

# From Lecturing to Apprenticeship

## Introducing play in museum learning practice

Emanuela Marchetti

Department of Learning and Philosophy  
Centre for Design, Learning and Innovation  
Aalborg University Esbjerg  
ema@create.aau.dk

Eva Petersson Brooks

Department of Architecture, Design & Media Technology  
Centre for Design, Learning and Innovation  
Aalborg University Esbjerg  
ep@create.aau.dk

**Abstract**— Analysis of museum learning practice, and related work, have revealed that communication of historical processes resembles school teaching, eventually hindering children's participation in museum learning activities. Starting from this issue, a new playful installation is being designed, actively involving a group of primary school children. Results from this process suggest that museum learning practice could be enriched, by moving toward a more non-formal learning approach, in which children and adults could engage in shared problem solving activities. Play is envisioned as an effective framework to support shared problem solving, also allowing for a symmetric dialogue to emerge between children and adults.

**Keywords**-non-formal learning; historical process; apprenticeship; object-mediated interaction.

### I. INTRODUCTION

Museums are currently facing a challenging innovation process, including re-shaping of, for example, their way of communicating historical and cultural knowledge to visitors. Many researchers have dealt with this challenge from different angles, from an institutional perspective [15] or from the visitors' perspective, either looking at what they do [6] or proposing new design solutions to enhance museum learning practices [14]. Despite these many contributions, these re-shaping processes are short off a clear direction toward innovation [15]. This situation has implications for museum learning practices, which still keeps a traditional and formal approach.

Conducting a Participatory Design (PD) study with a group of 25 Danish children around 10 years old, aimed at designing a playful installation to enhance museum-learning practice, a main issue was identified in the communication of historical processes. According to our study, museum practitioners consider guided activities as the most valuable learning method. Hence they tend to communicate historical processes through lectures, primarily in the form of one-way communication, based on chronological sequences of events, with the consequence of neglecting their actual complexity and embedded meaning.

Moreover, observations of primary school children attending a guided tour suggest that they perceive museum experience as another class to attend, in which the guide acts

like a lecturing teacher as they walk through the exhibition space. As a result, the guided tour mainly elicits a form of static interaction mode, similar to traditional school lectures, in which children are supposed to listen quietly and raise their hands whenever adults ask them questions.

Therefore, starting from the data collected through the PD process, it is being suggested that museum learning practice could be enriched by introducing playful and shared problem solving activities, in which children could participate more actively in a form of apprenticeship [25]. Learning experiences concern active participation in activities, leading to knowledge and skills [25, 21]. In this way, the intention is to initiate and enhance a dynamic communication, in order to foster a symmetric dialogue between children and adults during guided museum tours. This, in turn, is supposed to allow for a more effective communication, including a richer understanding of the actual meaning of historical processes.

In the next section related work is presented, then, in section 3 research methods and an analysis of museum learning practice are discussed, focusing on the communication of historical processes. In section 4 the design outcome and implications for museum learning practice are presented, finally in section 5 conclusions and future works are discussed.

### II. RELATED WORK

Different studies have been published in the past 20 years, about the use of interactive technologies in museums. The first solutions to be proposed were “kiosk-based computer exhibits” [14] showing audio and video material. Nowadays, more interactive interfaces have been created, promising a more engaging museum experience.

An interesting approach is represented by interactive environments, in which technology is hidden. Hence the visitors can simply interact with the exhibitions space and the objects available, focusing on the interaction itself, its output, and the exhibition content. The Kyla installation follows this approach. Designed to enhance visitors' experience of an exhibition about archaic culture from Karelia, Finland, the installation is a dark exhibition space, where the visitors can look at old paintings, while walking through the space with a candle. Sensors are hidden close to the paintings, so that whenever the visitors approach a painting with the candle, an old Karelian music is played

[12]. Observations show that the installation elicits interest and emotional responses among the visitors. A similar setting is proposed by Hall and Bannon, exploring how ubiquitous computing could enhance children's experience of museums [8]. The setting has been tested in the Hunt Museum in Limerick, Ireland, dedicated to the memory of archaeologist John Hunt, who donated his collection to the people of Limerick. The exhibition is conceived as an RFID-based interactive space, in which children can interact with copies of the collection objects. For instance, they can leave their feedback about the exhibition, by talking to a phone and listen to others' activating a radio [8].

Multi-touch tabletop interfaces for museums seem to have a similar approach, in providing an interactive setting with a valuable affordance for social/playful interaction among the visitors [11], hiding the technology and enhancing content. These kinds of interfaces are often represented by interactive navigation systems, allowing visitors to access information in a different way, compared to traditional brochures or audio-guides. For example, "Tree Life Table" displayed at the Museum of Natural History in Berlin and "Kurio", where the first installation is a multi-touch interactive surface, allowing visitors to search for information navigating through popping up bubbles, containing questions about different species. Ethnographic observations, conducted in the museum, reveal that people might engage in playful interaction, experimenting with what they could do with their hands, e.g. tapping with more than one finger at the same time, or caressing the surface with a flat hand [11]. Kurio [20] proposes a similar approach, but introducing play more explicitly, in the forms of shared problem solving, to enhance families' museum experience. Kurio is a hybrid system including tangibles, a PDA, and a tabletop display. The visitors are invited to play the role of time travelers, stranded in the present time, who have to collect information about their current time, in order to go back to their own time.

Exploration of the domain of interactive technologies for museums is wide. These cases have been selected as they attempt to introduce playful interactions, to enhance learning in museums. Similarly, this study explores the possibility to use role-play and cooperation, as a way to acquire knowledge and experiencing historical dynamics.

### III. MUSEUM LEARNING PRACTICE

#### A. Methods

This study is based on ethno-methodologies, such as participant observations, situated interviews, and participatory design (PD). Each session of field study and design process has been documented through video recordings and/or pictures, when possible, and field notes, to be available for qualitative analysis [26].

The project is conducted in cooperation with the Viking Museum in Ribe, in South-West Jutland (Denmark). This museum has been chosen because of its interest in communicating the story of the local community and its development. This form of complex historical processes is the focus of our study. The Viking Museum in Ribe is placed

in the oldest town in Denmark, Ribe, which was originally a seasonal market place. In 700 King Godfred turned the market place into a permanent settlement, dividing the land into smaller lots, which could be rented or sold to merchants and craftsmen. Hence, Harald Bluetooth, in 900, developed Ribe into a town, mostly by having fortifications placed around the settlement it [7].

The story of Ribe represents a typical case of urban development, unfolded through an intertwining of sociomaterial practices, such as: production of goods, technical and economic innovation, and political decisions. The political aspect was expressed through manipulation of the territory, mainly in the form of infrastructures placement and maintenance, as discussed by Akrich [1].



Illustration 1: Free visit in Ribe.

A field study has been conducted, so to reconstruct museum experience from the perspective of all the "users" involved. Hence museum practitioners were interviewed and a group of 25 children around 10 years old were involved in a PD process, to gain an understanding of their values and dilemmas about museum learning practice. This particular target group was selected as they have already started to learn about history in school, they have probably visited several museums, and they are able to provide well-formulated accounts about their previous experiences.

The PD process was held at an after-school institution in Denmark, which became a *design collaboratorium* [5]: a space for co-design activities, where the prototypes could be stored for future investigations. In the beginning the children were interviewed about their previous experience of museums, supported by a few tasks. For instance, the children should write on a sheet of paper the museum they last visited and an adjective to describe how this visit was. Afterward their comments were shared in a joint conversation. Later the children were asked to comment upon pictures showing objects displayed in Ribe Museum. In the following session the children were invited to freely visit the museum, which offered opportunity to observe how they engaged, verbally and non-verbally, with the exhibition space (Ill.1). Finally the children were invited to co-design a game about the Viking Age and were provided with design materials: Lego bricks, modeling clay, colored pencils and

papers (III.2). All the participants in the co-design session engaged in a material brain storming, where ideas for the game were expressed through the creation of game pieces, which were tested and played with. Hence several artifacts were produced and, furthermore, a cardboard prototype was created and tested twice. Currently, a working prototype is under development to be tested in situ, at Ribe Museum (Table 1).

Table 1. Process Diagram.



Illustration 2: A participatory session.

### B. Learning Practice and the Diachronic Perspective

Exhibitions have always been the main communication mode between museums and their public. Besides, publications, guided tours and other activities are offered to young visitors, so as to support them in gaining knowledge about the exhibition in question. The objects displayed, and the way they are being displayed, play a central role in museum learning practice, as this creates conditions for the ways learning, as well as social interaction, might emerge. The exhibition and the displayed objects constitute resources for communication enacting different functions:

- ideational (enacting “what goes on in the world”);

- interpersonal (enacting relations between the visitors and between the visitors and the exhibition); and,
- textual (enacting the combined whole – the exhibition) [9].

Museum tours, guided or not, are a form of object-mediated interaction [10]. The exhibition is created to convey knowledge from the museum to the visitors, and for visitors to communicate with each other, verbally and non-verbally, through the exhibition space and the objects displayed [17].

Furthermore, despite that many tangible or interactive exhibition settings are being proposed by museums and researchers, a gap has been identified in relation to communication of history from a diachronic perspective, which deals with historical processes through time. It seems that such settings aim specifically, at providing an immersive experience, about how it might feel to be in a specific point in time, from a synchronic perspective. Somehow they represent an attempt to shorten the time distance between the past and the present. Interviews with museum practitioners reveal that tangible representations of the diachronic perspective are seen as an interesting possibility, but also as difficult to achieve. Instead, lecturing and story telling are seen as the most suitable communication mode, because of their sequential nature.

Generally, the only tangible representation of a diachronic perspective is the exhibition configuration, which starts with the oldest findings and ends with the most recent. Hence the museum tour acquires the shape of a walk through time. This is to say that complex historical processes, such as urban development, socio-cultural change, or technological innovation, most often are conveyed through lectures and written publications or, more briefly, through explicative signs. Our study suggests that this approach may have implications for learning and social interaction conditions, in the museum context. In this way, the real complexity of historical processes is hidden. By historical processes it is intended socio-material interaction among a group of people, within and through the natural environment and its affordances, as it emerges from historical [7] and anthropological studies [1, 13]. These processes embody sociopolitical thinking and have strong impact on emerging communities, so that they become part of their identity. Similar cases are discussed by Ingold [13], who specifically studies how humans relate to their environment, and Akrich [1], who discusses how infrastructures placement might embody complex political agendas, such as developing rural areas. The story of Ribe provides an interesting case of such dynamics, as urban development took place through socio-material actions, such as land partition into lots, development of the market place, and construction of defensive walls.

A tacit awareness about this kind of dynamics would be beneficial for young visitors’ understanding of history, as well as for their social and cultural identity formation. Therefore, it was decided that the design outcome, from the present study, should aim at supporting learning of urban development, through playful and tangible interaction.

## IV. MICRO-CULTURE

## C. Social interaction in museums: guided versus free tours

Observations conducted during our field study and related work, show that emergent interaction among children and adults in museum, may assume different forms.

According to our data, during free tours some children explore the exhibition space divided into small groups, looking and commenting what they see. They may also be quite active physically, while others prefer a quiet walk by themselves. Furthermore, studies conducted on families visiting museums, suggest that many children have already learnt a lot by themselves about a specific topic, before coming to the museum. These children tend to comment the exhibition with their parents, showing off what they know, often criticizing the written explanations provided by the museum as incomplete or even wrong [6].

Instead our field work reveals that guides see their job as telling a “nice” story, that could be informative but also engaging for the children. They also would like to actively involve the children in the story telling process. The guides have developed a few strategies for that purpose, such as: to compare past and present, or to ask the children questions about the displayed objects to keep their attention alive, or even they try to “look at what they are looking at”, so to dynamically shape the story according to the children’s interest [17]. However, it is hard to understand if these strategies are as effective as desired, only a few children in fact seem to respond as expected. Most of them remain silent, wondering around the exhibition in small groups. This may happen because guides are perceived as authorities giving a lecture, and not as more equal facilitators.

Considering the analyzed dynamics, it seems as guided tours facilitate a static form of interaction, while free visits seem to afford a more playful exploratory interaction style, allowing for individual needs to be expressed, such as: chat with friends or enjoy a bit of calm. However, guides’ notion of story telling seems worth to pursue. It may also benefit from introducing play and/or playfulness, which could provide a safe and relaxed atmosphere, for children and adults to communicate as peers. Therefore, we propose to enhance children's museum experience, by introducing forms of tangible play, as a communication mode: so to provide a playful-material grounding to understand the complexity of historical processes and to provide an informal environment, facilitating the emergence of a symmetric dialogue between adults and children [22].

The scenario proposed in this study, is that museum learning practice should become a form of sociomaterial participatory apprenticeship. According to Rogoff [25] apprenticeship is a learning practice, in which individuals and their social partners are engaged in situated activities together, as an organic unit within the activity [25].

## A. Design concept

A playful interactive installation has being conceived through the PD process, in the form of low-fidelity prototypes. It is intended for the children to experience, through play, the meaning of historical processes as sociomaterial interactions, specifically in relation to urban development and placement of infrastructures on the territory. The installation is called *Micro-Culture* to suggest a biological metaphor, in which the children are supposed to observe cultural phenomena in act, as biologists do with bacterial culture. Hence the children are expected to get a clearer picture of the dynamics behind urban development and of the implications of placing infrastructures, on land and people's everyday practices.

The game is designed as a mixed reality tangible installation, in which sociomateriality in play is being emphasized. In this way, children's attention should be focused on the learning content and the game. Furthermore, since social interaction and participation, in experiencing historical processes, is the central element of the game, the setting is intended to facilitate eye contact among the players, eventually resembling a mixed reality board game. Ideally the players should engage with an interactive surface projected on the floor. In this way, there would be no chairs and the playing surface could be wide enough, to afford free participation from anyone. Moreover, physical engagement should emerge without fear of breaking anything. But for practical reasons, a screen will be used for the test, placed horizontally on the floor. On the screen a simulation of a population and a landscape is being showed from above.



Illustration 3: Test of the low-fidelity prototype.

The population includes people at different ages in lifespan; they can be newly born, move around to different environments, grow up and have children of their own, and, then, grow old and die. This lifespan aspect allows to make the population more realistic and to take advantage of children's interest for human bones, and their instinctive sympathy for stories about people from the past [18]. Moreover, since we are dealing with a diachronic

perspective, the succession of generations, coming and leaving the world one after the other, can be used to provide a representation of time passing by. After a few generations, it should be possible to decide that an age is over and, consequently, move to another time. Hence the people could build different houses, wear different clothes, and behave differently.

### B. Learning process

The design of Micro-Culture is motivated by the intention to enrich museum learning practice, so to transform it into a participatory apprenticeship. According to Rogoff, children acquire knowledge and skills, by being involved in goal directed activities, together with adults and/or peers, who act as guides through the learning process [25]. Rogoff's main references in this respect are Vygotsky [29] and Lenont'ev [16], who consider children as "active participant in their understanding", while engaged in "shared problem solving" together with their guides. Social interaction is considered to be essential for learning to happen, where adult or peer guidance is necessary in supporting the child to reach the "zone of proximal development", the region of sensitivity where the support from adults and/or peers is required for the child to reach beyond his or her limits [28, 29]. The prototype may act as a mediating resource, facilitating learning and social interaction [21].

The depicted situation has a few similarities with museum learning practice, as children are supposed to learn by coming to museum exhibitions and being guided by adult experts. Play and a playful approach offer a promising framework, when it comes to introduce shared problem solving within a given game. Furthermore, this could leverage on the guides' values, providing play as a communication mode for collaborative story telling. A goal could be directly embedded in the narrative, so as to facilitate individual play, for instance in trying to create a lively village or socially, in stealing peasants from each other.

Therefore, in our studies, play and playfulness may provide a valuable framework to introduce a goal-directed shared problem solving activity, enhancing children's participation in learning and social activities. Play is associated with exploration [24, 27]. Exploration occurs in novel situations where the child asks, "what can this object do?" whereas play occurs in familiar situations where the child asks, "What can I do with this object?"; situations where expressions and actions are experienced as sensations [22]. Accordingly, play consists of a variety of activities that involve manipulation of the environment. Bundy [3], Petersson [21], and Brooks and Petersson [2], have described play as a transaction between the individual and the environment, which creates situations that are intrinsically motivated, internally controlled, and free of constraints of an objective reality. According to cognitive developmental theories play is a cognitive process and a voluntary activity and as such it contributes to cognitive development, problem solving and creative thought.

Furthermore, play develops innovation, flexibility, enhanced problem solving and adaptation [28, 30]. Socio-cultural theories of play emphasize that through play with others, children learn social rules and norms; aspects that are practiced through play [19]. In this study, we address play not just as an activity, but as a state of mind; a playful attitude, and we apply Bundy's [4] Model of Playfulness where playfulness is determined by: the *presence of intrinsic motivation*; the *internal control*; the *freedom to suspend reality*; and *social play cues*.

Initial testing with a low-fidelity prototype showed that, by playing, children could engage in a friendly dialogue with the researchers. Specifically, they started asking questions about the prototype and the purpose of the tangibles. Hence, while engaging into role play or in setting up their village, they often commented or asked us suggestions about what could be added or changed. Moreover, questions were raised by the children about how people died and how they lived in the past. They also asked playful questions, both during design and testing sessions, e.g. they asked if there were lions or snakes in Viking Denmark. This behavior might be facilitated by the different features of the prototype and game play. A board games-like configuration of the prototype and exchange of tangibles facilitated eye contact and social interaction among the players. Moreover, the absence of a set of specific rules, allowed the children to feel relaxed and to explore what they wanted to do without any fear for failure, for example by building a settlement or attacking and teasing each other, as they were rival land lords<sup>1</sup>.

Certainly children's relaxed behavior may also be related to the fact that they became acquainted with us through a one year long PD process. Therefore, a working prototype needs to be tested in the museum, to verify if the same relaxed interaction style can emerge, also between the children and a guide they have never met. Moreover, a test should be performed also with occasional visitors, taking part to a guided or a free tour.

## V. CONCLUSION AND FUTURE WORK

Starting from data collected during a one year participatory study and related work about museum learning practice, addressed to primary school children, this study discusses open issues regarding learning and social interaction in museums.

The main issue identified in our study is the use of conveying notions related to historical processes through lecturing. In this way children's museum experience resembles a lot school teaching, hence children are usually very quiet and it is not clear what they are learning. Moreover, the real complexity of historical processes may be hidden behind nominal sequences of facts.

A PD process has been conducted for one year involving children 8-10 years old; in order to design a playful setting that could support such learning practice. The outcome of the process is Micro-Culture, a playful installation, based on

---

<sup>1</sup> A detailed discussion about emerging forms of play will be provided in a future publication.

tangible interaction and augmented-reality, aimed at conveying historical processes through play, emphasizing their meaning and complexity.

This study proposes to enhance learning in museums, by introducing play, so as to move from lecturing to apprenticeship, as defined by Rogoff [25f2]. The proposed approach intends to enrich story-telling practices, already present in museums, through play. Hence children and adults could both cooperate in creating their story, by playing together.

Initial testing seems to reveal that children could engage in play and informal dialogues with the researchers. More testing is needed in the museum, so to evaluate if and how playful interaction could be elicited between children and guides and what would be the learning implications.

#### REFERENCES

- [1] M. Akrich, "The De-Scriptio of Technical Objects", in *Shaping Technology/Building Society*, studies in sociotechnical change, Bijker and Law, Eds. MIT Press, 1992 pp.205-224.
- [2] A. Brooks and E. Petersson, "Play Therapy Utilizing the Sony EyeToy®", *Presence* 2005, London, UK, 2005 pp. 303-314.
- [3] A. Bundy, "Measuring Play Performance", in M. Law, D. Baum and W. Dunn (Eds.). *Measuring Occupational Performance Supporting Best Practice in Occupational Therapy*, 89-102. NJ: Slack Inc., 2001.
- [4] A. Bundy, "Play and Playfulness: What to Look for", In L.D. Parham and L.S. Fazio, Eds. *Play in Occupational Therapy for Children*, St. Louis, MO: Mosby, pp. 52-66, 1997.
- [5] S. Bødker and J. Buur, "The Design Collaboratorium – A Place for Usability Design", in *ACM Transactions on Computer-Human Interaction*, Vol. 9, No. 2, June 2002, pp. 152–169, 2002.
- [6] K. Crowley and M. Jacobs, "Building Islands of Expertise in Everyday Family Activity", in *Learning Conversations in Museums*, G. Leinhardt, K. Crowley, & K. Knutson, Eds. Mahwah, NJ., Lawrence Erlbaum Associates, 2002.
- [7] J. Graham-Campbell and M. Valor, "The archaeology of Medieval Europe , vol. 1, eighth to twelfth century AD," Aarhus University Press, 2007.
- [8] T. Hall and L. Bannon, "Cooperative design of children's interaction in museums: a case study in the Hunt Museum", in *CoDesign*, vol. 1, n. 3, pp. 187-218, 2005.
- [9] M. A. K. Halliday, "An Introduction to Functional Grammar", London, Edward Arnold, 1985.
- [10] A. Henare, M. Holbraad and S. Westel, "Thinking through Things, Theorising artefacts ethnographically", Routledge, 2007.
- [11] E. Hornecker, "I don't understand it either, but it is cool" – Visitor Interactions with a Multi-Touch Table in a Museum", in *Proceedings IEEE Tabletop 2008*, pp.121-128, 2008.
- [12] T. Ilmonen, "Tranquil interaction: exploring archaic culture in the Kyla installation", in *Proceedings of the 2007 conference on Designing pleasurable products and interfaces*, 22 August, Helsinki, Finland, pp. 92-106, 2007.
- [13] T. Ingold, "The perception of the Environment, Essays in livelihood, dwelling and skill", Routledge, 2000.
- [14] J. Kidd, I. Ntala, and W. Lyons, "Multi-touch interfaces in museum spaces: reporting preliminary findings on the nature of interaction," in *Re-thinking Technology in Museums: Emerging Experiences*, Ciolfi, Scott and Barbieri, Eds. University of Limerick, 2011.
- [15] C. Lang, J. Reeve and V. Woollard, "The responsive museum: working with audiences in the twenty-first century", Ashgate 2006.
- [16] A. N.Leont'ev, "The problem of activity in psychology", in *The concept of activity in Soviet psychology*, Wertsch, Ed. Armonk, NY Sharpe, 1981.
- [17] E. Marchetti, "Story Telling and Riddle Games" in *Proceedings of Pinc 2011, Participatory Innovation Conference*, Sønderborg, Denmark, 13-15 January 2011.
- [18] E. Marchetti, "Myth and Bones: Museums Socio-epistemic practice and children's values", in *Proceedings of InterSymp'2011, The International Institute for Advanced Studies in Systems Research and Cybernetics, IIAS 2011, 1st Symposium and Panel on The Art of Relational Living in the Communication Age*, 1-5 August 2011, Baden-Baden, Germany, 2011.
- [19] G. H. Mead, "Mind, Self, and Society", Chicago, IL: University of Chicago Press, 1934.
- [20] K. Muise and R. Wakkary, "Bridging Designers' Intentions to Outcomes with Constructivism", in *Proceedings of the 8<sup>th</sup> ACM Conference Design of Interactive Systems*, Aarhus, Denmark, 2010.
- [21] E. Petersson, "Non-formal Learning through Ludic Engagement with in Interactive Environments", Doctoral dissertation, Malmö University, School of Teacher Education, Studies in Educational Sciences, 2006.
- [22] E. Petersson and A. Brooks, "Virtual and Physical Toys: Open-Ended Features for Non-Formal Learning", *CyberPsychology & Behavior*, 9:2, pp. 196-199, 2006.
- [23] E. Petersson and A. Brooks, "Non-formal Therapy and Learning Potentials through Human Gesture Synchronized to Robotic Gesture [HRI] within a Virtual Environment [VE]", *Universal Access in the Information Society*, 6:166-177, 2007.
- [24] A. L. Robinson, "Play the arena for acquisition of rules for competent behavior" *American Journal of Occupational Therapy*, vol. 31, pp.248-253, 1977.
- [25] B. Rogoff, "Apprenticeship in Thinking, Cognitive Development in Social Context", Oxford University Press, 1990.
- [26] D. Silverman, "Doing Qualitative Research", Sage, 2005.
- [27] B. Sutton-Smith, "The role of Play in Cognitive Development", in *Young Children*, pp. 361-369, 1967.
- [28] L. S. Vygotsky, "Play and its role in the mental development of the child". *Voprosy Psikhologii*, 12, pp. 62-76, 1966.
- [29] L. S. Vygotsky, "Mind in society: The development of higher psychological processes", Cambridge, MA, Harvard University Press, 1978.
- [30] L. S. Vygotsky, "Thought and Language", Massachusetts: The MIT Press, 1997.