Science centre exhibits – from a teenager's point of view
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ABSTRACT Science centres all over the world are making huge efforts to increase the public understanding of science and capacity to solve problems in creative ways by the means of technology. The free-choice settings invite visitors to explore and experience science and technology through self-direction and self-discovery. Assessing the educational outcomes of the Science Centre pedagogy is not an easy task, but it may be fruitful to assume learning in technology in this setting to be an enculturating process. If so, the task is to summarize evidence of interactions that enculturate.

In this paper I want to discuss my forthcoming thesis from this point of view. I regard the science centre exhibits to be artefacts, materializing the views on science/technology and communication/learning in the social practice of the science centre movement. Focus is on how teenagers reproduce this practice when interacting around and with the exhibits. I am using the methods of visual ethnography to analyse what happens in these encounters, and data consist partially of video documentations done by fifteen-year olds visiting a Swedish science centre. The main issue in this project is to move towards a more thorough understanding of the potentials, difficulties and consequences of putting science and technology on display and to try out new ways of doing research on learning in science and technology in free-choice learning settings.

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Introduction

In a Swedish governmentally funded assessment (Riis, 1995), science centres have been pointed out to be an important resource in encouraging teenagers to choose higher education in science and technology. This is something that lies in the interest of the society, since there seems to be a problem to get a sufficient number to do so. And to get a sufficient number to do so is sometimes described as a fatal question for a nation’s future prosperity and development. Still, there are ongoing discussions within science centres on how this can be accomplished, because of the difficulty of getting teenagers to come to the centres on a regular basis. This is the starting-point of my research project, which I am conducting as a candidate for a PhD.

Teknikens Hus in Luleå, Sweden

My study is carried out at The House of Technology (Teknikens Hus) in Luleå, in the very north of Sweden. It is, as all science centres are, a place with activities and exhibits with the purpose of popularizing science and technology, and to educate in a self-directed manner, through interactive objects and demonstrations. But Teknikens Hus is focusing on exhibitions, which are based upon the technology of the Norrbotten region and everyday technology. Exhibits include steelmaking, mining, papermaking, aerodynamics, household technology, space and more. These exhibitions provide examples of a holistic concept, where the science and technology are shown in their application in the nearby society. However, whereas many other science centres organize their displays thematically, by different science phenomena (light, sound, etc), Teknikens Hus has chosen to focus on technology in its appliance (see www.teknikens-hus.se). This is also why my study incorporates learning in both science and technology, with the main emphasis on the latter.

An indoor picture of Teknikens Hus
A rationale for studying teenagers’ relationship to science centre exhibits

During 6 months in 2000, I was working at Teknikens Hus, when I got the opportunity to make a survey, including all the pupils who where about to leave upper secondary school that year. Since Teknikens Hus is one of the oldest science centres in Sweden, Luleå was at the time one of the few cities in Sweden where 15-year-old teenagers have had the opportunity to visit a local science centre during their entire life. Accordingly, the survey included only 14 informants who claimed that they never had visited Teknikens Hus on a school trip. There was also a pattern suggesting that they had been visiting the centre most frequently when they were 7-12 years old, after that only occasionally (usually on mandatory school trips). For the vast majority, visits to Teknikens Hus meant mainly browsing around the exhibit area, to learn “things” (during school visits) and have fun (if the visit was together with family and friends). However, they never specified in their answers what “things” they learned and what “things” they got to do during a visit. I started to think about how and towards what does a visit affect the visitor? What do teenagers experience when they encounter the exhibits? And since they have been very frequent visitors when they were smaller, what stops them from going there when they become 13 years old?

Bradburne (1998) suggests that you can look upon the traditional science centre as a dinosaur. Firstly, because the modern science centre movement was created in the post Second-World-War American society, and its concern of informing the public of a positive image of science and technology. Ecologically speaking, this niche has changed, since many nowadays measure a society’s prosperity from its ability to adopt the concept of being a learning society. The traditional science centre focus on scientific information is simply no longer tenable if the next generation is to keep up with the speed at which society is being transformed. Secondly, science centres are looking at falling visitors numbers because of the institutional model it has chosen to follow; a collection for people to visit. Instead, Bradburne argues towards a library model, in which people become users, rather than visitors. Following the dinosaur metaphor, science centres with its collections of interactive exhibits, are experiencing competition from smaller, more flexible forms of life.

In November 2001, I participated at the ECSITE4 conference held in Luleå. I especially remembered a seminar titled: “Museums and Teenagers: a continuing challenge!” It occurred to me that recurring efforts have been made at science centres around the world to promote innovative ways to reach out and engage teenagers, and catch their interest in science and technology. From my point of view, one of the problems with these efforts, is that much of it has been done to bring interest, attention, devotion, and motivation to the visiting teenager. The efforts as well as the analysis of these efforts have therefore come to regard either the content of the science and technology displayed as a subject, or the visitors’ ability to profit by the content of the subject matter or the way it is displayed in the science centre.

Since I am accustomed to the way science centres usually organize their learning environment, it seemed likely that it may be inappropriate to use a learning metaphor that implies that something is transmitted from the environment to the visitor. And it also felt strange to view the things transmitted as static and transparent, when you regard the science centre movement situated in its historical, cultural and highly ideological setting. Instead, it seemed more fruitful to regard the whole situation as teenagers living their lives, and when visiting a science

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3 This survey is not published, but information about it may be achieved from either the author or directly from Teknikens Hus (www.teknikens-hus.se). It is called "Ibland lägger sig vissa saker i bakhuvudet…" Elever i årskurs 9 i Luleå uttalar sig om Teknikens Hus – en enkätundersökning.
4 European Collaborative for Science, Industry and Technology Exhibitions (www.ecsite.net)
centre, their lives influence and get influenced by interacting with exhibits produced with a
purpose of making an impact in a specific direction. In the process of integrating these things in
their lives, the teenagers engage in a process where they create a relationship with the artefacts.
Perhaps this particular relationship may be one of the keys to better understand teenagers’
learning from interacting with traditional science centre exhibits?

A conceptual framework

Drawing of the work of Sharon MacDonald, it became clear to me that science centres not
only show science and technology in their exhibits, they create representations of these subject
matters.

In other words, one effect of science museums is to pronounce certain practices and artefacts belonging to the
proper realm of “science”, and as being science that an educated public ought to know about. (MacDonald,
1998, p 2)

Reading Walton (2000) also made me aware of the importance of regarding these artefacts as
situated in the science centre context. They are artificial in the sense that they haven’t been
constructed to change the world in some way (which are normally the characteristics of other
technical artefacts), but to change the visitors’ view of the world. Clearly, this is why they only
exist in the science centre culture and context.

Thinking of the exhibits as artefacts, and materializing the culture, history and ideology of
the science centre-movement, open up the discussion of people’s interaction with exhibits to be
more than transferring a content matter. James Wertsch (2000) points out that any action is social
since it “has to do with the broad socio-cultural context in which it occurs. By this I mean that
any episode of human action must occur in a specific cultural, historical, and institutional context,
and this influences how such action is carried out” (p 18). He continues that an artefact, and an
individual interacting with it, “provides a mechanism for analyzing the relationship between
individual and socio-cultural setting”. (p 18)

The exhibits at science centres are, as noted above, organized in different modes, but there
are some things they have in common. One thing is that they are designed to invite visitors to
explore them in a self-directed way. Teknikens Hus is not an exception. I would like to explain
the learning as organized in a tradition, which sometimes is described as intent participation
(Rogoff, Paradise, Arauz, Correa-Chavez, & Angelillo, 2003). Learning in this tradition is
explained as a transformation of participation in ongoing cultural activities, and affects all the
participators in that practice. This, in contrast to other educational philosophies where learning is
seen as accretion of information or skills, brought across a boundary from the external world to
the mind of the learner (Rogoff, 2003).

In using these conceptual tools it became clear to me that the phenomena I have to study are
not only activities performed by the teenagers during a science centre-visit. Instead, my focus
should be the practice these teenagers participate in when interacting with the exhibits, a practice
that is constructed over time, is highly situated in the science centre context and intertwined with
the teenagers’ personal experiences.

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6 This way of reasoning is in line with recent research on learning from museums; see for instance the special issue of
Science Education, 88(Suppl. 1), 2004.
Using the conceptual tools

Now it became quite clear to me that my research should concentrate on the relationship between the teenagers and the exhibits. The teenagers’ feelings about a science centre visit have developed from the ways they have learnt and understood what a visit means. These understandings are gained in part through interacting with the exhibits, considered as artefacts. Thus, my research problem becomes to understand how teenagers’ practice in the science centre shape and is shaped by their interaction with these artefacts.

In my work I have chosen to regard my unit of analysis, teenagers-interacting-with-science centre exhibits, as a multifaceted phenomenon with multiple choices about on how to analyse and describe it. Therefore, my results have to be a partial truth, with the starting-point in the teenagers’ agenda during their visit. From the science centre point of view, the built-in assumptions about the world are expected to be reproduced by the visitors when they interact with the exhibits. However, recent research on learning in science centres from a socio-cultural perspective, stresses the importance in regarding the visitors’ agenda, instead of the museums’ agenda (Ellenbogen, Luke & Dierking, 2004). The term “visitors’ agenda” emphasizes the need to recognize and accommodate the resources visitors bring to the museum in order to create a successful learning context. Visitors not only have their own agenda for their museum visits, but these agendas directly influence the impact of the museum experience. Drawing on Bradburne’s reasoning, you could ask whether the teenagers are using or visiting the science centre. So the question to begin with should be what role the science centre has in the visitors’ whole life, not only the moment of their life spent inside the museum.

Learning processes

Starting off with the teenagers’ agenda for a science centre visit in the analysis of their practices, I have chosen to put particular interest in the learning processes involved in these visits. When regarding learning as situated in a cultural activity, learning becomes an enculturating process (Bruner, 1996). Instead of trying to study educational outcomes of a science centre visit, it becomes more interesting to study functional aspects of the interaction between and among visitors and exhibits. Rogoff et al, (2003) also point out that assessing a situation where learning is organized as intent participation, the focus has to be on the process (for example, participants’ interest and voluntary willingness to be involved) and not on the outcome. Schauble (2002) shows the importance of studying practices instead of mere activities and behaviour of the visitors, to better understand the learning processes involved in the science centre experience. Participating in a community of practice means more than to involve oneself in activities; it is to function within a group that holds shared understanding, and learn through the notion of appropriation.

Appropriation is an activity of identity (Rogoff, 2003, Wertsch, 1998), and identities and communities of practice are inexorably linked. This is something Kirsten Ellenbogen stresses in her thesis:

Learners are members of a community to the extent that they have learned normative ways of thinking and acting that have been established by that particular community. Much of this learning is implicit and involves implicit assumptions and rules about particular ways of speaking and using cultural tools.-- The development and negotiation of identity is influenced not just by community, but also the organizations and institutions of the community. Building upon the statement that educational institutions are about enculturation (Bruner, 1996), leads to the proposition that museums and the other institutions that make up the learning infrastructure are about forming identity. (Ellenbogen, 2003, p 50-51)

The pedagogical perspective in this study is informed by the notion of learning as an activity of forming identity, which influences and is influenced by the process of shaping and defining the local community; teenagers’ interaction with science centre exhibits. The way the teenagers “do”
(construct) science centres in this local community, and the way they use the exhibits to represent their self-identities will allow for a better understanding of how the process of learning technology can look like in out-of-school settings.

Description of the study

I have chosen ethnography as methodology, considering it as an approach to experiencing, interpreting and representing culture. Since my aim is to study the encounters among teenagers and science centre exhibits, and to see how learning processes develop by the means of mastery, appropriation and representing self-identities, I have chosen a visual form of ethnography. My data result from the production of video films during a science centre visit, and how the informants and I make meaning of the content in these videos.

Acknowledging the science centre visit as highly personal and contextualized, I decided to go for a collaborative approach to the informants (in contradiction to an observational approach). I asked 5 teenagers from Luleå7 to go to Teknikens Hus and film their own visit. Later on we sat and watched the videos together, and the informants were asked to stop the video at any time in order to discuss the content more thoroughly. After this video session we had a group discussion of their visit and the films over all. Here I was participating as the one who fed the discussion with questions, mainly focusing on what they were doing in the video films. In all, the informants created a conversational space through the video films, in which they had the opportunity to represent themselves, and in which we mutually examined the role of the interactive exhibits in our co-construction of what it means for a teenager in Luleå to visit Teknikens Hus.

This has methodological and ethical implications. Firstly, it implies working with informants and attempting to understand and represent their points of view and experiences. It also builds on an assumption about accessibility of information that “reality” is not always visible, and even those that are visible will have different meanings to different people (Pink, 2001). And last, I view image production as part of a process by which knowledge is produced rather than as mere visual note taking. Ethically, this has led to my request for the permission to publish these video clips, which I have received from the informants.

Sense making

In my analysis I try to recognize the context in which the image was produced, the content of the image, the contexts in, and subjectivities through, which images are viewed, and the agency of images (Pink, 2003). This practice will hopefully take advantage of the ambiguity of meaning in images, and is built on an assumption that things become visible and meaningful because of how we see them rather than simply because they are observable.

After cutting the video films into film clips, I started to bring them together with the discussions we had about them later on. This procedure gave me the opportunity to reflect upon how my informants used the exhibits to represent themselves in the practice of doing a science center visit on one hand, and how they used the video clips to construct what this practice consists of on the other hand. Eventually, I also realized that my own role also had an important impact. This lead me to treat all parts of the group discussions where I was engaged verbally in any way, separately from the parts where the teenagers discussed their video films without my participation.

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7 These teenagers where picked out as ”collaborative” by their teachers. Another criterion was that they had lived in Luleå the past 10 years, and that they were familiar with Teknikens Hus.
About representation

In this paper I will concentrate on one part of the preliminary findings, which has to do with describing the teenagers’ practice when interacting with science centre exhibits. I have chosen to let them partially represent themselves, because I want to draw in and engage the readers, and to make use of the ambiguous meaning in images. In my forthcoming thesis I want to make full use of images and words and to combine them in a text that aims to represent how my informants spoke about, showed me and experienced their science center visit. This will include written theoretical narratives and narratives that combine images and words to represent the research materials and experience. During this conference session I would like the participants to engage in the following images, and hopefully this will lead to a constructive meaning making with the focus on learning in science and technology. During the session I will also show the films where I have picked out the still images below.

Depicting culture

I have deliberately chosen these examples because they combine images and text referring to a specific aspect of the science centre practice represented in the video clips. I want to stress that these examples should not be considered as something that characterizes the results as a whole; my point is to show how I work when interpreting my material. I would like you to appreciate the fact that these video clips, represented in this paper as still pictures, have a dual role, as both a reflexive device and a medium for representing examples of the diverse practices, opinions and experiences that form part of teenagers’ encounters with science center exhibits. They become a link between my fieldwork and representation, here used both to explore and to represent ethnographic experiences and informants’ self-representations.

Example 1: Heat Conduction

Images with subtitles from the video films:

Discussion among the informants during the video session:

- Nothing happened…
- I think I never have had the time to look at that thing.

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8 Heavily inspired by Pink (2004), I try to have a reflexive approach to analyzing the video films in this study.
Discussion among me (researcher) and the informants during the video session:

T*: This one has stood there for ages.
R: *What do you do there?
T: At first, we didn’t get it.
R: *You directly push the button.
T: Yes, you push all the buttons. What was its name? It was something that warmed up…
T: It is written there, it was going to show shadows when it got warm. It felt a bit simple.
T: Rebecca, when she didn’t see the results at once, she just said, “Let’s go”. As soon as she went, things started to happen.

Example 2: Mine Drill On Screen
Images with subtitles from the video films:

Discussion among the researcher and the informants during the video session:

R: *What do you do here?
T: I don’t know what it was. It was a lot of buttons.
T: But what was it about? I haven’t got a clue.
T: It was something you were supposed to steer.
T: But it was like one of these exhibits, where you don’t understand. And there was a lot of text that you can’t cope with reading. If you understand when you look at it, then you will stay and look.
R: However, you stood and watched quite a long time?
T: That was because there were a lot of buttons to push. You have to try them all.

9 T=Teenager, R=Researcher
Example 3: The Drinking Water.
Images with subtitles from the videofilms:

- And now…?
- OK.

Discussion among the informants during the video session:

T: We didn’t understand this one either.
T: You are supposed to drink from it.
T: Oh yeah? (laughing) I thought it was one of those game-things!

The Practice of Button Pressing

Encountering these exhibits mean trying to find out how to manipulate it. If nothing happens directly, there seem to be no interest in further investigation. In a way they consume the exhibit, by doing the one thing that crossed their mind from a first glance; to push the button/s. They concentrate on that something should happen in the exhibit. The consuming of this kind of exhibit is related to how much time it takes to manipulate it and to experience the reaction.

The button has a key role in their practice during the encounter with the exhibit; it both affords immediate action, and constrains any further investigation. Once the button was pressed, this kind of exhibit was consumed. The notion of mastery applies to the handling of the exhibit, to get it to work properly. Obviously, the notion of button pressing is something that is well appropriated in the practice of encountering a science center exhibit. Emily says: You have to try them all, and shows the meaning of that when encountering a tap with drinking water. She does not recognize it for what it actually is, but since she finds it in the science center context, she assumes it to be an exhibit, perhaps also since it is designed with a button to press.

Something more happens later on in the group discussion I had with the informants. We came to talk about the concept Teknikens Hus is using when displaying their exhibits, and one of the informants made a comment on how different Teknikens Hus would look like if it were built in Stockholm. Therefore, I made a connection to the fact that The Museum of Technology in Stockholm has a space for interactives, called Teknorama. In trying to make a further explanation about this place I suggested that in Teknorama you could do more experiments than in the rest of the museum. This led to the following discussion between Emil and Kim:
I don’t think there are so many experiments in Teknikens Hus. It is more like an assembly line. To me, it is more like pushing a button and look what happens. Everything happens in such a controlled form, it is not like you can break anything.

- Yes, you can...
- But everything is like…everything is fixed and nothing can be changed.

My association to science centers with making experiments just did not fit with the practice of button pressing. Instead, it seems like this practice involves simply looking at what happens. In this practice the exhibits gets exhausted after one, or a couple of tries or as Kim put it:

- You have been so incredible large number of times at Teknikens Hus so you have become fed up with it—Even if it comes new things, it is the same kind of things. It is always like…you know pretty much what to expect. No surprises.

The practice of button pressing, and the action of pressing and looking, is highly situated in the science center setting. It is the way my informants choose to represent many of the exhibits they encounter. The button almost becomes an icon, a science center exhibit specialty. My informants use the video camera to document when their partners press buttons, use handles, and manipulate exhibits in the required way.

However, the learning processes involved in this practice seemed to be focused on which button to press and when, with the objective to learn to manipulate the exhibit in the intended manner. Interestingly enough, the investigations do not move beyond that point. Indeed, there are other practices represented in my research material, which includes investigations that do move beyond merely manipulation. This indicates how strongly the artefacts influence the practices even though represented in the same setting (the science center).

**Depicting identity**

Surely, the practice of button pressing does not indicate higher levels of science and technology learning, looking at it through a traditional hierarchical framework for measuring science learning from museums (see Borun, Chambers & Cleghorn, 1996). However, these measurements reflect the museum’s agenda. Ellenbogen (2003) shows how explanatory talk among family members, the most desirable and important kind of talk to go on in a museum (because it is science talk) from the museum’s point of view, does not serve the visiting families’ agendas. Rather the identifying and describing levels of conversations, described as the lowest level of science learning by Borun et al (1996), are serving the vital agenda of how families construct meaning and thereby establish family identity.

The question is, how do the teenagers use the video films to construct meaning, and subsequently negotiate their self-identity, when interacting with the exhibits?

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10 Surely, it has its equivalents in other learning settings too
Example 4: The Key and the Lock.
Images with subtitles from the video films:

- (giggle) You always did this when you were small
- Aha, is that why it sounds like that when you put in the key?
- Yeah
- I have never realized that.

Discussion among the researcher and the informants during the video session:

T: There is a bit of nostalgia for this thing. You always go there.
R: Have you played with this one before?
T: You always go there. You always have. It’s good, because here you can see what to do. In this exhibit, I once realized why it sounds like that when you put the key in.

Images with subtitles from the video films:

-I want to do paper. Press!
-A lot of paper must be wasted here.
-Yes, people just throw away their papers.
-This is the most funny part
-Should we try and fold it and press a flower in it?
-Yeah, clever idea

Discussion among the researcher and the informants during the video session:

R: Why did you go there?
T: Because it’s fun, and because you always have gone there.
R: You said before that you have a special stroll round. Is it the same round every year?
T: Yes, it has almost become that way.
T: It is quite fun to get something that you have done for yourself. My mother has a picture on her room, which I have done on this kind of Teknikens Hus-paper. Before, it was brown.
These two examples show both how my informants have chosen to film certain exhibits because “you always go there”, and how they use the video clips to discuss what part these exhibits actually take/have taken in their lives. Just like Ellenbogen (2003), I think these findings raise questions about how to value the presence of identity negotiation during museum visits, when studying learning in this setting. I hope we will have time during the conference session to discuss this question further.

In my final report, I will discuss the following areas of interpretation from a pedagogical perspective: a) the different science center practices represented by my informants; and b) how the teenagers used the video clips to represent themselves and their self-identity when talking about and showing each other and me their science center experience. From my point of view, one way to understand the relationship between teenagers and science center exhibits is to study the intersection of these different areas of visual interpretations.

Literature cited


