

“CODESIGNING LINKX”: A CASE OF GAINING INSIGHT IN A “DIFFICULT-TO-REACH USER GROUP”

Helma van Rijn¹ and Pieter Jan Stappers¹

¹ID-StudioLab, Faculty of Industrial Design Engineering, Delft University of Technology,
The Netherlands, h.vanrijn@tudelft.nl

ABSTRACT:

Designing for people whose lives are very different from your own can be difficult. For example, it is difficult to understand the experiential world of elderly or handicapped people when you have never been in their situation yourself. In such cases, more effort is needed to get insight in the context of product use. It becomes even more complex when the users cannot speak for themselves and are dependent of other people, such as young autistic children. In that case designers depend on the knowledge of external parties and also need to take the ‘experiential world’ of these externals into account. Several user research techniques can provide insight in the context of product use. These include conventional techniques such as interviews, observation and questionnaires. Recently, new participatory techniques have been developed, such as generative techniques and probes, that aim to get insight in peoples deeper levels of knowledge such as experiences, feelings and dreams.

This paper describes a case, in which a language-learning toy for autistic children was developed. In the process, the caregivers of the children cooperated intensively, because these children cannot express themselves easily. Moreover these caregivers are a large and active part of their world. In this paper we describe how such cooperation can be realized with a diverse user group with varied and interacting needs and we describe the roles of the different users in this cooperation.

Key words: Contextmapping techniques, design research, participatory design

I. INTRODUCTION

Often, products are developed for mainstream users. Designers can empathize with these users, because these users' way of thinking, speaking, and acting matches them in one or more ways. However, when designing for people, whose lives are more different from us, such as the elderly, cultural minorities (Postma and Stappers, 2006), people from other cultures (van Rijn et al. 2006) or people with special disabilities (or abilities), more effort is needed to get insight into their experiential worlds. It becomes even more complex when the users cannot easily speak for themselves.

In this paper we describe a case, in which a language-learning toy for autistic children is developed. Because these children are severely dependent on their caregivers, the context of the toy features a strong interaction between the child, parent(s), and pedagogue(s). Therefore these caregivers were involved as experts to provide design insight. These caregivers can express their knowledge on the explored topic, while the children cannot. However, the children, parents and pedagogues differ in their needs, feelings, and dreams. Children want to play and feel safe, parents hope for progress in their child's situation, and pedagogues aim primarily to improve the child's skills. Parents and pedagogues do not always share the same point of view. Even among parents or pedagogues the opinions can differ a lot. The varied and interacting needs of a designer, one child, one parent, and a pedagogue are depicted below in figure 1. On purpose parent and child are depicted together, because this relation is the strongest, and in this case we always saw the child together with the parent.

Below we describe how we, in the development of a language-learning toy for autistic children, tried to satisfy and use these varied and interacting needs, beliefs and strategies of different people.



Figure 1: Involved people in the design process, with their varied and interacting needs

2. DESIGNING WITH 'CHILDREN AND CAREGIVERS' AS STARTING POINT

The design project aimed for a language-learning toy for autistic children. As mentioned before, it is very hard for designers, as it is for others, to gain access to the experiential world of these children. Their autism makes them experience the world very differently than children with 'typical' development in cognitive, sensory, and/or emotional aspects (Happé, 1999). The context of the future toy features a strong interaction between the child, parent(s), and pedagogue(s), because autistic children are severely dependent on their caregivers. In order to design meaningful products for this user group, it is therefore important to get insight in all aspects of the experiential world of both autistic children and their caregivers.

Several techniques have been developed in the field of user-centered design to inform about the context of product use. Different techniques address different levels of knowledge. Figure 2 shows the relationships between the various forms of data gathering and their ability to access these knowledge levels (Sleeswijk Visser et al. 2005). The central triangle lists a number of techniques, whereas the left triangle indicates what user activity the technique employs, and the right triangle shows the type of knowledge that is brought to bear.

With these techniques we can gain understanding of and empathy with the users, which is important for designing (Koskinen, 2003).

Techniques, such as interviews, observations and questionnaires (see e.g. Preece et al. 2002) provide explicit and observable knowledge about the context of product use. On this surface level users can easily share their explicit knowledge in interviews or questionnaires, just by telling what they think. Somewhat deeper knowledge can be obtained by means of observations. Observing people gives us insight in what people do and how they use things. Also this knowledge is easy to share for users, because they can just show how they use products. Finally we can dig into the tacit or even latent knowledge of people by means of generative techniques (Sanders and Dandavate, 1999; Sleeswijk Visser et al. 2005). These techniques aim to reveal people's latent knowledge, feelings, and dreams for the future. Accessing this deeper knowledge asks for some effort from users, because they need to formulate their tacit knowledge and reveal knowledge they are not always yet aware of.

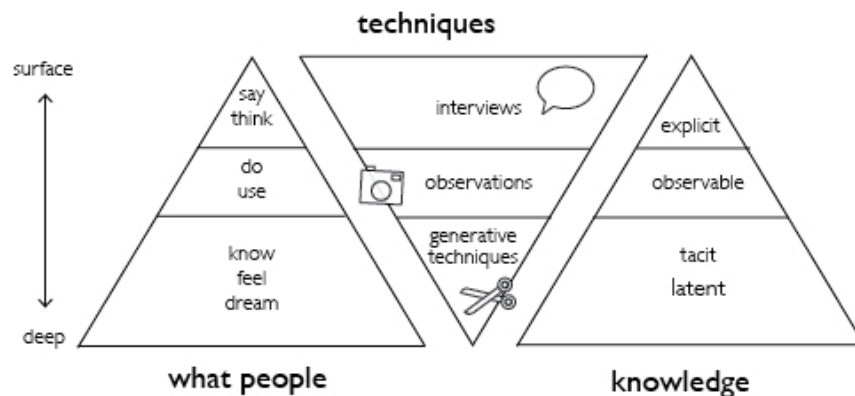


Figure 2: different levels of knowledge are accessed by different techniques

We refer to the sets of generative techniques (Sanders and Dandavate, 1999; Sanders, 2000) and probes (Gaver et al. 1999; Mattelmäki, 2005) as 'contextmapping' techniques: these techniques aim to bring user insight to designers in the conceptual phase of design (Sleeswijk Visser et al. 2005). In contextmapping techniques we encourage users to express views, anecdotes, and explanations about the explored context, which includes the use situation, the user's concerns, motivations and feelings. By means of the principle of 'make & say' people are asked to first create an expressive artefact, such as an associative collage or diagram. Later these people are asked to present this, often to a group of peers. This 'make & say' principle is especially important to gain an understanding of needs and values, which are often not explicit or observable knowledge.

Finally evaluating (early) experience prototypes with users is highly valuable for design, both from what it teaches about the prototype and as a further way to explore the user's context (Buchenau and Fulton Suri, 2000). Experience prototypes are versions of the product, which function well enough to let the prospective user experience how these can be used and how they would fit in their lives. Experience prototypes need not be fully functional in a technical sense – some functions may be 'faked' with Wizard of Oz techniques. Such prototypes can facilitate the conversation about the future product, and gives the opportunity to test interactions. Often more than one prototyping loop is needed, because the evaluation leads to improved insight in both prototype and context (Avison et al. 1999).

In the next paragraph we describe how we used the techniques described above to gain insight in the needs of autistic children and their caregivers and how we used this insight in the design process.

3. APPROACH

The case study was part of the first author's graduation project to design a language-learning toy that served the varied and interacting needs of autistic children, parents, and pedagogues. We tried to get insight in these needs by means of involving three autistic children, their parent(s), and pedagogues throughout the whole process. These volunteers were recruited at a medical day care centre in the Netherlands. The project consisted of three main phases: gaining user insights, developing the product concept, and testing the prototype. The project as a whole lasted seven months. In the first phase we asked for cooperation from children, parents and pedagogues. In the second and third phase we only involved the children and their parents. An overview of the process, its phases, techniques and involved parties is depicted below in figure 3.

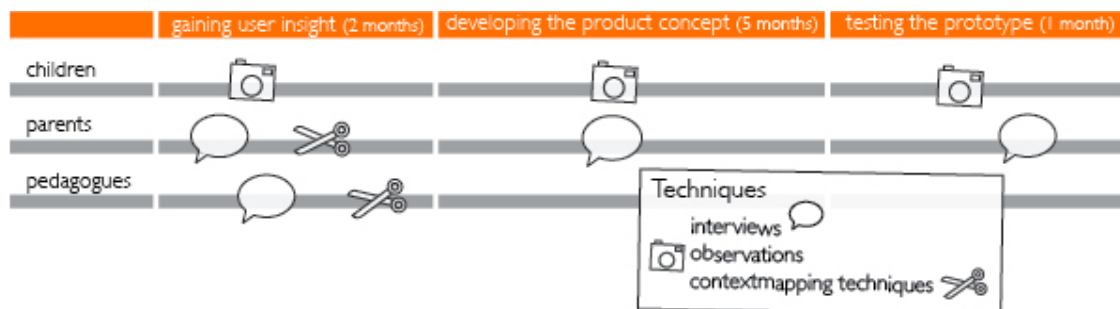


Figure 3: The process with its techniques and involved parties in time

In general we used three sets of techniques to gather user information: interviews, observation, and generative techniques. Each participant has different knowledge, and his or her own preferred way of expressing that knowledge. Figure 4 shows which techniques we could use with the different participants. Parents and pedagogues will both be involved in interviews and generative techniques. In general pedagogues are expected to bring more explicit knowledge, because their relationship with the children is mainly professional and they have a professional thinking. Parents probably have deeper knowledge inside than pedagogues, because they have an every-day full-day experience with the child. The children are the main source of observational knowledge. Only this knowledge can be obtained directly from the children, due to their limited verbal skills.

Below we explain the used techniques and the parties involved. In the next section we present what we learned about the participants and the techniques. We will do this from the top downwards: from explicit, to observable, and tacit/latent knowledge.

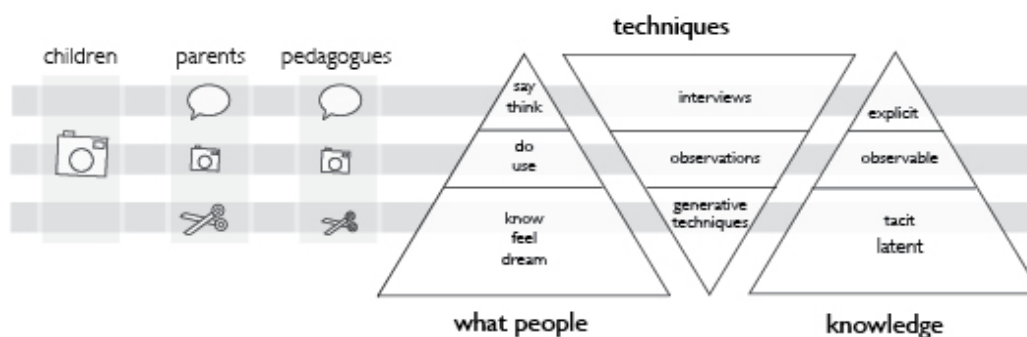


Figure 4: Different levels of knowledge we aim to access from children, parents, and pedagogues by means of interviews, observations, and generative techniques. The icon size represents how much knowledge we expect to reveal with that participant and technique.

Interviews

Caregivers can be involved in interviews, which reveal explicit knowledge about the play and learning behaviour of autistic children. We want parents and pedagogues to explain the motivations and feelings of the children. In that way, interviews and observations go together during the first phase. In later phases, parents will be asked to give their opinion about design solutions. In order to communicate our design solutions effectively, storyboards, and (early) experience prototypes are needed.

Observe & immerse

Only by immersing ourselves in the daily activities of autistic children and observing how they interact with prototypes (figure 5), we can get insight from these non-speaking children. This means we can obtain only observable knowledge directly from these children. Early in the process, the researcher gains this knowledge by taking part in their ordinary activities and acting with parents and pedagogues in learning activities. Later on, prototypes can be regarded as the way to communicate with these children (for the adults, storyboards went part of this way).

The caregivers are involved in observation in three different ways. First, an autistic child severely depends on its caregiver, and therefore a caregiver is always around interacting with the child: he/she is an essential part of the context, and the product has to work with them as well as with the child. This requires observations of caregivers interacting with the children as well. Second, the caregivers have a lot of knowledge regarding the motivations behind the child's behaviour, which they can readily express. Third, we need the parents as co-researchers during prototype testing, because they can bridge between the child and us. This bridge is needed for several reasons: the children trust their parent(s) best, the parents can facilitate the child's interaction with the prototype, and finally parents are highly skilled in interpreting the feelings and behaviour of their child.



Figure 5: The children involved were observed while playing with LINKX: the final concept design (van Rijn, 2007). The images show the key aspect of the concept: linking interactive blocks makes them play a word.

Contextmapping techniques

Contextmapping techniques are used mainly with the children's caregivers. These techniques aim to reveal what people know deep inside, what they feel and what they dream about. Knowledge from parents is expected to contain deeper levels, such as experiences, feelings, and dreams (in comparison to the more explicit knowledge we gather from pedagogues). Reason to assume this deeper knowledge is that parents are very attached to their child, while pedagogues can keep some sort of professional distance. Therefore the techniques aimed for different goals with parents and pedagogues respectively. The three parents were involved individually, while pedagogues participated in a group session. This individual involvement of parents was due to the fact that the parents were bound to their houses, because they could not leave their child easily to a babysitter. Also parents are expected to share personal stories more easily in an individual setting. A week before the actual sessions each participant receives a workbook with small exercises about both preferences and skills of the children and the adult's personal life with these children (figure 6). Main goal of the sessions with parents is to get insight in what their child triggers to play. The group session with pedagogues focuses on language learning in general and how they achieve that with the children they work with. We used these techniques to gain user insight for the development of the language-learning toy for autistic children.



Figure 6: An example of a sensitizing workbook that results from a contextmapping study.

In the next chapter we present what we learned from applying these techniques in this case study.

4. RESULTS

The case study led to insight on how, when and with whom techniques should be implemented in order to address a specific knowledge level. In general each knowledge level was in some way valuable for design. Especially observing and interacting with the children gave us many insights in what makes these children special. Interviews with parents and pedagogues helped us to get insight in the reasons behind the children's behaviour. As expected, using contextmapping techniques with parents led to more emotional expressions than using contextmapping techniques with pedagogues, because pedagogues looked at the situation with more professional detachment.

Interviews

The explicit knowledge that caregivers expressed while we observed the children play and learn helped a lot in the first part of the project in which the phenomena of autism were entirely new to the designer. Since parents and pedagogues are expert on the matter, they could readily interpret and generalize observations of particular behaviours. Hearing this information from a real person in a real situation informed and inspired us more than reading it in books, because the child was always present. This helped us to formulate our design direction.

In a later stage we interviewed the parents about an early version of the concept design. A storyboard, foam mock-ups, and observations of the child playing with these mock-ups (figure 7) facilitated this conversation. Parents were both good at explaining current behaviour with the early prototypes and predicting the future behaviour of their child regarding a specific solution. In their enthusiasm, the parents kept suggesting more features for the concept without realizing the complexity this brings for their child. They felt it was their job to provide as much as inspiration as possible. According to them the designer could judge best whether it was feasible in a suited way for the child.



Figure 7: During an interview with a parent, we observe a child interacting with early prototypes

Finally LINKX, the prototype of the final concept (figure 5), was evaluated with parents. Again they readily expressed their opinions during playing with their child. The evaluations afterwards often referred to important learned lessons during play with the prototype.

Observe & immerse

Observation in the beginning of the project helped us a great deal to gain empathy for the children, their parents and pedagogues. This was very valuable in the beginning of the project in order to ask the right questions. The behaviour of the children was very confronting. This was not the same as for example seeing an autistic child in a documentary. One child looked into our eyes from so close that it felt uncomfortable. Interacting with the children makes you aware of how difficult it is for them to learn, but also for their parents and pedagogues to deal with this. It also gives you a feeling for what kind of solutions would work and what would not. During concept development the children were observed while playing with (early) prototypes of the concept (figure 7). The differences in the children's play with these prototypes made us realize the variation in the spectrum of autism. However the joint interest of all these children was sensorial rewards according to the parents. Observing the children with LINKX, the final prototype, underscored the value of experience prototyping. Only observing the reactions on their play with the prototype, showed us LINKX is truly a solution that fits these children's needs and feelings.



Figure 6: From immersing with one participating child ('Beer') we learned numbers and letters provide him structure.

Contextmapping techniques

The workbook helped parents to access deeper levels of knowledge, because they can reflect on their experiences on a moment that really suits them. In the session they could tell about these reflections, which are visualized in this artefact, their workbook. Figure 6 gives an impression of a workbook completed by one parent. The mother added photos and drawings of the child's environment and the child itself to explain its preferences. Parents liked to tell about their child and their life together. Two parents liked the resulting workbook so much that they wanted to keep it. Another learned lesson was that it was difficult for both the parents and the researcher to keep focused when the child was around asking for attention. As expected, the

parent's stories contained more feelings than the stories of pedagogues. Sometimes a conversation with parents got so personal that it felt uncomfortable for the researcher. For example one time a mother expressed that a long time ago she sometimes wished her child had never been born. Knowing how to react on such remarks can be difficult.

The group session gave insight in the children's language learning level and process. As expected, pedagogues preferred giving factual information. They expressed often how they were taught to handle these children, instead of expressing deeper knowledge such as what they learned from interacting with these children. Interestingly the pedagogues disagreed on a language-learning issue. One pedagogue preferred teaching a short sentence to teaching a single word, because it takes the child equal effort. Her colleague disagreed, because only a single word has clear reference, which improves language understanding. This discussion showed us the importance of language understanding for these children. However talking about feelings was difficult, especially because having positive or negative feelings towards the children is not professional. A contextmapping session includes some creativity in selecting and organising with a provided toolkit. The pedagogues regarded us as 'creative' people since we are designers. When we asked them to come up with an ideal learning toy, they felt hesitation. They regarded that as our job, it was their job to provide information and inspiration.

5. DISCUSSION

In a case like this, a multi-disciplinary approach is needed in order to design a meaningful product. Caregivers have insight in the experiential world of children with autism, which most designers have not. However, caregivers cannot come to the same solutions as designers, because they are not educated in product design. The techniques described in this paper exist to bridge between the different involved parties. The chosen technique depends on the communication partner and what level of knowledge needs to be addressed. Moreover, each party has its own communication style, which can hinder optimal communication.

For a designer it is difficult to understand the communication style of autistic children. However by means of immersing with the children and talking with the caregivers people can get a feeling for this. Letting the children play with prototypes was the only way in which we could 'prove' whether the design fits their needs, feelings, and preferences. Children with autism always react purely, because they cannot fake interest. 'Probing' by means of providing prototypes was considered as very valuable. Without doing so, we would never know whether we are on the right track. However by means of interviews and contextmapping sessions with parents

and pedagogues we could probe in the right direction. In hindsight we also got a better view of contextmapping techniques in respect to other techniques for gathering user insights. For design it is important to address all levels of user knowledge. A standard contextmapping process usually involves preparation, sensitize, make & say, and discuss. After that, insights are analyzed, clustered and used in the design process (Sleeswijk Visser, 2005). Looking from a 'contextmapping point of view', interviews and observations can be seen as a preparation before diving deeper. By means of first gathering explicit and observational knowledge, researchers are able to pose the right questions in generative techniques. Using techniques that bring to light more explicit knowledge was valuable in the beginning of the project, and also in the end during user testing.

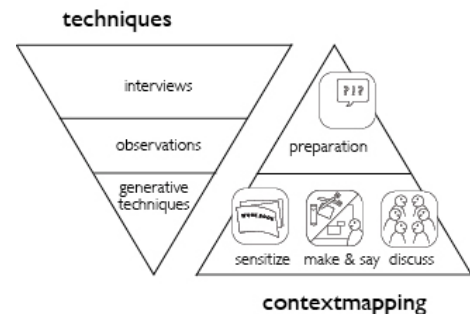


Figure 8: Contextmapping process in relation with other techniques for user insight

We learned that in all techniques, whether it concerns interviews, observations, or contextmapping techniques, it is important to clearly identify the roles people have and what input is expected from them. Especially collaboration with pedagogues in contextmapping techniques struggled from time to time, because they felt 'creativity' was our job. Maybe design solutions scared them off, because it could make them feel less important. Parents did not feel like this. They had already many ideas about how toys could help their child and loved to share those. During user testing we put parents clearly in the role of co-researcher. By means of informing them exactly about the research questions, the functionality of the toy and our motivations, they were able to collaborate in a desired way. In smart ways they tried to reveal the reasons behind their play and get insight in what they learned from the prototype. They are very tuned into their child; they could change their child's behaviour with the instructions they gave. For example, when one child played a bit roughly with the prototype, the parent interfered by telling the child that the blocks should 'kiss'. After that the child handled the prototype more gently. So during testing the prototype, the parents had multiple roles, such as facilitator, observer, and subject of observation, all at the same time.

The children differ a lot and so do the opinions of parents. Some children for example greatly enjoy being rewarded by sounds, while other children are irritated by this same sound. By listening to these contrasting stories, one can search for similarities in children. These similarities such as sensorial rewards, repetition, and predictability help to get an overview on designing for autistic children.

6. CONCLUSION

Collaboration between different disciplines is needed to design meaningful products, especially when the experiential world of users differs a lot from that of designers. The different techniques described in this paper involved the children, parents, and pedagogues in different phases of the design process. Each technique had its value depending on the persons involved and the knowledge levels addressed. The positive reactions on LINKX show that a connection was made between children, parents, and pedagogues. LINKX appeared also in the media, which led to reactions from other future users such as parents, pedagogues, and grown-up autistic people. This shows user involvement can help designers to empathize with special user groups and design for these special needs and feelings. This specific example shows that computers can help children to learn in other ways than in front of a computer screen. By integrating computers in toys, children can play in the predictable way they like, but still in a way that fits the children. Cause and effect take place on the place of action, the toy refers to real objects in their environment instead of symbolic representations in a generic drawing of an environment, and play takes place in their own environment, involving their bodily actions. These aspects help children to learn in a way that makes sense to them. These aspects should be exploited more in interaction design for these children.

However the risk exists that a designer gets immersed too much. Parents hoped so much that products came to solve it all. They sometimes forgot that we could not change their situation and that their child would stay autistic. However products can help improve the situation of children with autism and their caregivers. As one mother said in a TV interview: *"Eventually each parent wants his or her child to learn to speak, and therefore it is so important to have something that supports that."*

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