

# ECO-A: CHILDREN'S ENGAGEMENT IN ENVIRONMENTAL AND CLIMATE ISSUES

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## ABSTRACT

The paper describes experiences with Eco-A, an interactive installation for children and youth. The installation was designed to engage children and youth in active conversation around environmental and climate issues. It was developed using research through design (RtD), i.e., the practice of using design thinking, design processes and artifacts as inquiry methodology. Eco-A was made to help us to explore design spaces for youth and children's engagement with environmental issues and climate change. The installation was used as part of a larger exhibit City Kids at Sentralen, a culture house in Oslo. The paper summarizes our findings from observing Eco-A in use by children and youth, reflections on how well our design decisions supported the desired engagement, and knowledge gained towards future design.

## KEYWORDS

Design for engagement; research through design; youth and sustainability; interaction design.

## 1. INTRODUCTION

Our planet is changing rapidly, mainly due to human activities that are having a global impact. The extent of changes is so profound that the term Anthropocene era (Waters et al., 2016), referring to an epoch of human-induced changes in Earth's geology and ecosystems, is being increasingly used. Concerns around environmental and climate changes, in particular, often bring to mind the question "*What kind of world are we leaving to our children?*" The motivation for our work arose from turning the question into "*What kind of world the children see for their future selves and how their actions today impact that future world?*" We started by looking in the direction of design activism (Fuad-Luke, 2013) among Norwegian children and youth who are concerned with these issues. More specifically, we were interested in exploring why and how some children and youth get engaged with organizations acting on these matters, such as Miljøagentene ("Eco-Agents," 2016) and how could this activism and engagement be spread more widely. As we work within the field of interaction design and Human-Computer Interaction (HCI), we were also interested in the role of technology, beyond social media and the Internet, in catalyzing and researching this motivation, the level of understanding of issues at hand by those aged 13 and under, and opportunities for direct engagement.

This paper describes our attempt to explore children and youth's relation to environmental problems using research through design approach. The artifact designed and studied in real-life use, is an installation that we named Eco-A, a name inspired by Miljøagentene (Eco-Agents in English). Eco-A was used during the exhibit City Kids, and is shown in Figure 1. City Kids was an exhibit organized by Oslo Children's Museum and had numerous hands-on activities for children, focused on learning through play, tinkering, mastering etc. Eco-A was placed in a separate room, a bit outside of the area of main activities. It consisted of three components. The first component of the installation aimed to create a shared information space (Bannon and Bødker, 1997; Hornecker et al., 2007) related to diverse issues pertinent to climate changes and

presented at a level understandable for children. The second one took a critical approach, probing and questioning children's existing and future habits that impact the environment. The third component of Eco-A, inspired by design activism, aspired to engage youth and children in voicing their opinions on climate change and other environmental issues.

The Research through Design (RtD) approach was chosen because, as argued by Zimmerman and Forlizzi (Zimmerman and Forlizzi, 2014, p. 168), it engages with both what is (the present) and what can be (the future), while also creating opportunities of an ongoing dialog between the two. Thus, we present our findings and reflections on the installation's real life use situation, and our interpretation of how this dialog went in this particular case.

Verbeek, arguing for a post-interactions view in design, centered on mediation and mediation theory rather than interaction between technology and humans, points out that "*what is being designed, then, is not a thing but a human-world relation in which practices and experiences take shape*" (Verbeek, 2015, p. 28). In this sense, Eco-A was designed to be a mediation platform. The interaction bit in itself (with different parts of the exhibit) was not particularly novel. However, what interested us were the reactions and actions that were consequences of experiences with Eco-A. Reflective considerations over the exhibit as an artifact could bring forth many limitations with respect to its design and interactions that it facilitates. The strength of the installation, and what we wish to emphasize through this paper, is in the potential of the design space that Eco-A opens. Observing children's engagement with the exhibit gave us insight into what matters for deepening the engagement of young visitors to exhibits such as City Kids.



Figure 1. The image shows the three members of the team preparing for the opening of the exhibit. The informative videos are shown on the right, the critical questioning through the quiz on the left, while the possibility to voice opinions by speaking or writing a bottle-mail, was in the back. A glass side of the room provided a good spot for observations.

The paper is structured as follows: in the next section, we provide a short background on RtD. In Section 3, we describe the installation. Section 4 explains our research design, while the Section 5 presents discussion and interpretation of our findings. Conclusion closes the paper.

## 2. BACKGROUND

Over the last ten years, both interaction design and HCI have engaged in considerable research activity in order to find out how to tackle environmental and other sustainability related issues. These research activities have resulted in multiple approaches and an evolving framing of sustainable interaction design or sustainable HCI within these fields, e.g., (Blevis, 2007; Brynjarsdottir et al., 2012; DiSalvo et al., 2010; Dourish, 2010; Pierce et al., 2008). When it comes to sustainable HCI related to youth and children, research directions such as education for sustainability (Sterling and Huckle, 2014), gamification (Culén et al., 2015), awareness systems at home (Horn et al., 2015), family living styles (Håkansson and Sengers, 2013) and others have been explored. However, sustainable design for and with the youth and children that goes beyond learning and gamification is still largely under-researched.

RtD provides a way for human-computer interaction practitioners to reconcile research and design practices that are both needed when designing and making new technological artifacts. Many researchers and designers have actively advocated this approach that employs methods and processes from a design practice, e.g., (Fallman, 2007; Gaver, 2012; Stolterman et al., 2009; Zimmerman and Forlizzi, 2014). The reflective practice (Schön, 1983) is a fundamental part of RtD, and is a fundamental way of producing new knowledge about design (methods or processes), the artifact itself, and what gets mediated through the artifact.

Zimmerman and Forlizzi (Zimmerman and Forlizzi, 2014) describe the evolution of RtD, and frame three different design research practices that emerged as influential in RtD. These are the Lab, the Field and the Showroom. The Lab practice, native to Netherlands, combines design with experimental evaluation. The Field practice utilizes the user-centered and/or Scandinavian participatory design perspective, where the researchers try to identify design opportunities in order to improve the state of the world. Finally, the Showroom practice builds on the design of critical and speculative artifacts that challenge the current situation. In making Eco-A, we have used the Field practice, lightly touching and examining Showroom practice as well, in the second component of Eco-A.

In addition to the above mentioned literature, we also use work on ecologies of interactive spaces (Culén and Rosseland, 2014) and its components (physical space, technologies, people, activities and values), as well as Kaptelinin and Bannon's work on creating technology-enhanced activity spaces (Kaptelinin and Bannon, 2012). The physical space, for Eco-A exhibit, implied making only small changes to the room (due to the limited resources for the project) to visually better support the theme of the exhibit. A door decoration was made and the modern light fixtures were covered with green, organic looking fabric (see Figure 1). The other components, technologies, users, activities and values are addressed in the next two sections, woven into the description of Eco-A, or in the discussion.

### **3. ECO-A**

This project was initiated as part of a larger Creative Europe project that explores diverse forms of participation in culture and civic life. The Norwegian subproject is concerned with children and youth's participation and engagement in urban culture; activism being a part of this engagement. The initial work on the project was done as part of the interaction design course that four co-authors were taking during the fall of 2015. The remaining two co-authors were teaching the course and supervised design efforts. Several alternative designs of Eco-A were created during that time period.

Starting from the Field practice, and as is customary in the Scandinavian tradition, getting to know the user is important. Since we wanted to design for engagement and activism, initial contact with Miljøagentene ("Eco-Agents," 2016) was established. They are a small organization dedicated to giving children and youth an opportunity to voice their opinions regarding important debates around the environment. More than that, they strive to increase understanding around sustainability and promote active engagement in caring for the environment, involving thousands of children and their teachers or parents in meaningful activities. One of their actions that took place during the fall of 2015, was to collect opinions of children all over Norway on climate change (these were later actually delivered to politicians at the climate panel in Paris ("Barnas Klimapanel møtte FN's klimapanel i Paris - Miljøagentene," 2015)). This activity coincided with the start of the interaction design course, and the initial idea that the project group had was to cooperate with Miljøagentene and provide a platform for supporting the climate panel initiative by Miljøagentene. However, the work soon took a different turn, because of the interest in a broader age group, and particularly in children not already involved in activities such as those that Miljøagentene support. Thus, a public space installation was seen as a good way to reach this broader audience.

The design phase started with preparatory research, including informal research on what children know about climate changes and other related environmental and sustainability issues that we are face today. Ethnographic work and observations of how Miljøagentene operate and what they actually do followed. An interview with one of their employees was conducted. Then a focus group (a group of 6 children) and a workshop (5 children) were conducted with members of Miljøagentene, where the focus was on understanding what it is that motivates them and how other children who are not already active in the organization could be motivated to join and help build a more sustainable future. Regular contact with this group of youth was established and some of them helped during the design process with valuable input on

several occasions. Two of them also attended the City Kids exhibit. To reach those who are not already engaged, 17 children from the 7<sup>th</sup> grade (approximately aged 12) were also interviewed. Data gathered from these sources was combined and analysed. We found that the children knew more than we thought about climate change. However, the 7<sup>th</sup> graders did not seem to actively engage with what they knew. The knowledge did not seem to affect their actions in everyday life. Thus, the student design team wanted to make something that would present the facts in different, more experiential and fun ways inspiring personal and emotional engagement. The details of the design process itself are outside the scope of this paper. What is presented here is the work done after the course was over, and interaction design students were hired as creative professionals and researchers to continue the work on the project. Apart from interaction design, the team includes a practicing artist and a designer.



Figure 2. The photo shows images from three different video clips, providing information on climate and environmental issues. The small image shows tangible interaction form that was chosen to open and close videos.

The skills available within the group played an important role in deciding on the form and shape of information given to the children. The common information space took the form of short, funny and informative videos that used both artistic and animation skills available within the group. Tangible interaction was chosen as a way of controlling the choice of a video. Placement of a ball into the glass container started a video. Containers were identical, and there was, intentionally, no information on the kind of video that will play. This choice was to promote curiosity and make the children try them all. Videos were shown on a large TV screen (see Figure 2).



Figure 3. The intention with questions was to challenge children to discuss and reflect on their own behaviors. Are they, and their families “green”? Questions could be answered with “yes”, “no” or “I do not know”.

The second part of the exhibit was designed as a series of small questions intended to trigger reflection. The questions were posed as in a quiz, a familiar format for children, but the purpose was not to test their knowledge or play. The questions were intended as an impetus to reflect over and discuss their own habits and those of their families. The questions were answered by pressing a large leaf-shaped button with “Ja” (yes), “Nei” (no) or “Vet ikke” (I do not know), causing a leaf in the same color to appear on the tree at the

screen, giving immediate visual clue as to how green their choices were overall (see Figure 3, image on the left). Some questions led to a heated exchange with friends, (Figure 3, in the middle). Example questions are: “Would you mind getting second-hand stuff as a Christmas gift?”, “Would you be willing to buy less stuff to in order to reduce climate changes?” or “Do you think that it is better to walk or cycle to school, rather than driving in a car?”

After watching the videos and spending time going through a sequence of speculative and critical questions, the children could sit down and write messages to policy makers, parents, or whoever they thought could be responsible for helping them to shape a better future for themselves. They could use ordinary paper and pencils, or they could talk into the bottle, recording their message (see Figure 4). Bottles were then deposited in a deposit bin (see Figure 4, on the right).



Figure 4. The “activist” part: write a bottle post, or say it into the bottle and deposit in the deposit bin!

During the design phase, the prototype of the installation was tested at the Norwegian Museum of Science and Technology in Oslo (see (Smørgrav Viddal et al., 2015), the final report is in Norwegian, but the Tumblr blog is in English). It was observed then that during working days, audiences consisted mainly of school classes. This was not an optimal situation for this installation. As our aim was to potentially catalyze new domestic practices related to the improvement of the environment, parents’ engagement with the exhibit, alongside their children, was seen as a positive trait.

#### 4. METHOD

We have chosen qualitative and interpretative methods to study the use of Eco-A. Activities in the Eco-A exhibit room were followed, using *formal and informal observation*, over a period of two days. The first day’s informal observations (no documenting took place, either in the form of field notes, photos or videos), were serving as a basis of reflection, and guidance over choices of methods and tools for the next day. For example, we discussed some a-priori categories that could guide our observations. Those categories were *engagement, playful interactions, aesthetics, exploration, learning and activation*. Reflecting on these choices after the informal observations made on the first day, aesthetics and learning were dropped. This is because we understood that engaging visitors directly in the research through questionnaires, or short interviews would likely be taking away from their experience of the installation itself. The environment was rather hectic and somewhat noisy (videos playing, people talking and discussing), and their stay in the room was relatively short. We deliberately decided to stay away from interrupting the children’s exploration and interaction with the installation. Flexibility in research design, based on reflection and adaptation to the actual use context was preferred instead. *Engagement, exploration, playful interactions and activations were judged to be a good framework* for evaluating how well the installation mediates our intentions.

In order not to influence visitors’ behavior, fly-on-the-wall observations were chosen for data gathering, behind the glass door and through the glass panels (see Figure 1, the photo on the right). Some of the team members were available in the room to help visitors if needed (not more than one or two at the time), but they did not collect data from visitors. *Engagement* was measured by the length of time spent in the room over the period of 30 minutes. *Playful interactions* were measured by noting social behaviors; *exploration* by number

of installation components used and the number of quiz questions or videos explored. Finally, *activation* was about children engaging in telling their own opinions, either using bottle-mail, or other people in the room. These were also taken over a 30 minutes period. This was done as a way of validating what we observed, and very simple descriptive statistics (average) were used. Given our study preferences, some of the gathered data, such as quiz logs that were collected automatically, were also left out for the purposes of this paper.

In addition, Mara (name changed, a 13-year-old girl), one of the Miljøagentene, joined the team. Towards the end of the day, Mara was interviewed using the open interview method.

Lastly, the children's bottle-mails (see Figure 5) were gathered and the texts were analyzed within three age group categories - aged up to 7, 8-10 and 11-13 years. If more than one child wrote a message together, the age of the oldest child determined the category.

## 4. FINDINGS AND DISCUSSION

As mentioned in the introduction, this installation was part of a larger City Kids exhibit and its activities. Firstly, observing the visitors' movement patterns and activities, we were happy to conclude that the decision to place the installation in a separate room and out of the main action site for City Kids was the appropriate one. Secondly, we could observe during the first day that the space that Eco-A created indeed seemed to foster *engagement, exploration, playful interactions* with others (both among children and intergenerational) and that it moved the children to express their opinions (*activation*). Thus, those were found to be appropriate as an evaluation framework for gaining insight in how well the installation fulfilled its design intentions.

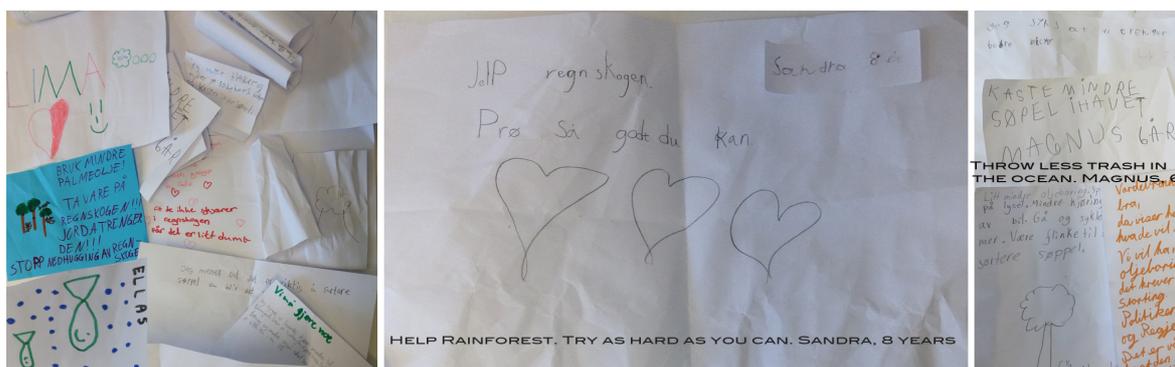


Figure 5. The photo shows a selection of collected messages. Couple of them translated from Norwegian by authors.

There were no difficulties that we could observe in accessing and engaging with the activities. The children understood the actions needed – all of them pressed the buttons, or could understand that the video changes when the ball was transferred from one glass jar to another. However, in a case of the youngest children, reading questions from the screen was hard and some were interested in hearing them, while others chose to leave. In one case only, a child who looked old enough to be able to read requested assistance with reading questions. He then went through all the questions. The bottles caused much curiosity. They were just a prototype, with LED lights lighting up, and what the child said was actually recorded by us. Some of the older children managed to figure this out; see Figure 4, the central image. The lights inside two bottles stopped working and the software crashed once during the 2-day period. The prototype was indeed sturdy enough to last for a while, including glass jars (none was broken). So, the technology in itself was not a problem regarding affordances, entry and access points (Hornecker et al., 2007).

### 5.1 Length of engagement

We start with observations on the number of visitors to the room and the length of stay. Within 30 minutes, 34 people came by, and 26 of them chose to come into the room. Others looked in and walked away. Most visitors were families. Two girls came alone during the observation period, but this was their third visit that day. The longest stay lasted 23 minutes (the second longest nearly 16 minutes), and the shortest one about 30 seconds. The average stay was approximately 9 minutes long. A stopwatch was used to record the time, but

since multiple actions were taking place simultaneously, the time could not be registered very precisely. However, it is a close enough approximation for the purpose of providing an idea of how long the engagement lasted, typically, over both days.

## 5.2 Exploration and playful interactions

Those families or children that stayed longer typically used all three components of the installation and they watched all three videos (with two exceptions, the two girls who came in alone and who, during the observation time, used only one component and one family who stayed with the bottle-mail for the duration of their visit). Interestingly, most visitors, without any guidance, did this in the order intended - videos, questions and then bottle-messages, allowing enough time for a child to write, draw or tell what they think. The two girls, who came alone, used their time on questions, reflecting on their choices and discussing them together (Figure 3, the central image). Another young girl used about 10 minutes just to deposit bottles (with repeated messages) into the deposit bin. From this short observation period, we learned that those who did enter the room and engaged with the installation stayed long enough to explore and playfully interact with the exhibit. The ones who stayed for a short period were mostly parents with very young children. Again, taking times and noting activities were helpful in confirming what we observed during the two days otherwise.

## 5.3 Effect of engagement and age on activation

Looking at the bottled messages best indicated the level of learning and ability to reflect on the issues we wanted the visitors to engage with. All messages were gathered after the second day and separated by the age of participants. The youngest group was aged up to 7. Many children in this age group still do not write well or gladly. So many messages with simple drawings were placed in this category, although they did not have anything written on them. One team member was tending to the children writing messages (explaining how to “record the message”, or write their thoughts on the paper and then send it off to those who can help with climate issues). The children 5-7 in this group, who could write, were clearly influenced by the videos they saw and what they learned from them. For example, Ella (5) just drew fishes in the polluted ocean (Figure 5, left bottom corner). She made two drawings with similar motives. Peder (7) drew a large fish eating a huge piece of plastic. A smaller fish was drawn swimming close to the plastic. It smiled a huge smile. Perhaps Peder thought that a piece of plastic saved the life of the smaller fish.

Those aged 8-10 were both reflecting on own actions and could add an environmental tip or two of their own. *“I deposit my bottles and press the Red Cross button (note: bottle return stations in most supermarkets in Norway have an option to play lottery for the value of the returned bottle. This is a form of donation to the Red Cross, a humanitarian agency) and I do not throw trash in the nature”*. *“A bit less oil drilling. Save the light (bulbs). Less driving. Walk and bike more. Be smart and recycle the trash”* (Alexandra (6 ½) and Vilhelmine, (8 ½)). This note also had a drawing of a tree.

Older children, aged 11-13, were more assertive and expressed more radical opinions. Two girls, Ella (10 ½) and Ella (11), wrote: *“We believe that one should stop cutting down the rainforest. Also, we can stop eating food with palm oil. We also believe that everyone should recycle. And stop throwing trash into the sea. Everyone can help by removing the trash from the beach.”* Kristina (12 ½) and Sara (13) wrote: *“Ball-burning is good, then the whole of Norway shows what they want (note: vardebrenning or ball burning has become a political symbol and lately serves as an expression of the Norwegian populations’ desire to keep the Lofoten islands free from oil drilling). We want less oil drilling; we demand that from our parliament. The politicians must hear. This is our future, do not throw it away and remember that time passes fast!”* (the message is on the far right, bottom, of Figure 5).

The most active, helpful and radical person that day was Mara (13), from Miljøagentene. She has been with Miljøagentene for nearly four years. She described her experience during the day at City Kids: *“There were many kids here, and I tried to help. However, many children were not interested in the video. They were more interested in the ball, and moving it from one of the glass containers to the other or in pushing buttons. However, after a while when they got an explanation, they followed more closely, learned a bit more, and began to draw and write, and deposit bottles. They were then very engaged. It was fun to go around and help. Many still have no idea what climate is and why is it important. It is nice for them then to see the video.”* (a direct translation from Norwegian)

Mara would, thus, gladly see more people who, like her, provide explanations for younger children. When asked about what could be done with the prototype to make the children understand consequences of climate changes better, she answered: *“You should make more videos that present more facets of the problem. It is*

*important to talk about this (climate change) more in the media and have it be more present in everyday life”.*

The age of children emerged as a parameter that was important, especially about the ability to reflect on the environmental and climate issues. The installation was fun even for some of the youngest children with regards to playing, exploration and engagement. Smaller children took changing videos by placing the ball in different jars as a game, and the little boy in Figure 4, on the right, spent quite a bit of time putting the bottles in and then taking them out of the bin. In one case, an approximately two-year-old boy, who came in with his mother, used the ball used to select a video, but rather than watching the video as all others have done, he ran out of the room with the ball and had much fun being chased all over the building. Finally, saying or writing down an opinion and placing it into the bottle, the children found to be fun. Just as it often is, there were also exceptions. One such example is of a girl who sat down at the table and wrote: *“miljø suger”* (environment sucks). When asked why the environment sucks, the girl replied that her mom dragged her to the City Kids, when she did not wish to go at all. She thought that the whole exhibit was just something for small kids.

Analysis of bottled messages shows that children did remember what they saw in videos. According to their age and developmental capabilities, they could also reflect on their practices and those of their families, and yes, they would take action and speak up if offered a chance.

## **5. CONCLUSIONS AND FUTURE WORK**

RtD was used to reflect on the Eco-A interactive installation and ways in which the installation mediated understanding of climate changes for children and youth. Our findings show that the installation in itself may have limitations, but it opens a previously underused design space for children and youth’s activism related to climate and environmental issues. Additionally, we highlight that the installation had the components that were needed: the information in the form that is accessible and appropriate for the age group, engaging interactions and questions intended to catalyze reflection. We could observe that parents and their children engaged reflectively with the questions. Some children discussed questions with others (than parents) as well. Mara sometimes initiated discussions, in particular when she saw that children needed a nudge to think, highlighting the positive role of having young activists as a catalyst in such conditions.

The question that we reflect over and discuss in the paper is related to what the installation mediated, and finally activated, through engagement, exploration and interactions that we designed for. Given that each prototype is a concrete embodiment and instantiation of a range of ideas and that, in the process of *prototyping one idea*, we have eliminated many other possible alternatives. We could clearly see some limitations of the prototype. Even Mara could do that, e.g., how our choice of three videos and questions delineate and simplify the problem space and how more themes and issues need to be explained.

Future work in this area could explore speculative and critical design and its effects in activating this age group more explicitly.

## **ACKNOWLEDGEMENT**

This project was, in part, financed by the EU Creative Europe project “The People’s Smart Sculpture”, under the grant number EC-EACEA 2014-2330. We are deeply grateful to one person in particular, who made this exhibit possible, Katie Coughlin, the leader of Oslo Children’s Museum and the organizer of the City Kids exhibit. Katie has also initiated our contact with Miljøagentene. The organization Miljøagentene also deserves our deep gratitude for their input and contribution to the project. We are also grateful to the two young agents who visited the installation.

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