would like to thank everybody at the public department at the National Museum of Science and Technology in Stockholm for their fruitful cooperation during my internship, in particular my supervisor Mariana Back for so much more than just a fantastic and successful internship. Furthermore I would like to thank Marko Klemetti for his support in all technical questions and Gunhild Eriksson for her assistance in organising the workshop. The unstinting individual opening hours of the library at “Nordiska Museet” were of great use for the theoretical part of the thesis. The contact to my second supervisor Maria Björkroth at “Höskolan Dalarna” was particularly valuable in the beginning of my research. I am greatly indebted to my parents, who always supported me big-hearted whenever I needed their help. Finally, I would like to thank my friends for all their constructive words, thoughts and hints that reached me wherever I was.
2. Frame

2.1. The National Museum for Science and Technology

The National Museum for Science and Technology in Stockholm is Sweden’s biggest museum of technology and was founded in 1924 by the Royal Swedish Academy of Engineering Sciences, the Confederation of Swedish Enterprise, the Swedish Inventors’ Association and the Swedish Association of Graduate Engineers. The building was opened in 1936 and is situated in the Stockholm city in the neighbourhood of the Museum of Ethnography and The Maritime Museum. Visitors reach the museum by bus that stops in front of the museum.

The National Museum of Science and Technology has a national charter to be responsible for preserving the Swedish technological and industrial history cultural heritage. The museum’s collection consists of more than 50 000 objects and artefacts, 600 shelf metres of archival records and documents, 200 000 drawings, 620 000 images and about 50 000 books. The museum also documents technologies, processes, stories and memoirs in order to preserve them for posterity. The galleries comprise around 10 000$\text{m}^2$ and attract therewith around 170 000 visitors every year. The museum employs around 60 people, around 50 of whom hold permanent positions.

Educational claims are one of the tops on the museum’s charter. Particularly in schools in Stockholm and surroundings it is well known for its reputation as an institution with well-developed educational programs. The science centre area “Teknorama” mainly contributes to that.

„At the National Museum of Science and Technology, we want to stimulate people’s curiosity about technology and the possibilities and limitations of the natural sciences. We don’t just want to talk about the history of technology – it’s just as important to understand what technology means to us today and what it can mean to us in the future. We hope to get people talking about what technology should and shouldn’t be used for, too.“

(The National Museum of Science and Technology about the educational aims\(^1\))

Since January 1st, 2005, a total of 19 state-owned museums in Sweden have been covered by a reform that grants free entry to the public to these museums. However, the National Museum of Science and Technology is not one of these museums and is therefore not covered by this reform. In view of the fact that the reform had its start only half a year before the study was conducted, the museum was not able to perceive a shifting in the visitor structure. It is to be stressed that the museum offers free entrance on wednesday afternoons between 17:00-20:00. This is also the only day when the museum opens until 20:00, usually it is open for the public between 10:00 and 17:00. During summer many tourists visit the museums with their „Stockholmcard“ that provides free entrance to the Museums in Stockholm.

2.2. The Exhibition: “Antarctica – that’s cool!”

The exhibition “Antarctica – that’s cool” is core and frame of this thesis at the same time. The author had the possibility to work exhaustively in this project from its first intensive days, 6 weeks before its opening up to two months afterwards. Although the findings of this study could apply for other museums or exhibitions too, the unique situation of the exhibition critically defines and affects what people actually experience and how they react. Furthermore the details of the exhibition should provide an essential contextual frame for understanding the methodology, results and discussion in the paper. Therefore the reader will find a summary description of the exhibition, its objects and stations.

2.2.1. Idea and General Information

The National Museum for Science and Technology was host for the Antarctic Treaty Conference Meeting 2005 (6-17 June). Related to the ATC-meeting, different museums in Stockholm decided to present exhibitions that dealt with Antarctica and polar areas in general; a project that is called “Museums Together”. The Exhibition “Antarctica – that’s cool” is one part of it. According to the museum’s philosophy, the exhibition presented recent research projects on Antarctica and gives the visitor an understanding of life as a researcher on this hostile piece of earth.

The exhibition is a joint production of the National Museum of Science and Technology with the Polar Research Secretariat of Sweden, the University of Stockholm and the Royal Institute of Technology in Stockholm. “Antarctica – that’s cool” was supposed to open the 27. May 2005 and was in its very first concept planned as an exhibition for the period of the conference. Not surprisingly for temporary exhibitions in the museums’ world, the length of the exhibition was extended to January 2006, which is not inevitably its last postponing. But these uncertainties and discussions about the length of the exhibition lead to an almost marginal increasing of the exhibitions budget in terms of working hours for craftsmen and designers.

The exhibition is placed in the third building of the museum on the second floor and covers approximately 200m$^2$. The exhibition hall is a dead-end street meaning that it will not be discovered by chance. The visitors will hardly miss the big signs that mark the entrance of the exhibition and thus will have to make a decision, consciously or not, whether they want to take these steps up to the exhibition or not. The setting of the exhibition area itself entails different approaches to the behaviour and characteristics of visitors moving in “Antarctica – that’s cool!” Why do the visitors choose to see the exhibition? Is it interest or boringness of the rest of the museum, did they choose the exhibition by chance or because of a “do-not-miss-anything”-thinking?

Furthermore it is necessary to mention that the exhibition lies in the ‘Science Centre’-Area of the museum called “Teknorama”. Here it is allowed and desired to touch and try every hands-on exhibits, the visitors encounter. Entering “Antarctica – that’s cool” from this interactive area is a challenge for the visitors, who might be confused by the mix of interactive and hands-off objects. It is also a challenge for the exhibition builders to decide which objects can be shown, and which objects need particular safety installation.
Nobody did really expect that visitors are actually able to take an Ice-Core out of the freezer carrying it through the exhibition and throwing it on the floor. Unfortunately it happened.

Although the topics the exhibit deals with are not always easy to understand, the exhibition is directed to all visitors of the National Museum of Science and Technology. This is another challenge for the exhibition builders, trying to offer some activities and objects for every age group within topics even the exhibition builders had difficulties to understand.

2.2.2. Sections of the Exhibition

Exhibits should invite visitors to participate and become intellectually involved, let visitors touch objects, manipulate machines, smell an environment and hear sounds.

(Falk/Dierking 1992: 142)

The exhibition lives with and off the objects and knowledge that was offered by the exhibition’s partners, the Polar Research Secretariat of Sweden, the University of Stockholm and the Royal Institute of Technology in Stockholm. Already when entering the stairs up to the exhibition the visitor encounters a bluish area with 27 flags that represent the consultative members of the Antarctic Treaty to emphasize the uniqueness of the Antarctic area that is the only place on earth not controlled by one country. At the same time the flags depict Sweden’s scientific cooperation in different research projects. The ingress text catches the visitors’ attention by mentioning the unique characteristics of the continent, its hostility and the early conquerors of the continent. The aim was it, to make the visitors aware of the circumstances the researchers are working under, during the short period of light.

The first section of the exhibition about the European Project of Ice-Coring on Antarctica is a small one, which shows one of the most impressive objects in the exhibition. Researchers and technicians from ten European countries have been working together in this project for ten years, while Sweden is project member since 2001. The ice cores are drilled out of the kilometre thick inland ice to study traces of imbedded chemical components. These chemical studies, also done at the Stockholm University, give answers on the climate then and its development now. The visitors can see and in case of available floor-staff even touch an ice-core that is brought to Stockholm from Antarctica; one of the exemplars that are studied at Stockholm University. The ice-core lies in an everyday freezer and the visitors have to open the lock to see it. To encourage them to do this, the label about the project as well as a sign at the freezer itself says what is to see in the box.

The second section deals with the neutrino telescope AMANDA (Antarctica Muon and Neutrino Detector Array) and its successor IceCube. It includes several objects hardly any visitor is familiar with. An old fogchamber that visualizes cosmic radiation stands in a dark corner, which even increases the impressive rays that can be seen in the fog of alcohol. The location in the corner also implies that many visitors miss the object, because it is not situated on their path through the exhibition. The object itself is not necessarily related to Antarctica but it is a useful visualization of the cosmic radiation that can be measured with a neutrino telescope.
The object that catches the visitors' attention at the very beginning, is a model of the neutrino telescope that is buried under the Antarctic ice at the South Pole. 750 detectors are embedded in the ice more than one kilometre deep under the surface and measure the neutrinos come by. The isolated location causes the hostile working conditions that are entailed by building a telescope at the South Pole. This model shows the location of the 700 detectors; the bottom of the model representing the deepest location of the modules. These imitated modules blink in different colours and simulate the reactions under the ice, when different elementary particles hit the modules. The model itself is quite abstract and kids like to interpret it as a wood of lighted bars, one can pass through. Without reading the label the visitors will hardly map the meaning of this object. Next to the model, a flat screen shows one of the boreholes with a module that is on its way down. This almost psychedelic installation visualizes the dropping of the modules in the ice as an addendum to the model beside. Three modules that are hanging from the roof in eye-height of the visitor build the third part of this section and show three original detectors that are buried in the ice. Behind them a big panorama picture images the positions of some of the holes that enclose the detectors, to get an idea of the size of this telescope under the surface.

(Wasa model, detectors Icecube, screen Icecube)

These two projects represent Sweden’s international research cooperation on Antarctica. The next section’s main focus lies on the Swedish research station WASA, Swedish research and researchers’ live on the station. The visitors look at a model of the station see its position in between of the different buildings of the area on a second relief model. The highlight of the section is a big picture (3 times 4 meter) of the station itself and a snow area in front of it. This backdrop can be used to take a picture with a camera and send it per email. This email simultaneously works as a kind of commercial for the exhibition itself.
A third element of this section is a display with clothes that are used on Antarctica. The display shows the complete clothing system in different layers. The visitors even have the possibility to prove one of the jackets that are shown in the display and take a picture as a polar researcher in front of the station. Across from the big image of the station a display case shows different objects that are necessary for the daily life in a research station on Antarctica. From climbing and glacier equipment, to different communication utilities, up to food and kitchen accessories, these objects make the visitors aware of the differences and similarities of living in a land without life. A slide show presents pictures of the journey to the station and the life on WASA.

Particularly kids are addressed in the children’s corner; the very young ones as well as school kids. Sitting on ice floes, they have the possibility to follow a film about the animals at the Antarctic coast. Penguins as a well-known symbol for Antarctica are an easy way to arouse
the children’s fascination for this continent. Two big round maps of the two poles, North Pole and South Pole, serve as a visualization of the two ends of the world that can be used by parents to give their kids explanations about these areas. But they serve also as a game board for a simple card game. 12 cards with different images that belong either to the Arctic or Antarctic are placed with magnets on a fridge door. The front side of these cards shows an image and on the back the visitors find a description of the image, as well as some further information without mentioning the Pole it does belong to. The visitors are asked to assign them to the two maps. By opening the fridge door they will find the right answer for the classification. Some seats and information materials are offered on boxes that were used for transportation between the South Pole and Stockholm.

(children’s corner)

Another basic part of the exhibition is the knowledge pool represented by four computers with touch screens. These contain a presentation with pictures and text about the AMANDA/IceCore-Project and EPICA. One can also browse through a diary of two Swedish researchers who lived at the South Pole for two months and a presentation about the climate and weather on Antarctica. These presentations offer a lot of information that could not be presented on a label because of the amount of text and its grade of complexity. So visitors who are interested in further information have the possibility to deepen their knowledge according to their need and interest. The idea here is that adults and older kids, the target group of this section, can use the knowledge pool as intensively as they want, while smaller kids watch the movie about seals and penguins and discover Arctic and Antarctica with the help of maps and cards on the fridge. This part of the exhibition was additional decorated with the flag of the Polar Research Secretariat.

The exhibition does not follow a specific order, so the visitor has every freedom to explore the area in every direction and depth they wish. The language of the labels is Swedish, but a handout including English text is available.
2.2.3. Exhibition Building Process

Sheila Grinell (2003) claims in her guideline for science centres that programs and exhibitions should not be guided by concerns about public knowledge and deficits but by public interest. Exhibition builders, who were almost unfamiliar with the subject in the beginning of the exhibition-building period, made the exhibition “Antarctica – that’s cool”. Therefore they were reliant on researchers and people who have been to Antarctica, to get a feeling for the subject and to receive correct information. Under these circumstances, building the exhibition and dealing the subject as “novices” in the area met Grinell’s claims. Without question, Antarctica was and is a long-running issue of peoples interest. The adventure novels, enjoyed by so many readers, the political and scientific interests, and last but not least the rising number of travel agencies that offer journeys to Antarctica for average persons, prove this.

An exhibition is an “assemblage of objects or some specific nature though which visitors move from unit to unit in a sequence designed to be meaningful instructionally and/or aesthetically”. It usually consists of several exhibits or large objects and has broad rather than narrow topic. (Burcaw 1997:13). The exhibition, the thesis deals with, is located in a museum and therewith visitors put the same claims on this exhibit as they do on other exhibits in the building. These claims are build on former museum experiences, on stories the visitors know from others, on knowledge about the exhibition and the museum in this particular case. Moreover visitors get an idea about exhibitions through the media and the exhibits the visitors encountered on the very day of the visit before entering the exhibition “Antarctica – that’s cool”. People working in a museum are unconsciously familiar with most of these claims. In general it is not the first exhibit they build and they have seen many different exhibits before. Thus planning, designing and building an exhibit is only seldom based on guidelines about “How to build an exhibit” but on experiences. Anyway a lot of these guidelines exist and they succeed in bringing these experiences on paper.

Sheila Grinell (2003:32) mentions in such a guideline that visitors trust the information and experience that science centre and museums provide. Therefore scientific correctness was one of the major claims the exhibition builders put on the exhibit “Antarctica – that’s cool”. Some of the displays deal with complicated scientific issues, not just because of the objects that are in general unknown to visitors, but also because of the research projects that were related to those objects. The cooperation with the Stockholm University and the Royal Technical Highschool was essential for the success of the exhibit. The researchers with their scientific background were the explainers for the exhibition builders with a museum background, who tried to communicate this knowledge towards the visitors. The corresponding researcher first approved every text, label and slideshow before its use in the exhibit. This included a lot of waiting and text-sending back and forth. Although the scientists enjoyed working with the museum, although they did not get paid for the work and the exhibition builders got a lot of interesting insights in the researchers world, it would make things much easier if museums could hire a scientist for this period of time, which in turn depends on the exhibitions budget.

The exhibition was a low-budget production, meaning that the exhibition builders had an interior designer for some days and the museums craftsmen but rarely budget for materials. From this ensues that the exhibition was very much based on the donations of the different institutes as well as on the creativity of the exhibition builders. The print of some huge pictures was sponsored, while the technical equipment (computer, flat screens, DVD-Player) was already in place from an older exhibition, yet not presented anymore. Among all the materials, the main focus first lay on the exhibition texts and labels. The producers of the exhibition were not just dependent on the scientific feedback, but had to keep the graphic
designer’s schedule, too. On account of mistakable communication, some of the labels already done had to be changed in the very last minutes before the opening of the exhibition. Building low-budget exhibitions is sometimes very much improvisation and relates only seldom to the guidelines that are known about how to build a successful exhibition. Not mentioning the front-end studies that should have been done before. The front-end study of low-budget productions is the exhibition producer’s experience.

Another important aspect was the unavailability of permanent floor staff that has not just an impact on labels and exhibits that need to be fully self-explaining but also on questions of safety for the visitors and protection of the objects. A model of the research station WASA and an ice-core that was brought from Antarctica were the objects that needed most protection. Something the exhibition builders unfortunately only realized during the first week of the exhibition. The ice core lay in an everyday freeze box, the visitors were encouraged to open on their own. One day, when the museum was crowded with school classes exploring on their own, some pupil thought it would be fun to carry the ice core around and show it to others. Probably because of its low temperature or a struggle, only speculation, the core landed on the floor and fell apart in thousand pieces. The Stockholm University fortunately had another piece that was not in use for research purposes anymore and the exhibition producers had the possibility to learn from their naivety and put the core in a closed plastic box. Therewith the visitors are not able to touch a piece of ice that comes from the coldest continent in the world any longer - an experience that might have been a lasting one. While some of the detector modules of the neutrino telescope that hang from the roof were abused as a big pendulum before fixing them at the floor, the model of the research station was converted to a LEGO building with movable pieces.

An essential section of the exhibition was the knowledge-pool with further information about the research projects and the living conditions on Antarctica. This information was offered in 4 computers the visitors could use with the help of a touch screen. Beverly Serrel and Britt Raphling (1992) stated that computer programs are often developed for visitors that are more interested. More interested is herewith meant as a code phrase often used by content experts to describe people like themselves. But only a small percentage of museum visitors meet this description. Computer storage information is often too wide, thus visitors have thousands of options to choose and thousands of information to handle: a difficult venture in a world of information overflow and media saturation. Therefore, the start of the program should be accessible at every single step of the presentation and the principles for museum labels are just as valid. Aside of that an important issue is that visitors are seeking the experience of technology, not the content that it offers. Their basic motivation consists of questions like: “what can this thing do” or “what can I do with this thing?” (Serrel/Raphling 1992: 181-189)

The computer programs were located in touch screens that the visitors could navigate by using arrows in the bottom of the screen. Three arrows allowed them to go forwards, back and to the beginning of the presentation. The exhibition producers chose a self-running modus for presentations with a big amount of pictures and only little text. On contrary presentations that offered longer text with more complicated sentences could only be navigated by the visitors themselves. Due to the lacking experiences in creating such a presentation and finally setting it down in the computers that were used in the exhibition, many ideas and graphical designs could not be realized because of different technical standards. It would have been impossible to show these programs without the help of the museums technicians who are already experienced in using computers on exhibition floors.
It is interesting to realize that an exhibition, although meaning to be done at the opening day, seldom abandon the work in progress status. Some projects, ideas and exhibits will never be realized others will always remain in a status of incompleteness. Some of the ideas that did never find their way into realisation were the temperature data on the stairs and the floor of the exhibition hall that should support the imagination of the low temperatures at the continent. Furthermore an exhibit should imitate a “white out” experience. After talking to some researchers who have experienced this before the exhibition producers tried many ideas, that could enable the average people to feel like them. Although a cheap and simple solution was found, ski-glasses with a white layer of cotton wool, it became never part of the exhibit. The snowflakes mentioned above that were used as seats for the kids watching the movie about the penguins, where cut in pieces by chance. But observing the very first kids interacting with them and trying to puzzle Antarctica, the exhibition producers were disappointed about the idea that did not come up in time.
3. Background

3.1. Museum Visitors and Visitor Paths

Planning an exhibition or workshop and analysing the results, requires knowledge about the visitors who might use the intended offers. Visitor studies today has a more than 100-year history, culminating in the current thriving enterprise involving hundreds of professionals and generating an increasing practical and theoretical literature. (Hein 1998: 12). Since this thesis is not to be a pure visitor study, the author wants to reduce the theory in visitor studies here on general findings that are accumulated in the benchmark The Museum Experience (Falk/ Dierking 1992).

Museums, a term that includes here zoos and science centre, are first of all visited by families, social groups and school groups. Parents with an average age of 30-50 accompany children in the age of 8-12. Obviously this number differs according to the museum type; while science centres, zoos and children museums count around 80% families, history museums, art museums and galleries are visited by much less, down to 10% families (Falk/ Dierking 1992: 20). Equally to all visitors in the different facilities applies that socioeconomic level and education are higher than average and is a determinant with higher relevance than income, employment or hobbies.

The popularity of a museum is another variable that has an influence on the visitor structure in museums. People with high economic factors describe a certain group that visits all kinds of museums, on contrary people with low economic factors visit mostly zoos and first of all popular museums. Valuable for the concept of the workshop that is to be held during the summer vacation is the seasonal change of visitors in museums. While frequent visitors and visitors from town are mostly seen during wintertime, tourists, occasional and out-of-town visitors fill museums, zoos and science centre in summertime.

Highly relevant for the visitor observation in the exhibition “Antarctica – that’s cool” is the knowledge about the structure of a single museum visit. Falk and Dierking (1992: 58-63) describe four components of a typical museum visit. They hereby distinguish between first-time and occasional visitors and frequent visitors. Since the study is conducted during summertime, the author wants to focus the theoretical cogitations in this thesis on first-time and occasional visitors. The first component of a museum visit is the orientation phase that takes approximately 3-10 minutes. During this time the visitors determine what there is to see and in which direction to move, when the museum closes and where the restrooms are. The usefulness of a map that is mostly available at the entrance is disputed. Many visitors have difficulties in reading such a map and thus even problems in finding the orientation in the new place even increase. As pointed out by Hayward and Mary Brydon-Miller (1984), orientation experiences can have a significant impact not only on people’s initial actions, but also on their ultimate satisfaction. To secure this, many museums provide information desks at the entrance of the museum, with up-to-date information about new exhibits as well as a program with all activities for the day and mostly further information material. The second phase of a museum visit is the intensive-looking phase of about 15 to 40 minutes. In that period, visitors read almost every label and look at everything they encounter. It seems as they are trying to move systematically through the exhibition without selecting specific objects, allowing personal interest or attractiveness. They start, where they perceive the beginning of an exhibition to be and try to follow the read thread systematically. Falk and Dierking (1992: 60) describe it like that:
“They are trying to do what they think, they are supposed to do in a museum – look at exhibits and read labels”

Particularly adults notice in a big museum that it is impossible to see the whole museum by looking at everything intensively. Most occasional and first-time visitors think their agenda is to see the whole museum and after realizing that to be unfeasible they change their behaviour dramatically. The visitors now move rapidly through the halls searching for objects or displays that catch their interest because of the attraction power or a personal relation. Children get tired and the visitors start to talk about eating, using the restrooms and what to do after the visit. Moreover they become conscious of time. This exhibit-cruising period lasts about 20 to 45 minutes. The last phase is characterized by hunger, fatigue and the feeling of having completed the visit. The visitors even ignore objects with a high attraction power. The inter-group conversation increases and the focus changes dramatically from things to people, even outside the group. The only topic that is longer important, is the question about where eat and what to do after the visit. This leave-taking takes about 3 to 10 minutes. Beside these phases some more aspects of the structure of a museum visit are relevant for this thesis. If possible visitors start their museum visit on the right side and strive always, often unconsciously to the exit; in the whole museum but also in different rooms of single exhibitions (Nielson 1946).

To understand the structure of a museum visit completely, the focus must also be put on the visitors company. The National Museum for Science and Technology is not defined as a children museum; still the museum is a place that is first of all directed to children. Every single exhibition provides a children’s corner if not even completely constructed as a playground for children and adults that never grew up. The museum is therewith mainly directed to children and their parents. The family is the most significant influence in learning leisure activities. Parents often resume half of their activities they themselves participated in when they were young, but still they depend their visit mainly on their kids and what they want to see. A family visit means a lot of social interaction during the visit; in the end it is the daily family life just in another setting. This has to be considered when providing a workshop for kids and analysing the paths in a certain exhibition.

### 3.2. Review: Museum Fatigue

Museum fatigue was originally described by Benjamin Gilmann in 1916 as the decline in the numbers of exhibits, visitors look at and in the length of time visitors view each exhibit. While Gilman posted that physical exhaustion causes museum fatigue, it is Edward Robinson who says that psychological factors do have a greater importance as reasons causing the museum fatigue. These findings have been verified by several investigators, such as Arthur Melton (1935) and Falk et. al. (1985). (Bechtel/ Churchman 2002)

Exhibitions near to the entrance and on the first floor are more heavily visited than exhibits located deeper within the museum or on upper floors (Falk/Dierking 1992: 56). The exhibition “Antarctica – that’s cool” is located on the second floor with a distance of almost 100m to the entrance. The exhibition hall is not a through room but a dead-end-street, so the visitors will not encounter the place by chance. All that includes that the exhibition lies in the exhibit-cruising phase of the visitors. Due to the location of the exhibition almost every visitor that does not come to particularly see the exhibition about research on Antarctica is in a phase where museum fatigue catches the visitor’s attention and the fight for the visitors’ attention is
even harder for the exhibition producers. It would go beyond the scope of this master thesis to analyse complete visits in the museum. Therefore, the author only takes museum fatigue in consideration for the conducted research.

3.3. Floor Staff in Museums

Personal interaction increases the likelihood that a museum experience will be memorable. A staff person can, and should, attempt to personalize the experience for each visitor.

(Falk/Dierking 1992: 157)

 Shrinking budgets and program costs that rise at least with the raising salaries of the museum staff make it necessary for museums to evaluate the value of museum floor staff. Visitor research has begun to explore the impact of paid and unpaid facilitators and is starting to understand how these interactions contribute to visitor satisfaction and learning (Margie/Koke 2003).

Beverly Serrel (1998) states people working in a museum can be the most welcoming device a museum can provide. She stresses that this should not be reduced on an information point close to the front door, which is obviously essential to provide a welcoming atmosphere, particularly to those visitors who are not familiar with the museum or gallery. Traditionally, museums and galleries only provide a limited number of roles for front-of-house-staff. Unfortunately the visitors have found not all of them very encouraging. The main role of the traditional floor staff was to provide security often in proto-military uniforms, in some countries even with guns and jackboots. Visitors feel uncomfortable with their presence, particularly when floor staff is not able to answer on questions concerning the objects and content in the exhibition.

“They are quite off-putting actually. It’s a bit like going into a shop and a policeman looking over your shoulder.” said an Afro-Caribbean

(Trevelyan 1991: 51)

“I felt like I was a suspicious person“ a visitor to the Toledo Museum of Art in America

(Getty Centre for Education in the Arts, 1991: 32)

Nowadays, the emphasis is placed on customer care and on helping visitors to find their way around and to feel comfortable. Floor staff often wears uniforms that fit to the museum’s design and image and the improvement of soft skills like communicating with visitors, has an increasing meaning.

Many museums started encouraging actors in the exhibition. The national museum of Film, Photography and Television in Bradford e.g. has maintained its traditional security staff and employs a resident team of actors to act in the galleries and take workshops out to school. The “Action Replay Theatre” works closely with curators and museum staff, using some of the methods of “Theatre-in-education”. The members of the group might use mime, discussion or role-play, but each performance relates closely to the galleries and collections, within which it
is performed. Especially school groups are expected to participate in these role-plays. The actors are offered a permanent job with creative opportunities. They have the chance to write small-scale productions and develop a range of skills. Not only the actor’s position in the museum is supported by encouraging them to give as much input in the museum work as possible, but there is also a change in using people rather than machines as communicators on exhibition floors. Demonstrators are used where it is appropriate and generally enhance the friendly atmosphere of the museum (e.g. older people showing older machines, dressed like them and using the former vocabulary). (Serrel 1998)

Hooper-Greenhill and Moussouri (2000) stated that only a few studies concentrate on the participation in programmes or workshops and their impact on visitors. Furthermore they stress the need for studies that look at visitors’ experiences as a whole, a need for holistic approaches of visitor studies.

The answers seem coming up too fast, when Randi Korn & Associates Inc. publishes their study Whole Museum Experiences in May 2000. This study reported findings from an extensive summative evaluation of visitors’ overall experience at The Tech – Museum of Innovation in San Jose, California. Four Issues were found to have an especially strong association with visitors’ overall experience rating – staff courtesy, exhibit maintenance, staff availability, and exhibit availability. Randi Korn & Associates Inc. found that although staff availability was low (almost one-third of visitors reported no interactions with staff), staff courtesy was rated highly. (Randi Korn & Associates Inc 2000)

The Denver Museum of Nature and Science in Colorado presents similar results in their study from 1998. They observed visitor behaviour – with and without floor staff – within the permanent gallery Botswana. In a specific section of this exhibition, where visitors can explore the nocturnal activities of African wildlife, the average length of stay in the area increases enormously. Visitors stayed in average 56 seconds without floor staff while when live programming and hands-on activities were added, visitor time investment increased to 4 minutes 59 seconds in average. But not just that, satisfaction with the gallery improved too. And visitors used adjectives like “fun”, “interesting”, “exciting” and “informative” to describe what had previously been an underutilized treasure. (Margie/Koke 2003)

The study at The Tech states also that female visitors would appreciate it more than men to have staffs that help them to use the exhibit. These findings go back to former studies of Randi Korn & Associates Inc. in 1995 and 1998. The exhibits made females feel more overwhelmed and insecure about technology than they did males. While females may, in fact, need assistance in the galleries, another possible consideration for their rating difference compared to that of males is that females typically rate themselves less knowledgeable about any given subject than their male counterparts.

Another perspective shows that live facilitators do not work equally well for all visitors. The 2000 Tech Report indicates that men are less likely to use on-floor staff. A study conducted in Denver in 1997 (Experiment gallery) showed that all-adult groups are least interested in the interaction with floor-staff. Another study of the Denver Museum of Nature and Science of the 1999 travelling exhibit “Africa: One Continent, Many Worlds” revealed that adult males and teenagers of both genders were significantly less likely to initiate interaction with an explainer than adult females and children.

Different studies by Jane Marie Litwak and Andrea Cutting conducted at the Minnesota Historical Center in Minneapolis showed that floor staff is not more important than other
delivery systems such as looking at objects, reading text, and watching videos. (Litwak, J. M & Cutting, A. (1996). In some cases, interpretation may actually be detrimental to the visitor experience. At Denver Museum of Nature and Science a study in 1994 of the exhibition AZTEC: The world of Moctezuma documented that overeager explainers sometimes even interfered with visitors’ desire to engage individually with an exhibit.

Falk and Dierking (2000) put the emphasis on the influence of floorstaff on the museum visit as a learning facility. Comparable to Hooper-Greenhill and Moussouri (2000) they stated, that even after more than a hundred years of educational research documents about the important role of teachers in facilitating learning, it is amazing how little research exists on the role that museum staff (volunteers, guides, explainers, demonstrators and performers) play in facilitating learning from museums. Particularly in a society with innovations that are no longer innovations after having studied them at the university and life-long-learning as a term everybody should be familiar with, museums are assigned a new role as learning facility far off schools and universities. Investing effort in having knowledgeable and skilled interpreters available to assist visitors is one way to communicate that the museum is a place for learning. The few studies that exist, suggest that staff and volunteers do positively influence the museum experience, particularly, when they are skilled interpreters, helping to facilitate and make the experience meaningful for visitors. Studies (Benton 1979, Diamond 1980, Hilke and Balling 1985, Rosenfeld 1980, Taylor 1986, Wolf and Tymitz 1979) showed that staff members or docents that were available to answer questions informally for families, increased the time spent at individual exhibits to as much as twenty-two minutes. Researchers have consistently observed that families spend more time at exhibitions involving interaction with other visitors or docents or staff. Moreover children often continued asking their parents. Other visitors were engaged to ask questions, they wondered about before, when they find a suitable stage to get answers.

A museum is a community of practice in all its senses and with all its members. In the truest sociocultural sense, staff and volunteers are members of the community of learners themselves. They are also transformed by the interactions they have with the visitor, in the same way as visitors are affected by the interactions with them. This reciprocity is one of the key concepts of constructivist learning.

An increasingly common form of social mediation is the use of theatre, performances, film or first-person interpretation as interpretative strategies. Research is beginning to be developed demonstrating that this approach is effective in communicating and connecting visitors. Specific findings is the participants’ general perception these experiences to be informative, educational and valuable (Hughes 1988). Theatre and performance might be powerful mediators for learning, since cognitive research universally demonstrates that people can effectively organize information mentally if it is recounted to them in a story. These experiences enhance visitors learning of content as well as their ability to articulate complex issue as and ideas. Furthermore it is important that volunteers and staff have enough content background or training to respond quickly on the visitors’ questions to avoid a role as policemen rather than facilitators of collaborative learning.
3.4. Educational Programs in Museums

Many writers attribute all progressive educational ideas to the education that takes place in museums. Often they contrast the “informal” education that takes place in museums, with the characteristics of self-directed learning, respect for all learners, use of materials, with “formal” education in school that is characterized as dull, content driven and highly didactic. These terms used by Hein (1998) are not valid anymore in general. School changed drastically and especially Sweden is known for its open classes. Nevertheless museums and science centre are learning places out of school, university and other facilities.

“Museums and science centres are ideal places for youth programs because they combine three fundamental elements for healthy youth development: varied, substantial intellectual resources; a positive peer environment; and caring adults who can make a difference in young people's lives.”

(Association of Science-Technology Centres 2005 http://www.astc.org/resource/youth/index.htm)

The Association of Science and Technology Centres published some major findings about youth programs in museums and science centres that base on the YouthALIVE initiative (Youth Achievement through Learning, Involvement, Volunteering, and Employment). This initiative provided support and professional development between 1991 and 1999 for a network of more than 60 science centre and youth museums that were engaged enrichment and employment opportunities for youth. The study states clearly that youth programs in museums and science centres do not just meet the needs of adolescent development, but support also immensely the intellectual and soft skills of the kids. What people learn and experience autonomously and can think of as an own personal discovery, often has the most lasting effect. Learning and fun are not contradictory experiences, but end in a mutual symbiosis (Friedman 2003). Sheila Grinell claims in her Science Centre Guide, that exhibits and programs should provide opportunities for serious play, for learning from mistakes and for learning from others. She stresses the importance of present people in the exhibitions with real-world tasks, settings and interactions. Moreover the programs should offer cognitive tools that support sophisticated thinking and reasoning. The identification with people like the visitors themselves supports the learning and partaking rate. The visitors behave more natural and loose their stoppages when they experience that the one who is responsible for the program is the same kind of person as the ones that are addressed by the program.

One way to secure the success of a program is to choose programs, already proved to work elsewhere. This might sound copying but fledging institutions do this. The visitors should be invited to handle the program in a structured way that makes for a successful interaction and allow for free experimentation along several dimensions. Beside schoolgroups, the dominant users of museums and science centres are family groups, who come on weekends, holidays and summers. Fewer visitors come early or late in the day, so family visitor density is greatest in mid afternoon, whereas older teenager and seniors are infrequent visitors. These data were taken in science centres and museums in the USA. (Grinell 2003: 33).

As long as visitors’ attention is appropriately rewarded with experiences that combine leisure and learning, museums and science centres can keep the public’s good will and so maintain their privileged position in the community and distinguish themselves from commercial ventures, to visitors and funders alike. Since visitors come voluntary in their leisure hours,
these institutions compete in effect with other leisure-time pursuits for visitors’ time and money. (Grinell 2003: 33)

The visitor orientation in these institutions was mentioned above. Some Science centre and museums simplify this task by focusing their communication strategies and contents on children, assuming adults will act primarily as chaperons. This strategy is not just based on the audience’s need, but sees the kids as the driving force in decisions about how to spend a family-day and uses the forces they have here. Still and first of all the profiles of science centres and museums should be interesting and stimulating for adult visitors and children in the same way.
4. Methods

This study will be based on qualitative methods. The aim is to understand the reasons for the visitors’ behaviour in the exhibition. Why do they take part in the workshops and ask questions and what impact does this have on their visit. Qualitative studies imply conclusions from a single source as the individual visitor in the exhibition to the general, as museum visitors in general. While quantitative studies strive for reduction of the amount of information, qualitative studies' aim is it to grasp the complexity of visitor behaviour and thinking.

This research approach requires open, unstructured or semi-structured methods that are used in the field. The study should be conducted in the natural situation of a museum visit. An experimental design of this study would require a narrow operationalization of the constructs that are embedded in a hypothesis. In contrast, qualitative research asks questions that go beyond these well-defined constructs. It is exploratory and tries to deal with the research question from a holistic point of view. Reliability and validity are concepts central to every research in social sciences. A variable or measure is valid if its values are close to the true values of the thing that the variable or measures represents. In plain language, it is valid if it measures what it is supposed to. Reliability means the repeatability of the study. No matter whether the study is repeated some years later under the same circumstances or of another researcher, the results should be fairly the same (Diekmann 1997: 118). In qualitative studies or naturalistic research as Hein (1998) names it, validity often is substituted by the term ‘transferability’; ‘dependability’ is used in place of reliability. (Hein 1998: 75)

This study is based on two different observations. Observation is the primary method of social sciences because of its simplicity and close relation to the daily life. It is the aimed, controlled and systematic apperception of an observing object by an observer. Depending on the technique, money and time, that are available, observations can be done in real-time or the observation objects can be recorded by a video camera. For this study we choose to observe the individuals in the exhibit “Antarctica – that’s cool!” on their path through the exhibition as well as when they participated in the workshop.

The author followed the works of Melton when dismissing the idea of supplementing the findings with semi-structured interviews. Melton(1935/1988) set important benchmarks concerning the methodology of visitor studies.

The number of objects that a visitor examines and the time he spends before each object are all we know about his interest without importuning him with requests for subjective reports and even though these subjective reports were obtained, we would still insist that the spread and duration of his attention to museum objects are kinds or dimensions of interest which have inherent validity. As long as one holds to a definition of interest which makes it an observable phenomenon of everyday life, and thus avoids a definition which relegates interest to the realm of transcendental phenomena, the number of exhibits examined and the time spent in examining them will be taken as the interest of the visitor rather than as fallible expressions of interest.

(Melton 1935: 6-7)
Another important issue of museum learning and studying visitors concerns the manner in which the exhibition itself is captured and represented in the study. Therefore it is essential to understand the meanings of the exhibition, the intentions of the exhibition builders and the museum’s aims in presenting exhibitions and their attitudes to visitor learning. Because of being immensely involved in the exhibition building, in decisions about the exhibitions and in the daily life of pedagogues and curators, the author is able to design a study that is embedded in these experiences. It is a matter of facts that this inevitably holds the problems of bias and narrow-minded research. The question about the meanings of out-of-house researcher will be discussed in the conclusion. It should only be mentioned that a holistic approach, as this paper demonstrates, is only realisable when having the possibility of being part of the museum for a certain period of time.

4.1. Visitor Observation

The aim of the visitor observation is it, to analyse the visitors’ paths and interactions in the exhibition “Antarctica – that’s cool” and therewith measure the exhibit’s success. This measurement is to be realized by comparing the exhibitions intention with the visitors’ behaviour in the exhibition. According to Hein (1998: 58) these “summative evaluations attempt to describe what happened as a consequence of a program or exhibition”. Tracking and timing is part of the methods in the early visitor studies, but did never lose its meaning. On contrary, museums are significantly involved in improving the technology for visitor studies in terms of timing and tracking. Using heat sensors to measure the visitors’ path might become a standard solution for museums if affordable. The National Museum of Science and Technology was not using technologically supported methods for studying visitors. By reason of that and to comply the qualitative approach, the observation had to be carried out with a observer who was placed in the exhibition.

Tracking and timing visitors without technical support involves the possibility of recording so much more than just the paths and duration in the exhibition. Analysing the success of the exhibition’s intentions requires an analysis that goes beyond these quantitative data. Voices, speeches and sentences that were valuable for the research were recorded as well as the interactions with the different exhibits. On account of findings about the presence of floor staff in museums and the visitors behaviour (q.v. chapter 3.3.) the observer tried to pretend being another visitor and so realize the most natural behaviour of the observed individuals. Drawing the visitor’s paths in the exhibition map was done after the individuals left the exhibition or hided when the visitor spend more time in the exhibition. The watch that recorded the time spent in the exhibition and pen and paper were disguised as notes that were done during the pretended museum visit. The researcher tried to keep distance to the individuals and was located in the part of the exhibition, the observed subject already had passed or was going to pass later. Reading labels, watching the slide shows or trying to play the game, were activities that should strengthen the visitor’s assumption, the observer being another visitor. The observer’s behaviour was inspired by the assumption about usual visitor behaviour. A guarantee for realizing this behaviour plausibly cannot be given.

The field observation took place in different periods of the day and days in the week. The choice of these periods is not exhaustive, but tries to give an insight in the behaviour differences depended on the daytime. Observation periods were: 10-12, 12-14, 14-17, 17-20. During these observation periods the researcher followed one individual from entering the exhibition until leaving. The architectural conditions supported the timing because by entering the exhibition over stairs it was obvious to define the visit’s start and end. After the leave-
taking of an individual the researcher observed the next person who entered the exhibition. This was not just the easiest way to realize this observation; because of the aims of the research another sample was not necessary. Comparable to experiences in observing visitors it was impossible under the given circumstances to not follow only an individual but a group of people. Therefore the researcher decided to follow the first individual that enters of a group of people and took notes about the visitors that were accompanying this individual. Notes were also taken about obvious group processes that influenced the individual’s visit. Gender and age were recorded. While the decision about the visible gender did not evolve any difficulties, the question of age was more complicated. Since the observation should be conducted without any contact to the visitor the only possibility of recording the visitor’s age was estimation. The visitors were classified in age groups as follows: below 5, 5-10, 10-15, 15-25, 25-45, 45-65, above 65. Two criteria were decisive for the definition of the age groups. It was a basic condition to ease the classification by visible criteria. It is much easier to estimate the age of children between 0 and 15 than adults between 25 and 45. On account of that the steps between the age classes are narrow when estimating children. Another reason is the difference in the stages of development, which a museum visit is largely depended on. Not just the psychological but also the physical conditions influence the structure of a museum visit and therewith the stay in the exhibition “Antarctica – that’s cool”.

Since the exhibits offer different levels of interaction, it was not possible to use indicators that are usually used to measure learning experiences in science centre, e.g. Barriault (1998). Furthermore the observation was not conducted, to measure the learning power of the single objects and exhibits. Therefore the researcher classified the interactions in the exhibition in four groups: no interaction, stop and look, little interaction (read, touch), more interaction (read longer, touch, move, try, play, watch). The positions where the interaction took place were recorded in the same map that was used to draw the tracks. The three last categories got the number 1-3, with increasing interaction; the category “no interaction” was not recorded in the map. This involves that tracks without numbers or positions of interactions are paths with the only aim of reaching the next exhibit, object or label.

Experiences of a pre-test proved the usability of the codes that should be used. Still the researcher realised that it is difficult to keep the balance between hiding as a visitor and observing every little interaction of the individuals. Furthermore, the pre-test revealed the importance of conversation between the visitors. For that reason, the observer recorded meanings and comments the visitors gave when seeing the exhibition.

As stated before it was undoable to observe the complete museum visit of the individuals. Therefore, to record the time the visitors spend in the exhibition is not that significant for evaluating the success of the exhibition in the context of the entire museum visit. Still, the time taken is usable for judging the interactions in the exhibition and giving answers about the single objects’ holding and attraction power in the exhibit.

A total of 25 individuals were observed; of those were 11 female and 14 male visitors. The main age group was 25-45 years (19), three visitors belonged to the interval 45-65, two were above 65 and one child was between 10-15. These were the individuals that were primarily observed and followed through the exhibition, but notes and comments to the accompanying visitors were recorded as well. Except one individual, the visitors were Swedish or spoke Scandinavian language and were therefore able to read the labels.

4.2. The Ice Cream Workshop
The workshop as described in detail below, lasted for four weeks and was improving by adapting the collected experiences every single time. Hence the author consequently observed and analysed the workshop every day. Minutes out of memory were written after the workshop, in which the author processed results out of conversations and observations. This part of the research is called formative evaluation; “the modification of an exhibition or program as it is being developed” (Hein 1998: 58).

4.2.1. Concept

The target group of the activity were first of all kids of all ages without excluding adults and other interested visitors in the museum. The number of participants was not limited and a registration was not required to take part, a strategy that is common in activities in the National Museum for Science and Technology. On account of this, the guide had to be prepared for a varying number of kids between approximately 10-30 kids a day. This had to be considered in the organisation of the material and the time schedule of the activity.

Although workshops do have many different faces, there are common ideas that are valid for most of them and on which the author based her concept for a workshop in a museum. One of the most obvious characteristics is its openness. Workshops are not compulsory, the participation is voluntary which causes many of the following characteristics; workshops are known for and lead to a concept that take these into consideration. Being an open offer for everybody who is interested, the perception of a workshop has to consider different and even completely unknown participants. Of course it is necessary to define a target group, the workshop is mainly directed to, but if not announced clearly, the participants come and take part, depending on their interest, time and motivation. Due to this, the participating group is characterized by different age, gender and socioeconomic and educational background. Another meaningful aspect is the loose hierarchy between the guide and participants. This differs obviously in the workshops; depending on different factors, e.g. age difference between leader and participants, number of participants and the guide’s level of knowledge and experiences. It is therefore complicated to collect them from their level of knowledge and experiences; an essential demand on workshops with educational characteristics. Furthermore, the participants may be unfamiliar to each other, particularly when organizing a workshop in a surrounding like a museum. The guide is new for them too, which influences the hierarchy in the group as well. Depending on the period of time the workshop takes place and the continuity of its participants, it is worth thinking about certain activities that support the partakers to get to know each other. Another idea is it to offer badges that can be used as nameplates, which is unfortunately not doable for a workshop that keeps the kids’ interest for not more than 25 minutes. By reason of the workshop’s openness, one of the most essential demands is it to keep the children’s interest and curiosity. While the kids accept and are familiar with staying on their seats during school classes, in museum different activities, exhibits and objects compete for the kids’ interest that easily follow the different temptations.

On account of the differences in age and background, it becomes necessary to define the aims of the workshop on different levels. The scale that is following described gives an idea of the workshop’s aims that should be reached by the kids depending on their age and background. Do-it-yourself was the first and most important aim that should be reached by everyone who took part in the activity. A demonstrator and children who listen and try the ice cream at the end reduce the workshop to a demonstration, on contrary the kids should act on their own with as less guidance as possible. The following aim is almost at the same level as the first one; that the kids have fun doing the activity is essential to keep them interested and avoids
loosing their attention. The next step is it to get done with the activity, to fulfil the task and to keep something in your hand, something you can show around, or even taste. Realizing some physical explanation behind the activity is considered to be the next step in the learning process. Asking for an explanation and understanding is to be the next to last step that gives the demonstrator an idea of the level of understanding. To transfer the knowledge in the daily life, or to bring up other examples that work after the same principles is to be the last level of learning. Throughout these steps of learning, the kids have the possibility to succeed in reaching their aims, according to their age and background. Moreover the demonstrator can use this scale to supervise the children’s success and adjust the explanations and tasks to the their age. Since the workshop is going to take place for four weeks, the feedback can be used to improve the activity continually and adapt it on the participants’ needs. This method is called action research.

The over-all aim of activities in science centres and museums is to make curious and rouse the interest on topics the activity is dealing with. Particularly science centres devote themselves to the natural sciences and their aim is it to rouse the visitors’ interest by presenting objects, ideas and complicated issues in a way that is easy to understand and to transfer in daily life. The workshop follows these aims.

Enable children to an activity and giving as much guidance as needed and as less as possible, is to be the main methodological idea. The demonstrator or guide should act as a person that encourages them to take part, provide the ingredients and materials that are needed and give the appropriate guidance.

4.2.2. Description

The idea for the workshop emerged during the exhibition building process, by collecting some inspirations for the opening of the exhibition and arranging the availability of floor staff for the summer vacation. The production of ice cream is an easy-made and well-known activity in pedagogical context. But still it is an experiment that is fascinating even for adults, something the author experiences, when showing this at the opening of the exhibition. Even scientists and politicians were astonished about the easiness of a self-made cup of ice cream. These kinds of workshops are already a well-known element in a museum visit during vacations in the National Museum for Science and Technology. In summer 2005 the museum offered for example a robot-workshop as well.

The workshop itself is a combined offer of ice-cream production and information desk. During the very first weeks of the exhibition, when surveillance was needed because of many school classes that were cruising through the museum, often without any interest in the exhibitions itself, the author noticed that it is easy to catch the visitors’ attention by giving some spotlight-tours through the exhibition. Just opening the freezer and talking about the ice-core, or explaining the use of the sensors of the AMANDA-project, made the visitors stay, listen and ask questions. This experience was the preposition for a workshop that targets adults and children: both on the one hand with age-based information about the exhibition, as well as age-based explanation of the experiments and ice-cream production.

The workshop was to meet the aims of the educational programs in the museum. Although the visitors might be able to imagine what the life on Antarctica is and which kind of research is going on their today, the visitors might not understand every object of the exhibition, particularly thinking about the cosmic radiation. Particularly children might meet a subject
that is completely new for them. The workshop follows the museums aim to work with technique, research and innovations and should clarify the museums role in communication research and research’s meaning in the public. Combining these aims with the knowledge about youth programs in museums and science centres led to a workshop that is described in the following paragraph.

Taking place in July, the workshop was held in the time of summer vacation for school children and most of their parents. It is also the time of the year when Stockholm hosts most of its tourists. Due to organizational reasons, the presentation was only shown 3 times a week, Tuesday to Thursday. By arrangement with the museums pedagogues the period between one and three o’clock in the afternoon was chosen according to general findings about the high number of visitors that are in a museum at this time, figures that do also apply to the National Museum of Science and Technology. It is conceived for one person, who is demonstrator and explainer, responsible for the organisation, information sheets and everything else that is involved in the workshop.

To start in time and make the presentation a success, the demonstrator was forced to act after a tight schedule right before the presentation. Working with ice and children does not allow being behind schedule. The children show this with impatience and frustration in its increased form, the ice with an unintended state of aggravation. Since the presentation was announced in the museum loudspeaker system around 13:00, it was expected to greet most of the kids at this time. The fridge, a bowl with ice cubes and salt, had to be done, the thermometer should at least show –20°C degree in the beginning and the ice-cream basic blend should be ready to process in children’s hands. Coming to the table the demonstrator introduced herself and the kids were asked for their names, as long as this was possible and their number did not rise above five. The demonstrator introduced them in the ice-cream production, stressing the fridge that consists only of ice and salt and the ingredients are used that are very common in an everyday household. The kids got every a mug to fill in some of the basic blend out of milk and cream. They had the choice of three different tastes, strawberry, chocolate or vanilla, to add and were then asked to put the mug in the big bowl with ice and salt that posed as fridge. A thermometer showed the temperature that increased from –20°C in the beginning to –13°C after 20 minutes.

The kids were told, that it takes about 10 minutes until the ice cream is done and depending on their interest, the demonstrator talked about this to be an old possibility to create such a cold environment. In the 19th in New Jersey a woman launched the first ice-cream machine for homemade ice cream by using a rotating bowl with ice-cream ingredients in a bed of crashed ice and salt. (Hans Kronbrink: 2005). To bridge the time gap, the kids could try to lift an ice-bit with a string and some salt. The demonstrator showed them some things to try and see in the exhibition according to their age and depending on the company. If possible and needed, the demonstrator guided them around in the exhibition.

An information sheet (appendix) with detailed instructions to the activity and different additional suggestions for experiments with ice, should encourage the participants to explain the activity to each other and take the ideas home and try it there. This could even spread the experiment out of house, and the museum would no longer be necessary for the realization of the experiment.
4.2.3. Evaluation

As described above, the workshop lasted for four weeks and was improving by adapting the collected experiences every single time. Hence the author consequently observed and analysed the workshop every day. Minutes out of memory were written after the workshop, in which the author processed results out of conversations and observations. These minutes were structured in different categories. Information was collected about the organisation, the group processes, reflections about learning effects and reflections about the work as a demonstrator. Organisational reflections enclosed ideas and comments about the structure of the workshop, particularly with regard to its development. Although the activity was done once before at the opening of the exhibition and ideas for the improvement were collected then, the author still needed more experiences to provide an activity that fails only because of outer circumstances that cannot be influenced. In a group of people, in this case the members of the workshop, learning takes only place if the situation does not pose a threat for the learners themselves. Merely contents will be learned, that are perceived as maintenance, development and stabilisation of the own person. On account of that it is essential to provide a learning ambiance that support pluralistic group processes. The leader’s positions should be as weak as possible and as strong as necessary and the kids should try to grow in their roles as explainers for the one who come after them. Although it is difficult to describe group processes that will not last longer than 10 minutes, it delivers important insights into the kids’ behaviour towards a demonstrator and kids that are completely unknown for them. Moreover, learning behaviours in families can be studied. Another category are learning effects, therewith the author wants to depict some learning behaviour the children show when taking part in the exhibition. The last category summarizes the demonstrator’s thoughts and impressions when holding the workshop. These reflections should visualize the reciprocity of learning effects between museum staff and visitors, particularly with regards on improvement of the workshop.

4.3. Validity and Reliability

Although claiming to be a reliable and valid study, the operationalization of the categories for the interactions does not meet these claims. The study is a work conducted by a researcher, who was deeply involved in the exhibition building and who was the demonstrator of the workshop. This bears the advantages of a holistic study that can only be done this way under the personal and physical circumstances. But the disadvantages are as clear; the study is not repeatable and offers many more objections. The workshop was held and observed at the same time, it can thus not only be criticised that the demonstrator was not able to sense every detail, it is also doubtful whether she was able do that unbiased. Another objection is the choice of the observed visitors. The author chose to observe the individual of a group that enters the exhibition first, which does not offer an unbiased observation. Group processes need to be considered as well; the first person of a group might have specific characteristics that adulterate the results of the observation. Further on it is difficult to estimate the influence of the observer’s presence, even if she pretended being a visitor.
5. Results

5.1. Visitor Observation

A total amount of 25 visitors were observed when visiting the exhibition. The results of the observation will be exposed in the following sections and amended by additional observations during the workshop.

5.1.1. The Single Exhibits

The paths the visitors take are quite similar, they differ mainly in the direction. Therefore the majority of the visitors encounter the objects with the highest attraction power and they are encouraged to stop and take a look. The three objects with the highest number of interaction do have different characteristics that explain their attraction power.

The knowledgepool with the touchscreens was the most frequented part of the exhibition in terms of interacting or reading the labels. The visitors were attracted by the screen and the option of manipulating the content they could obtain by watching or reading the screens. It was also observed that the choice of the computer was only influenced by its position. The computer in the corner was less frequented than the ones in the beginning of the row. This can be put down on the visitors’ path through the exhibition, which influences mainly the objects that will be met by the individuals. Only one out of 25 observed individuals passed the screens without interacting with them. Although computers are part of the daily life for years, on the one hand visitors were still very much attracted just by the presence of computers in the exhibition. On the other hand some were not able to cope touch screens at all. The difficulty was not to realize that the presentations were to navigate with the help of the touch screen, but the use of the arrows in the bottom of the screen. Although symbols were used that should be familiar to the visitor of technical equipment at home, like television, video recorder and stereo, some were not able to transfer these daily life experience to this screen.

The module of the neutrino telescope, attracted through the blinking lights, but even more because of its complexity. This was not only shown in the observation, but also through conversation with the visitors. When starting to explain the exhibit, the visitors showed astonishment and asked much more. They could hardly believe the information. Unfortunately nobody understood the three parts of the section, which was caused by three objects or installations, they had never seen before. On account of that they were not able to combine the three objects. They did not read the label either, that would have explained the objects in a way easy to understand. Although everybody passed the exhibit that was located close to the entrance, 8 out of 25 visitors passed it without taking notice at all. The misunderstanding was so immense, that kids walked through the object and parents even encouraged them to do so.

The third station that immensely woke the visitors’ interest was the big image of the Wasa-research-station and the possibility of taking pictures in front of this backdrop, create a postcard and send it. Analogue to the knowledge pool, the visitors were attracted by the computer itself not by the activity that was offered. Their paths lead them directly to the screen, often without realizing the whole installations. Although they could see the picture of other visitors, who tried the activity before, on the screen, they had a hard time to fully understand how to use this. The instruction to the activity was found next to the picture.
Become an Instant Polar Researcher

Take a picture of yourself in front of the Wasa research station. You can send your picture to friends and give them a dazzling surprise.

If the visitors read the text to the postcard activity, they used it appropriate otherwise, it was difficult to understand that they could take a picture and send it. An instruction attached at the top of the screen would have been useful to initiate the activity. The visitors expressed enjoyment when using the activity and thought it was a great idea to send a picture from the exhibition to friends or relatives. As described in chapter 2.2.2 the ground in front of the picture was made out of a material that imitated snow. Many visitors and particularly kids noticed that and were amazed about the snow in an exhibition with a room temperature of 28°C. “Look, this looks like real snow” (observation sheet 18) children used to say when catching sight of the icy ground out of plastic. Moreover it must be stressed, that the computer and the camera did not work reliable so that many visitors wanted to try the hands-on exhibit but were stopped because of technical problems. This evoked frustration as well as the visitors’ attempt to repair the exhibit. Some tried to shut down the computer (OS 03), others used their own technical equipment (digital cameras, mobile phones) to take the picture.

Unfortunately the visitors hardly noticed the clothes that were to see next to the postcard-exhibit and could have been used to dress like a polar researcher. Although the display with the clothes showed layer on layer, and the uniform that were to find in a clothet, were located next to one of the most frequented exhibits, the visitors did not spread their enthusiasm from the email-activity to the neighbour activity. The sign that should be attached to the computer should therefore also stress the clothes that could be used for the activity.

The original Antactica ice-core in the freezer got a lot of attention, too. Like the model of the Icecube project, the exhibit is situated at the entrance, and every visitor who enters the exhibition, passes the object automatically. If the freezer was noticed at all, the visitors tried to open it. Some did not succeed, but most of them could catch a glimps on that unique piece of ice. But comparable with the Icecube model, visitors avoid reading the labels. Even a not-understanding does not encourage them to read the text and understand the exhibit.

At this point the guide often intervened and made the visitors aware of the uniqueness and authenticity, she explained the project EPICA and told the visitor about the research that is conducted at Stockholm University. Visitors showed astonishment and many were grateful for the information. “Ah, so we got to know so much more”. Although the guide hardly extended the information that was written on the accessory label, still the visitors felt an appreciation by the personal contact.

The card-game on the two maps and the fridge-door came fifth in a ranking of interactivity. Although the instructing text said so, the visitors did not use the maps as game board but attached and assorted the cards on the fridge door. They understood the rules of the game and got the result by opening the door. Even though a description of the single cards was offered on the backside, it was observed that the visitors did not use them. A reason therefore would be that the users of the game did neither know nor expect a text on the cards. Once father and daughter tried playing the card game on the fridge. They spent some time there, but did not notice the backside of the cards, only when the guide showed them the text; they could succeed and enjoyed it obviously. While the father read the text to the daughter, the daughter
decided where the card belongs to after some thoughts together. Another visitor came to the demonstrator during the workshop, asking her, whether the solution was wrong. After presenting her the explanation for the solution, she realized her own mistake and was glad that she asked the guide instead of doubting either in her own understanding or in the game itself. Experiences like these obviously prove the learning effect of hands-on and mind-on exhibits as well as their holding power.

Many visitors got carried away of the film about the animals on Antarctica. The sound filled the exhibition hall and the moving pictures were embedded in the white surroundings of the exhibition. When passing the screen most of the visitors dared a glimpse on the film, many stopped and watched longer and some even sat down on the seats offered there. Particularly kids used the ice floes, settled down and followed the pictures. Observation showed, that children often commented on that they were watching the film about the penguins now. Speculations might explain that with TV-habits at home, but are not to bring further in this thesis. Remarks as “they really look like human beings” (OS 19) or “can they really live in this cold and icy surroundings” (OS 16), establish the penguins’ reputation as darling of the public and most popular symbol for the sixth continent.

The digital presentation about the researchers’ life on Antarctica was equally frequented as the display with objects that are necessary in these surroundings. Although the presentation itself provides unique insights in the life on the research stations, the visitors never saw more than 5 pictures. This presentation was running on its own, because of the high amount of pictures, which necessarily involves that the visitor were not able to navigate the presentation. On account of that the pictures were most likely unappreciated. On contrary though the display with food and equipment was frequented equally, visitors had conversations about the objects and looked at them thoroughly. At this very point the clash of two ages of museum and exhibition techniques could be observed and obviously improved.

A classic museum display is the model of the Swedish research station Wasa. Although placed in the centre of the exhibition, the object hardly evoked the visitor’s interest. Every visitor, whose stay lasted longer than a minute, necessarily passed the exhibit, but only 5 stopped and paid attention. The opposite happened to the boxes that were used for transportation and should provide authenticity in the exhibition. These boxes were not interactive at all, nor did they provide learning facilities. Still, these objects fascinated visitors, they read the attached label and browsed through the offered flyers and information material.
The ice floes in the centre of the left part of the exhibition were not just used as seats but kids often tried to use them as puzzle pieces, as stated before, the pieces were cut by chance and do not fit together. Still, the kids patiently followed the challenge to puzzle Antarctica. A map out of these pieces, showing the places that are named in the exhibition would be an important enrichment for the exhibition.

The object that got least attention during the observation period was the fogchamber, due to the fact that it was out of order. During the pre-test it was shown that although the chamber is placed in the outer corner of the exhibition, the attraction power was very high. Which is of course traced back on the light and the fog that is seen behind the glass, additional to the age of the chamber. When the chamber was out of order, the visitors either missed it at all, or they looked at it guessing what it could be. Although the object apparently fits in the section about cosmic rays, the exhibition builders did not succeed in building a bridge that is easy to go. Another part of the exhibition the visitors did not loose their comments on, was the starry sky of the southern hemisphere that was seen next to the ingress text as backdrop for the freezer. During the entire observation time, nobody even realized it to be the stars that can be seen from Antarctica.

**5.1.2. General Observations During the Entire Visit**

The very first impressions that become obvious when listening to the visitors, was the complaint about the heat in the exhibitionhall. Although the visitor’s attention is attracted by the title „Antarctica – that’s cool“, they will not enter a cold area, but a 28°C warm exhibition that tries hard to evoke the feeling of cold. Visitors are surprised, dissapointed and some even leave the exhibition because of the high temperatures. Unfortunately for security reasons it is not possible to install an aircondition that might at least demonstrate some wind. The visitor comfort did not meet the claims as prerequest for a learning environment (Hein 1998: 137). Although never realized, many visitors read the numbers on the stairs (1-30), that could have easily be used to demonstrate the temperatures on antarctica just by adding a minus in before every number. Unfortunately this idea was part of the ones, that have never been realized.

In general it must also be stated that visitors hardly read any text in the exhibition. The text that was read most, is the ingress text, which introduces the visitor in the topic. Even the text to objects the visitors obviously did not understand were not read, not mentioning whether they understood the texts. The objects that caused most confusion, were the Icecube-Modules. Children were asking their parents about the objects and the parents were not able to answer. Some were looking for a label that describes the object, but did not succeed, although the text that described these modules was fixed at the neighbouring wall.

Spotlight tours that were provided during the workshop and when the exhibition had to be supervised, gave possibilities to ask about the exhibition. But the visitors only seldom took the chance to clear questions, they asked them aloud but without directing them to the guide. When the questions were answerd, or the guide herself started to explain some objects, the visitors were interested and pleased to listen to information that came from one of the exhibition builders.

According to Falk/Dierking (1992: 64) most of the visitors start their path through an exhibition on the right. The study at hand shows that visitors equally started their visits on the left side and see the exhibition clockwise, as on the right side and therewith follow the path counter clockwise. As shown in the observation records a difference in interactions or the time spent in the museum cannot be stated.
Although the time spent in the exhibition cannot be set in ratio with the entire visit time in the museum, it provides an insight in the exhibitions success. The average time spent in the exhibition was 4.5 minutes, including two outliers (34 seconds and 1440 seconds). Since only 4 observed individuals saw the exhibition alone, statements cannot be made about the company’s influence on the time spent in the museum. Although not meaning to be a quantitative study, the results show that the time spent in the exhibition and the number of interactions between the objects and the visitors increase proportional (appendix: listed observation sheets). The long sections without any interaction are to trace back on the exhibit-cruising period that is reached, when entering the exhibition. Most of the objects only attract the visitors’ attention briefly, but a holding-power was seldom stated.

Furthermore it was observed that it was difficult for children to find objects that caught their interest in the exhibition. Although the labels were kept in a simple language, children read even less than adults and therewith just run through the exhibition looking for something interactive and left it right away. Children in the age up to 15 years never stayed longer than half a minute. The ones that came with adults either stayed there upstairs because of waiting for them, or when looking at the objects together. On contrary during the workshop many children came alone, or just with friends and even looked around in exhibition, while waiting for their ice-cream. But not only children, visiting the exhibition were influenced by the accompanying adults. Parents were guided through the exhibition by their children as well, when following them to the objects the kids were interested in. These findings prove the necessity of analyzing group processes as well, when conducting a qualitative visitor observation.

5.2. Workshop Evaluation

5.2.1. Organisation

Right after pre-testing the ice-cream production during the opening of the exhibition, the author realized that the waiting time until the ice cream is done is to be one of the most difficult parts of the activity. Therefore, the organisation’s first aim was it to develop a tight schedule to shorten the waiting time as much as possible. Due to the announcement of the activity in the museum’s loudspeaker system, most of the kids came in the very first minutes of the workshop. And since they often did not realize that the activity lasted for 1-2 hours, it was hardly possible to put them off until the next 20 minutes. On account of that and because of uncertainty about the children’s experiences in handling ice and salt, the demonstrator prepared the freezer for the kids. As described in chapter 4.2.2., the children mixed their ice cream on their own. It was amazing that they had more fun in mixing their own ice cream with their individual taste, than observing how the mixture actually became ice cream. After 4 days, the demonstrator encouraged the kids to prepare the ice-salt-mixture. The kids had very much fun doing that, and the guide had to realize that she underestimated the kids in the beginning.

Approximately 3-6 children could work simultaneously at the table. Once 25 kids, a school class came to the tables at the same time, right after the announcement in the museum. Everybody screamed and wanted to start. It was impossible for the demonstrator to handle that and motivate them to wait and come back later. The kids spilled everything, there was not
enough space in the freezer and they became disappointed and frustrated. The only solution that might solve the problem in such a situation, is the division of the group and explaining them strictly that everybody might have much more fun when waiting some minutes until their turn. When working with a group like that, the demonstrator should also dare to ask the teacher or minder for help.

Because of the high temperatures in the exhibition area, it was difficult to keep the mixture cold for more than one hour. It became therefore necessary to use a thermometer to control the freezer’s temperature. It was now possible to add salt or ice in time or to mix a new freezer and the visitors were even more astonished when seeing the temperature of –19 degree. Unfortunately the activity that enabled the visitors to take a picture and send it to a friend, did not work unfailingly because of the heat. Because of that the demonstrator could not imply this activity for bridging the waiting time.

Before asking something about the exhibition, the visitors often wanted to know whether the demonstrator worked in the museum or whether she is introduced in the exhibition. This uncertainty stresses the importance of definite clothes and charisma of museum staff that encourage the visitors to ask their questions.

It was amazing that the children asked increasingly for milk-free or lacto-free ice cream. Is it discriminating nowadays, not to offer that?

5.2.2. Group Processes

Group processes describe the levels of interaction between the partakers in the workshop and the leader of a group. Although the workshop was held in an open and informal atmosphere, the children raised the demonstrator in a hierarchical position that was not intended. Particularly when asking about the waiting time for the ice-cream, they trusted truly on the demonstrator’s words. If the demonstrator said, it would take about 10-15 minutes, they came back after exactly 10 minutes and accepted hardly any delays. Moreover they wanted the guide to decided whether the ice-cream was done or not. Even if she continuously repeated that the kids could decide on their own, they trusted on the demonstrator’s decisions when it is to be ready. The kids blamed it on the demonstrator’s advices too, when their mug took a bit longer than the ones of their friends. Furthermore they wanted clear advices for every single step and the concrete amount of the ingredients. Only a few tried to experiment with the ingredients.

Adults and parents were also fascinated of the activity. They tried to create their own ice cream and supported their kids with a helping hand or advices. This was particularly helpful when the demonstrator was not able to be the explainer for every child. On contrary some parents could not understand their kids passion in waiting for their ice cream. “You really want to wait for these 2 spoons” was an expression that showed this clearly. These parents had difficulties, recognizing the workshop as a learning facility.

It was astonishing for the demonstrator that the kids were quite shy in the beginning. Many asked their parents whether they could take part. Often, the parents even had to motivate them. But the ice breaks later; the kids explained everything to each other and even encouraged friends or siblings to try this.
5.2.3. Learning Effects

Some obvious learning effects, the author observed when holding the workshop, shall be listed here. Heart of the workshop, concerning the learning effects, was a simple explanation appropriate to the children’s age. Much effort was put in this explanation, on that account it was even more surprising that most of the kids were satisfied with a simple explanation, telling that water becomes cold when adding salt. They never asked further, wondered or even doubted this explanation. Only a few adults asked about the chemical and physical explanation and still never wanted to know smallest details. When beginning with deeper chemical or physical information, most of the adults lost interest. Only the ones that were obviously very familiar with these processes followed the demonstrator and sometimes even named further substances that show these characteristics. Interestingly enough it became usual that the children created their ice cream and the adults asked for the explanation. More often than kids, adults transferred the knowledge and experiences they had when following their kids’ activities and asking for an explanation, to their daily life. Sentences like “Ah, then we can use that when cooling a bottle Champaign at home” or “then this is also used when salting the roads in winter time” proved this.

On the other hand children wanted to take this activity home by repeating it there. Many of them asked their parents, whether they could do that at home. They wanted to show it to their relatives and friends. And very often even adults were taken by the idea to have the same activity on their next family meeting. A sheet of paper with instruction and explanations for the activity as well as further ideas helped the activity on its way out of the museum and in private households. The visitors who took part in the activity might work as disseminators for a simple experiment. Beside that children showed learning behaviour when starting to explain the activity to other children or to their parents.

5.2.4. The Demonstrator’s Reflections

Aside of the visitors’ behaviour and to understand the output of the workshop completely, it is crucial to take a look at the demonstrator’s thoughts and reflections. Connected to the findings in 6.2.2. The author wants to point out the difficulty to explain that even the demonstrator herself did not know exactly the period of time that the ice-cream would need. The guide also observed that the people stay much longer in the exhibition and in front of the workshop table, when there are less people in the exhibition. For the demonstrator it was then easier to start a conversation that goes beyond the instructions for the activity. Not only once the author experienced gratefulness and interest of the visitors in a conversation with museum staff that was deeply involved in the exhibition. Under these circumstances it is also less complicated to follow the visitors around in the exhibition and explain their questions at the objects.

Because of the long period of time the workshop was held, it was an interesting experience how easily the workshop became routine for the demonstrator. While every day, even every 20 minutes new kids and children entered the room and were enthusiastic in mixing their own ice cream. It is important for demonstrators, guides and floor staff in general to be aware of that all the time to avoid losing interest in their work and to keep the same quality. It is therefore very important for museum staff to get as much feedback as possible; intern feedback from museum staff in the same or different positions, as well as from the visitors themselves. The demonstrator was able to experience that several times. Other guides as well as museum staff in other positions were interested in the activity and gave feedback and hints
how to improve the activity. Visitors articulated their feedback quite often and directed it to the demonstrator. But the most shaping experience was it to listen to some boys in the bus. The museum closed and the author went in the same bus downtown as many visitors too. Without being recognized the author could listen to some boys who told a third one, that they were making ice cream in the museum. They described him how to do it and argued about the taste they tried. They stressed several times the simplicity of the experiment.
6. Discussion and Conclusions

Throughout the paper, many minor discussion points were mentioned and some conclusions were already drawn. In this chapter, the remaining results of the study will be discussed and overall conclusions will be offered that go beyond exhibitions, floor staff and learning facilities.

During the fieldwork and the internship at the National Museum of Science and Technology it was continuously detected that, although the organisational structure of the museum provides many cooperation points between different sections in the museum, an exhibition stands and falls with the exhibition builders’ engagement, patience and insistence. The exhibition-building period, independent of being a low budget project or an exhibition with sufficient financial resources, is often characterized by a tough and extensive schedule and hardly ends with the opening of the exhibition. If not done before, guides need to be introduced in the exhibition topic, remaining installations must be finished and the maintenance work starts with the very first day the exhibition opens for the public. Particularly these very first days prove whether the results of front-end studies were implemented correctly and require sensitive observations in the exhibition halls. The opening is also the kick-off for formative and summative evaluation. Exhibition builders who are lacking the enthusiasm and interest in their exhibition are the worst prerequisite for a successful exhibition. Hence, it is essential for exhibition builders to develop enthusiasm for an exhibition topic and to be as communicative as possible to spread the information about the exhibition amongst the museum staff as well as initiating the out-of-house public relations.

An important characteristic for the exhibition and the National Museum of Science and Technology in general, is the integrated science centre area “Teknorama” in museum halls that follow the charter to be responsible for preserving the Swedish technological and industrial history cultural heritage. Science centres work on the maxim “Nothing happens unless you make it happen” and are thus predominantly characterized by hands-on exhibits and their constructivist structure. The exhibition “Antarctica – that’s cool!” joins constructivistic exhibition elements and hands-on exhibits with objects that represent the Swedish technological cultural heritage. On account of that the exhibition builders have to walk a tightrope, when combining these elements in an exhibition hall that does not offer the possibility to obviously separate these elements. This leads on the one hand to clothes that remain unproven in a cupboard, although being meant to spread the feeling of a researcher’s daily life on Antarctica or on the other hand to a model of a research project that is abused as a labyrinth. Efforts must be done to safeguard the classic exhibition elements and implement the hands-on elements characteristics that encourage visitors to try them. Finding solutions that suite the museums financial and personal budget were main task in the first weeks after the opening.

Throughout these first weeks that were characterized by aggravating circumstances because of hundreds of school classes that flounced the museum without any custodians, the author accepted the challenge to be role model, guide and security at the same time. Experiences showed that particularly school children in groups even when reproving them for their behaviour in the exhibition hardly follow the guide’s instructions. Very positive experiences were made when acting as a role model, taking pictures with the camera, proving the jackets and reading the presentations in the computers. It was also observed that visitors acted as role models as well, a behaviour that is already described in Falk and Dierking’s (1992) descriptions about the social context of museum visitor. The exhibition “Antarctica – that’s
cool” could benefit of the science centre area that already introduced the visitors, particularly children, in behaviour patterns of interactive exhibition elements.

The results consistently show a positive visitor feedback on the presence of floor staff in the exhibition. They appreciated the workshop that was offered and the spotlight tours, they were eager to ask questions once the first contact was made. Museum staff on the exhibition floor provides not only complex possibilities for learning effects in an exhibition, they are even essential to build bridges and links in the exhibition. Although an excellent exhibition is to be self-explanatory, only humans are able to sense the visitors’ previous knowledge and accompany them on an appropriate level through the exhibition.

Museums and science centres in general should stress the focus on learner-centred evaluations. Museums should offer a red thread throughout all their exhibitions, to stress the difference of museums to a book with different chapters that are only linked through the spine. This red thread should not only be visualized by a corporate layout but by contents and topics that stimulate each other; a museum structure that derives from the World Wide Web with its hyper links. The users and visitors are not forced to use these links but they are encouraged to do so. Of course it might be difficult to integrate a red thread in museums with a long history and collections that hardly change. But particularly in those museums, floors staff has a key role in linking the singular objects and exhibitions and thereby contribute to an interesting and stimulating museum visit.

Particularly in times, when museums and cultural facilities have to fight for money and reputation, to maintain and build exhibitions and to fulfil their charter, discussions about affording the own museum staff are the ones feared the most. People, who talk with the visitors that represent the museum in its halls, add zest to the museum. Due to the financial circumstances, short-staffed museums are the rule and the staffs that are available should be encouraged to contact the museum’s audience frequently. And although computers are by now part of the daily life for almost two decades, the machines cannot be substituted for museums staff. In fact, results proved that computers on exhibition floors have a high attracting power, but only seldom keep or stimulate the visitors’ interest.

Moreover, the exhibition perfectly represented a clash of museum techniques that overextended the visitors as well as the museum professionals. How to explain that one object has to be touched in order to display its assertion and the object next to it is not be touched at all? Surprisingly, objects with a high authentic value, as the Icecore and boxes for transportation, had a very high attracting power although not looking enthralling at all.

As the results proved and the exhibition builders expected, the exhibition hardly offers contents for children in the age 5-10. Therefore the idea for a theatre performance in the exhibition became relevant during the very first weeks of the exhibition. The National Museum for Science and Technology already offers short plays for the youngest museum visitors, about the space and historical plays in the mine. The author wrote a short synopsis for a play in the exhibition. Using the contrast between Arctic and Antarctic and playing starting with the common question about the eating behaviours of penguins and polar bears, could even fascinate children younger than five years old. The exhibition itself with its southern hemisphere’s starry sky, the white horizon along the walls, the snow area in front of the research station and the ice floes, could act as the stage setting, for penguins and polar bears, Amundson, Scott and Peary, for polar day and polar night, for inuits and compasses. A theatre play like this could use and prove the fascination about our sixth continent, after activating this fascination, other educational programs for young and old might increase their
efficiency. Even topics, as astrophysics do not seem that complex any longer when wrapping it in such a theatre play.

Last but not least the author wants to stress the increasing importance of museums in our society. As stated of several researchers before and analyzed in this study as well, visitors trust the information, they get in a museum or when talking to museum staff. Museums are learning places; they should become aware of this function in a society of life-long-learning and take this advantage of the situation. Particularly new or highly specific topics, disputes or campaigns could find a suitable stage in museums (John/Thimess-Demel 2004: 44). Therefore, museums should continuously work on their image that is to be changed from dusty places with old objects to dynamic learning areas. In times of information overflow, hectic pace and anonymity, museums are places that compress information and present it in a place of silence. Museum staff that is encouraged to transfer the museum advantages to the visitors, is the highest capital of a museum. Further studies that put light on museums under broader perspectives might contribute to the museums’ image and provide them a responsible position in today’s society.
7. References


Margie, Marino / Koke, Judy (2003): *Face to Face, Examining Educational Staff’s Impact on Visitors*, ASTC-Dimensions


41
8. Appendix

Observationsheets (OS 1-25)
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<td>234</td>
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<td>The son says that the fog chamber doesn’t work → this should have been the first station of their visit</td>
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<td>M</td>
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<td>175</td>
<td>M3/F2,5</td>
<td>Model IceCube: „Ui vad fint“ Film penguins:</td>
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"Kan de verkligen bara leva av vattnet?"
Family, everybody did something else, they tried many things.

<table>
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<th>Age</th>
<th>Name</th>
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</tbody>
</table>
| Example:  | company: M5/ F2,2  
Male 25-45, (female) two girls 5-10 years old |  |  |  |  |  |  |
Barriault (1998) established different items to measure the visitors interest and learning in an exhibition. Since this study is not supposed to measure the learning in the museums, this study only uses the items, that describe the different levels of interaction.

The ranking is based on the multiplied interaction, meaning that the number of interaction 1 is multiplied with 1, the number of interaction 2 is multiplied with 2 and the number of interaction 3 is multiplied with three. These results were added.

\[ \Sigma = x \times \text{Interaction1} + y \times \text{Interaction2} + z \times \text{Interaction3} \]
Floor Map: National Museum of Science and Technology
Så gör du din egen glass
- och andra experiment med is

Glaskåller

Du behöver:

Till glass:
mjölk, grädde, socker, vanilj, kakao,...

För att kyla:
2 skåtar av olika storlek, is, salt

Och:
handskar eller handdukar, sked

Och nu:

Rör mjölk, grädde, socker, kakao eller vanilj (beror på vad du gillar, du kan även testa andra smaker, slutligen är det du som ska experimentera och blandad din egen glass) i den lilla skålen och rör din glassmassa.

Nu tär du den större skålen och rör ihop is och salt. Det funkar bäst när du använder 1 del salt och 3 delar is (t.ex. 33g salt och 100g is). Sätt den lilla skålen i den större skålen och vänta. Vispa eller röra in din glassmassa ibland.

Snart är din egen glass vara färdig; utan frys och utan en resa till ANTARKTIS.

SMAKLIK MÄLTID!

OBS is-salt-blandningen kan bli 20 grader kall, använda handskar eller en handduk. Fråga glänsa en vuxen om hjälp.

Förklaring

Varför smälter isen när man saltar på den? Det kan verka som trots att is kan smälta till en lösning som är -20 °C bara för att man håller på vanligt koksalt. Men metoden har använts för att göra ködblandningar i många århundraden, t.ex. för att frys glass.

Här en förenklad förklaring till varför isen smälter. Vanligt koksalt löser sig lätt i flytande vatten. Det blir inte särskilt salthy, temperaturen sjunker kanske några grader grad i lösningen. Om man saltar på is "vill" alltså saltet läsa sig i vatten. Men där finns inget flytande vatten, bara fast vatten (is). Därför kommer isen att sträva efter att smälta (bli flytande vatten) så att saltet kan lösas, men för att isen ska smälta krävs värme, det gäller ju att bryta attraktionen mellan vattenmolekylerna i is. Värmen måste tas någonstans ifrån och den tas från isen och den lösning som bildas när isen smälter. Det syftar är inte konstigt att vatten i en bomullstuss blir kallt när en del av vattnet i tussens avsnitt. Lite värme tas förstås från luften också, men luft innehåller inte särskilt mycket värme eftersom det är så grej bland molekylerna. Tänk till
Exempel på att det är en vildig skillnad mellan att ha handen i en het ugn och att stoppa den i kokande vatten! Om man blandar en del salt och tre delar is blir det som allra kallast. Då blir den saltlösning som tillskrivs närmligen mildtat på salt. Då ska man kunna få -20 °C. Ibland sällar man med kaliumchlorid (vågsalt) istället. Med rätta proportioner på is och vågsalt kan man komma ner till -30 °C.

Experiment med is

Lyfta en isbit

1. Häll upp vatten i en skål, fyll skålen till hälften och lägg sedan in en isbil.
2. Försök plocka upp isbiten ur vattnet, kläm efter hur hal den är. Lägg tillbaka isbiten i vattnet.
3. Lägg en bit bomullsträd över isbiten och strö över en nypa salt.
4. Vänta 1-2 minuter, försök därefter att lyfta isbiten med hjälp av tråden.

En iskedja

Ta flera iskuber och strö salt på en sida av varje iskub. Sätter de tillsammans som en tåg och vänta ett ögonblick. Snart frysar de tillsammans och du har en iskedja. Kan du även bygga fantasifulla figurer?

Var kan man förvara is längrest?

Lägg is i en skål, termos, plastpåse, träläda, tidningspapper... Var tar det längre till isen smälteras?

Vem har den kallaste eller varmaste händerna?

Ta en iskub i din hand. Vem iskub smälter först, vems sista?