

Game probes:

**design space exploration in the area
of multilingual family communication.**

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Abstract

The focus of this thesis project is exploration of the design space of the area of multilingual family communication. The project elaborates and adds to the concepts of design space and design openings and applies these concepts to the research area. In a common design process the focus at design space predominates at the early stage of design development, when problems and solutions are not found yet and the goal is to create a handful of design openings. Those design openings are leading the designer in different directions of the development of the design proposals. Some design openings and proposals are introduced in this project as illustrations of the design space exploration.

The idea of game probes is discovered in this work as a tool of design space exploration. Multilingual children have been attracting my attention as an interaction designer during the last few years. Playful interaction is one of the basic communication channels between a parent and a child of the pre-school and early school age. Artefacts are powerful elements of design research, moreover tangible, visual and embodied experiences enable creativity, exploration and re-thinking of given ideas. All these key concepts are widely discovered through such methods as cultural and technology probes and critical design. The notion of game probes was established in this project through finding connections between its goals and practices of probing methods, playful activities and critical game design.

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1. Introduction and background

Multilingualism exists in different forms. In many regions people speak both a local language or dialect and an official national language equally well. When speaking about bilingual or multilingual children in this project, I refer to situations when one or more minority languages are spoken in a family. These are immigrant families in which one of the parents is from another country, both parents are from another country, or both parents are from two different countries and are raising their child or children in a third country. I am going to focus on such family environments and particularly on families who are trying to raise their children as balanced multilinguals. This means raising children so that they can speak, understand, write and read two or more languages equally fluently. (Edwards, 2008).

With this project I would like to contribute to interaction design research in the area of family communication with multilingual children and parents as a user group. Interaction design for multilingual children has not received much attention from researchers and designers. There are a lot of sociological, psychological and linguistic recommendations and methods for raising and educating multilingual children, but scant design-based initiatives or artefacts. I would argue that there is a notable lack of design openings and developed design spaces for this user group. Common ethnographic practices usually aims at narrowing down the research area, but this is not the focus of this work. Instead, this projects will be focused on using artefacts, particularly technology probes, in design-based research to reveal new openings and opportunities for design.

This project involved several stakeholder groups, including two families with children of 5-10 years of age, and parents with two different mother tongues.

Initial fieldwork took place during interviews with family members conducted at their homes and were followed up with further technology probes experiments, forming the core field research component of the project. The families participated on a voluntary basis and were recruited through my personal social network.

Four additional groups of stakeholders were involved in the process through interviews conducted at the onset of the project, namely:

- an online network of parents of multilingual children who completed a qualitative survey
- researchers in the area of multilingual children's development, education, and social studies.
- teachers
- adults who grew up in multilingual environments.

Expected result of the following work were a range of openings with design potential in the area of multilingual children-parents communication.

The research was focused on the phase of the design process that precedes problem definition and finding the solution and did not expect any particular final product design but considered it as an option if the process would lead to such an outcome.

2. Research focus

The area of interaction design with and for multilingual children as users has not been particularly well explored. Proceedings of child-centred design conferences like IDC¹ do not mention any works focusing on multilingual or bilingual children, though there are a number of works written on learning foreign languages, sign language and communication between parents and children in a family in connection to digital technology.

Interviews with the teachers, parents and researchers (see section 5.1.) point to one recurrent theme: bringing up a multilingual child requires hard work, strict discipline and dedication from family members if their goal is to bring up a balanced multilingual. The majority of the participants mentioned various books and educational recommendations but they could not name any physical or digital artefacts that would be aimed at supporting multilingual communication.

There are quite a large number of studies covering educational efficiency of artefacts such as web 2.0. and video games in learning second language among teenagers (Thorne et al, 2009, Kan et al, 2010). It is usually based on a design of an interactive digital system with an edutainment element or existing virtual environment and examines how well this system performed as a teaching aid. Those studies use ethnographic approach and interviews to assess user experience and learning benefits, however throughout their paper Throne et al.(2009) repeat that

...there is a great need to more substantively explore the educational potential of social virtualities in ways that move beyond text-based CALL [computer-assisted language learning] paradigms to examine other possible effects, dynamics, and uses associated with visually rendered and avatar-based virtual worlds.

The focus of this project is to open up the area of interaction design with multilingual children in the centre, create design openings and explore the potential directions.

The method that is commonly used in interaction design process is based on ethnographic approach. However this approach leads the solution-focused design; the goal of ethnography is to identify particular problem and find a solution to this problem through narrowing down the research area, group of stakeholders and use situation (Crabtree et al, 2009). Therefore, ethnography does not really let the researcher expand and open the design space which has not been previously studied enough.

A few established design researchers have been discussing critical design as an approach to open the design space for exploration and posing new questions. Other related methods are cultural and technology probes that create different quality of knowledge rather than ethnography. The nature of probing is generic while the nature of ethnography is analytical. This is discussed more in detail in the section 3.2.

¹ www.interaction-design.org/calendar/idc_2013_-_interaction_design_and_children_conference.html

The use of probes in the current project is chosen mainly due to the two following factors:

- A. Probing and critical design approach is aimed at exploring the focus area for design openings and discussion
- B. Probing and critical design has been successfully used in the domestic and family settings (Hutchinson et al, 2003, Dunne & Raby, 2001, Gaver, Dunne & Pacenti, 1999)

Research question:

- 1. *What openings are there for interaction design to facilitate multilingual family communication?***
- 2. *How can probes based on playful interactions be used to explore the design space of multilingual family communication?***

The knowledge contribution of the following project is a set of concepts exploring design space. Each design opening that is expected to be discovered from the probing experiments can result in a number of concept sketches that are filling in the design space.

In relation to the secondary research question, I will explore a probing tool based on playful interactions and draw conclusions on its usage and effectiveness in design process for family settings.

3. Literature overview and related work

As the current project explores probes through playful interaction in the area of domestic multilingual child-parent communication, in this chapter I will discuss literature on the related topics.

3.1. Multilingualism: theory and practice

The vision of multilingual children has been changing a lot through the last century and new theories and practices have been discovered and explored. Up till the 1960s, bilingualism and multilingualism in children have been considered as a traumatic condition that decreases a child's cognitive and intellectual abilities. There has been a stated notion that multilingual children are deficient in their spoken and written expression, their vocabulary is very limited and all the negative consequences of multilingualism affect a person up to their early adult age. Interestingly, it has been discovered that most of these studies were lacking an objective methodological approach; they did not consider socio-economical status of the research subjects which influenced the overall picture. For example, often, bad school performance and low IQ levels were blamed on the bilingualism of the social group rather than their socio-economic environment (Hakuta, 1985). Starting from the 1960s, the research methodologies became more elaborated and the notion of multilingualism has changed. Bilingual children were proven to be more cognitively flexible, enabling "a better manipulation of verbal and non-verbal symbols" (Hakuta, 1985). In the 1970s, researchers looked in more detail at the thinking patterns of bilingual children and their cognitive abilities. They discovered a lot of advantages in bilingual thinking opposite to the monolingual thinking.

An interesting point about research of identity of multilinguals was made by Edwards (2008). He summarises different studies that have been conducted through the past years and emphasises that the research community is lacking empirical data about how bilingualism influences self-identity and personality. Some of the theories have been adopted by different authors but never proven experimentally (Edwards, 2008). For example, one of the popular theories assumes that unconsciously, a bilingual person has some kind of split individuality, as the language, dialect or jargon is closely attached to self-identification with a certain location, culture and social status. Most of the authors on bilingual children development write that already as early as the age of 2, children separate the languages depending on the person they are talking to or the social situation (Meisel, 2004). At this age, children get an awareness of their bilingualism and intuitive code-switching. There are no conflicts between grammar and vocabulary systems, they rather develop in parallel starting around the age of 2.

However, it would be wrong to state that monolingual and bilingual children have similar language development processes. For example, if the languages are developing out of balance, some grammatical structures from the strongest language can be imported into use of weaker language (Meisel, 2004).

Some general points about children multilingualism were given by Annick De Houwer (1999). She confirms that there is no scientific evidence to causal relationships between a multilingual environment,

language and learning disorders. She explains it as a simple lack of consideration of other factors that influences a child's behaviour. When multilingual children behave differently in a society such as a classroom for example, many think of it as a psychological disorder without analyzing their cultural background and traditions of their community (Park & King, 2003). Another way to create such an attitude towards multilingual children is to neglect the socio-economic status of their environment. For example, in the mid-20th century, hispanic children in the USA were considered linguistically handicapped and the reason for their statistically bad school performance was thought to be their bilingualism rather than their social environment, family status and traditions (Hakuta, 1985).

There are a few popular practical methods and recommendations for parents raising bilingual children. One of the most widely used is the One parent - one language (OPOL) approach that was caught attention in the 1990s (Barron-Hauwaert, 2004). It simply consists of each parent using exclusively his or her mother tongue while communicating with the child from its birth. The main argument of this approach is that it is much easier for a child to refer to one person speaking one language and even before the child starts to speak himself, he or she acquires the understanding of two different languages and starts speaking both languages fairly naturally (Barron-Hauwaert, 2004). All the research pioneers of this method had bilingual children of their own and were observing their children through their childhood and adolescence. There was a gap in the research of the OPOL method and other approaches to bilingualism in the mid 20th century and in the 1980s linguists resumed their interest in it. In the 1990s it was argued that in order to achieve the best results while using the OPOL strategy parents should speak the minority language (not the language of the community) when addressing each other (Barron-Hauwaert, 2004). The OPOL approach enables the child to organise his or her vocabulary, get natural emotional feedback and make active use of the language rather than just passively understand it. Both families that participated in the current thesis project use this technique of communication quite successfully.

In fact, the participated families are exposed to three and even four languages in their everyday life. In the literature, multilingualism is usually discussed as another type of bilingualism and it is actually not a rare phenomenon (Barron-Hauwaert, 2004). As it was mentioned previously, multilingualism in relation to mono- or bilingualism is not researched enough, particularly its influence on the social and cultural identity of a person. However, Barron-Hauwaert points out that just growing up in a multilingual environment does not guarantee a balanced development of several languages. It requires use of media, books and communicating with many different speakers, especially when there is a clearly minority language spoken by very few people very rarely. There are different scenarios and different combinations of multilingual children development and some of them are going to be mentioned and investigated in this thesis project.

3.2. Artefacts in design research

Creating the artefacts is one of the most common practices in design-based research. Artefacts are created at each stage of the research starting from the early experiments up to testing the final prototype. As stated previously, this project is focused at the early stage of the process and addresses the question of how the design artefacts create valuable knowledge when exploring the design space.

Design artefacts are the medium of connecting the area of socio-linguistic studies and interaction design. In this section, I will discuss different types of artefacts that have been used by different design academics.

3.2.1. Critical design

One of the strongest examples of the research artefacts is the concept of critical design. It belongs to the everyday life of people and are experienced in casual circumstances. The point of this experience is not meeting the needs of the user, but rather puzzling and perplexing them. The products of critical design create dilemmas and emphasize questions instead of resolving them. The canonical authors of critical design Dunne and Raby (2001) do not really state that critical design is a design knowledge, though they argue that

[Design] needs to establish intellectual stance of its own, or the design profession is destined to lose all intellectual credibility and be viewed simply as an agent of capitalism”
(Dunne & Raby, 2001:59).

Dunne and Raby (2001) are discussing the vision of a designer as a creator of something that is comforting and simplifying the life with realistic concepts for the mass market. Rather designer should challenge the society and try to blur the border between the real and the fictional and create “carefully crafted questions” represented by these artefacts. This challenge and provocation is not necessarily something negative. People can get engaged through artefacts that communicate through humour, surprise or wonder.

One of the best known examples of critical design of Dunne and Raby (2001) is the Placebo project (figure 1). They created everyday objects that were placed in the volunteers’ homes for them to explore their meaning and influence in their lives. The overall theme was challenging people’s perception of the electromagnetic field, making it more intense and thus changing their behaviour or state of mind.



Figure 1. Placebo project: compass table; electro-draught excluder (Dunne & Raby, 2001)

The object's shapes reminded of conventional furniture but their meaning and function was open-ended so that the users could question themselves and find their own interpretation of those artefacts. The experiment was wrapped up with a series of interviews with the volunteers about their experience.

Considering the relevance on the ongoing thesis project, critical design covers the essentials of how a design artefact can be a tool of creativity and discussion rather than final project with defined functionality and aesthetics.

3.2.2. Cultural probes

Another type of design artefact that appears for the sake of the process rather than adjusting the final result is cultural probes. An example of cultural probes is postcard with questions, cameras to take photos of the details and events of everyday life or other physical artefacts that allow a participant to express the feelings from an aesthetical and cultural point of view. The probes are distributed among the participants, which are representing a potential user group, and are collected after a few days or weeks.

William Gaver (2004) suggests that cultural probes should not be considered as a source of scientific knowledge, first of all because the interpretation of the probes, as well as collecting probes by the user, is very subjective. Gaver et al. (2004) argue that summarizing, analyzing and extracting knowledge from those probes is inappropriate. As the researcher is not present and cannot observe the setting from a side view, the probes are influenced by many events and things that create different cultural layers which influence the probe return. Probes are made to the settings where empathy and engagement rather than utility is crucial. They are also considered useful in domestic and family settings, similar to the topic of the upcoming master thesis project.

“ Instead of designing solutions for user needs, then, we work to provide opportunities to discover new pleasures, new forms of sociability, and new cultural forms.”

(Gaver & Dunne, 1999)

Cultural probes are not only a source of inspiration for the designers but also a tool to provoke the users. This is what makes cultural probes similar to the critical design discussed above; they both make people think about their roles and experiences because of their embodied materialised nature.

3.2.3. Technology probes

The aforementioned Placebo project brings us to the concept of the technology probes that goes further than data creation all the way to knowledge. The use of technology probes is mainly described in the article “Technology probes: inspiring design for and with families” (Hutchinson et al, 2003). Technology probes are defined as “simple, flexible and adaptable technologies” (Hutchinson, 2003) that enable design exploration. The probes are created in an open-ended way so that the user is able to interpret

them freely and possibly change the behaviour of the user, making the idea somewhat similar to the concept of critical design. The core definition of technology probes is “an instrument that is deployed to find out about the unknown – to hopefully return with useful or interesting data” (Hutchinson et al, 2003), though the use of technology probes implies further synthesis to provide inspiration for innovation.

Another interesting way of interpreting technology probing is that it creates not only design knowledge but also contributes to the social sciences. Technology probes can be a new way to make a qualitative ethnographic research for social sciences, for example revealing new patterns in communication between family members and providing new tool of sociological research. Knowledge contribution to interaction design and engineering would be synthesized insights for designing novel technologies and artefacts. What distinguishes playful and ambiguous cultural probes that Gaver (2004) discusses, from technology probes that Hutchinson (2003) introduces, is that Hutchinson et al. created a functionality that would log the interaction with the probes in terms of time and duration. The cultural probes technique does not imply any explanation or interview with the participant and it embraces ambiguity. This would make technology probes somewhat more objective and more suitable to be considered as a source of knowledge.

Open-endedness and ambiguity in design process is discussed by Gaver (2004). In the general understanding of Human-computer interaction (HCI) ambiguity is seen as something negative as the goal of HCI is flawless usability and usefulness (Gaver et al, 2003). However, ambiguity is the factor that helps evoke “personal relationships with the technology” (Gaver et al, 2003). Redström and Hallnäs (2006) also argue that sometimes usability (the only correct and possible way of using the artefact) is not the solution to the complex problems. Re-interpretation and misuse of the objects opens new perspectives on design. “Human beings acts towards things on basis of the meaning these things have for them” (Hallnäs & Redström, 2006). Acts are what creates the meaning of a thing to a specific person and extend the intended use. For example, a door, which intended use is to pass into a room. It can be slammed, which would express a person being angry, the same door can be left slightly open meaning that the visitors are welcome to come in. Therefore, human actions are what shapes the design of a certain object.

3.3. Playful interactions and language

Use of languages, words and expression in playful activities has a long and rich history. Unexpected, playful and provocative use of language were immersively discovered in children stories by Lewis Carroll and Dr Seuss, artistic experiments of dadaists and surrealists (Flanagan, 2009). Both Flanagan (2009) and Salen & Zimmerman (2003) refer to the psychologist Brian Sutton-Smith and his notion of *play on words* and how language is used in a playful way. Children rhymes, riddles, jokes and puns are the oldest and the most common use of wordplay which is an important part of many cultures since ancient times (Flanagan, 2009). Salen & Zimmerman (2003) conclude that jokes and humour in language would not exist without a conventional use of language.

The play exists both because of and in opposition to the structures that give it life.
Salen & Zimmerman (2003)

This statement juxtaposes what Flanagan (2009) states about subversion as an element of critical play. When a playful use of language takes place, subversion becomes an essential component, the joke would not be a joke without subverting and disrupting conventional use of words.

3.3.1. Play and language development in the pre-school children

Play is one of the basic human activities. Huizinga (1949) has even argued that play evolved earlier than culture and play is an essential part of everything that a human does. Canonical researchers on children development as Vygotsky and Piaget argued that in the process of playing children use the skills that they are currently developing (Ely & McCabe, 1994). Riddles, rhymes, teasing, verbalised fantasy and storytelling are other very common ways of using language in a playful engagement by preschoolers. Modification, repetition, making sense of nonsense and imitation are also a part of the development of language skills, handling words and sounds. An important thing is that in many cases the language play is a part of a social interaction. Role-play, for instance, is first of all a play of words that enables social interactions. To express one's role character, the player verbalises his or her role, putting meaning into it and sharing it with the others. Sometimes children can act out a character without any props, rules, costumes or toys - language, sound and humour can fully express the role.

3.3.2. Video games and language

Thorne (2009) discusses a number of cases when virtual environments were used for learning a second language. It was noticed that online multiplayer gaming, pop culture communities and other social online environments unintentionally encouraged learning of a second language. For example, participants of the fan fiction movement of Japanese pop culture, create stories and imagery based on existing storylines and characters of films, books and animation. Emotional attachment and peer recognition gave teenagers a strong motivation to learn and research a new language (Japanese) or improve their English as a language for international communication.

Thorne et al. (2009) mentions another interesting example, when gamers of World of Warcraft unintentionally started a language related discussion through the game instant messaging interface. Russian and English language speakers spontaneously started to teach each other bits of each other's languages and share experience. This represents an interesting design opening that was discovered by means of a game as interaction design artefact where the game became a flexible medium for human-human communication.

One more way of collaborative language learning was performed by two Chinese-speaking students who had to accomplish an English-based quest (Zheng, 2009). Logs of the game, observations and interviews with the participants showed that collaboration of a student who could speak fluent English and the one with weaker skills resulted in acquisition of semantic and discourse practises, finding meaning and modifying cultural perspectives.

In the aforementioned paper Thorne et al. (2009) summarise perspectives of using virtual environment for learning of foreign languages. All the cases were based on existing game environments and the article concludes with a number of questions for further research, stating that the potential of this research area is big and yet unexplored. All of those conclusions are based on the problem of efficiency of language learning through games. In this project, I am going to look at the area from a wider perspective, make a step back and see the possibilities and interesting openings to many different problems or questions rather than going with efficiency of learning as a starting point.

4. Method

In the 1960-1990s in the area of multilingual development the biggest concern was if multilingualism had a positive or negative influence on a person's cognitive and verbal skills as well as identity and social skills. According to Hakuta and Diaz (1985), quantitative research was mostly used for those purposes. Focus groups like comparison of bilingual and monolingual individuals and statistical analysis based on the psychometric tests gave the researchers groundings to argue against or in favour of multilingual children development and to observe the differences between the two groups rather than explore their language abilities. Most of those studies stated that monolingual development is a norm and multilingualism is a deviation from this norm, therefore such studies were rather biased (Meisel, 2004).

The current master thesis project addresses the research of multilingual communication from a design research point of view. Interaction design is a complex cross-disciplinary area of studies that can contribute to areas such as engineering, social studies and product design. The aim of this thesis is to contribute with knowledge valuable for the interaction design community and possible contribution to sociology and language studies.

The focus of the current project is children in multilingual family settings. The common ethnographic approach would recommend exploring the situation by observing everyday interactions and communication within the family. The nature of probing is generic while the nature of ethnography is analytical. Ethnography originates from the social sciences and using the methods of ethnography, designers create design knowledge (Gaver, 2004). Design, respectively, can contribute to both knowledge areas – design research and social sciences – through using designed tools such as technology probes. The basic ethnographic approach in design was related to the people's work environment where efficiency and usability were the main focus of the designers. 'Work' in an ethno-methodological approach means any conscious human-machine action or interaction. Since technology moved from the workplace and computing became ubiquitous, it became challenging to find new ways of exploring non-work related situations of human-computer interaction. On the contrary, probing is suggested to be used in "designing for everyday pleasure" (Gaver, 2004). An interesting point is that what people do and how they do it is actually organized by people themselves, so it makes sense to take a closer look at the cultural interpretations of the actions and be critical to people's actions and interactions.

An interesting observation was made during a previous personal experience of working with children. A 4-year old boy was offered to play a simple board game, "snakes and ladders" type of game. For some reason, either just by denying the established rules of the game or because he was too young to understand and follow those strict rules, he unintentionally transformed this game into a playful activity, role-play storytelling. According to Salen and Zimmerman (2003), a game is defined by rules, artificial conflict and quantifiable outcome while a playful activity is "a free movement within a more rigid structure" (Salen & Zimmerman, 2003:304). The child did it by altering the established structure of the game and making it into a *transformative play*. The child created transformative play from a game that

was not supposed to be transformed, while there are many games that are originally designed as transformative. Board card games such as Fluxx and 1000 Blank White Cards presume constant transformation of rules by the players while playing the game (Salen & Zimmerman, 2003).

In general, the method of this projects was creating an open-ended adaptable and flexible game probes and implementation of this tool in the multilingual families. The families were asked to interact with this probes as they feel a need or desire during one week. Interactions were followed by a detailed interview with the users and possible co-creation activities. This information was used to shape design opening and groundings for further research.

This thesis project defines *game probes* as transformative games that provide design openings and inspiration through re-interpretation and co-creation by user.

Game probes were designed based on the initial fieldwork that include a number of interviews and a long-term observations that have been made over 8 months of communication with multilingual children and their families at home and Sunday language school.

Participating families were people with a strong proactive life position who were willing to contribute to the research on children multilingualism. The goal of this project was explained to them in a very detail and they see themselves as an important participants of the research rather than experiment subjects. Building personal trust and mutual understanding was a big part of this project.

There are a few other concerns that argue in favour of probes approach instead of ethnography. Working with children and intimate family settings in focus is always a bit more complicated, first of all, due to the ethical issues. Also, this project was limited in time to about 10 weeks of the research and these time constraints did not allow me to spend time on recruiting volunteer families for the ethnographic studies. Participatory design often requires profound long-term relations with the participants and is usually aimed at solving a concrete problem. In this project, I did not face any particular problem and, as stated previously, the aim was to open up the design space.

4.1. Qualitative research

4.1.1. Semi-structured interviews

Each empirical study of this thesis projects was based on the semi-structured qualitative interviews. Initial fieldwork as well as analysis of the game probe implementation were aimed at opening the area for the insights, interesting facts and inspiration for design.

Initial fieldwork was held in a form of unstructured interviews with 4 groups of stakeholders. The interviews together with previously done observations provided groundings for inspiration of the technology probes and helped to point out potential points of interest.

The essentials of practice of qualitative research are described by Alan Bryman (Bryman, 2012). As standardisation is not important in the qualitative interview, the questions can vary in order or wording and even be created as a response to what was previously said by the interviewee and be held in a more conversational style. The goal of semi-structured interviews is to get as detailed and rich data as possible with a focus on the research area. Semi-structured interviews can be based on an interview guide which is a list of questions or specific topics that are going to be discussed. Questions that are not included in the interview guide can also be asked if the researcher feels that it is reasonable and important; those questions usually evolve as a follow-up on the points mentioned by the interviewee. Semi-structured interviews allow the interviewees to raise additional or complementary issues in relation to the topic which is important when the goal of the whole project is to find multiple various directions and openings for design.

The questions of the semi-structured interview are based on the research focus and the research question. The language of the questions has to be comprehensible and accessible to the person who is interviewed. Leading questions must be avoided to have an unbiased point of view of the interviewee and more reach answers. There is a list of question areas that make a qualitative interview (Bryman, 2012) such as:

- *Values;*
- *Beliefs;*
- *Behaviour;*
- *Formal and informal roles;*
- *Relationships;*
- *Places and locales;*
- *Emotions;*
- *Encounters;*
- *Stories.*

All of these things reflect the interviewee's experience in relation to a specific research topic.

There are also some basic recommendations on how to conduct a semi-structured interview (IDEO Toolkit, 2009, Bryman, 2012). It is important that the person who is interviewed feels comfortable and relaxed. Privacy, especially when talking about family matters, is crucial, the person has to be reassured that his or her private information will be used confidentially and only for research purposes. Privacy also entails that the interview has to be set in a quiet area where the conversation is not under a risk to be overheard (Bryman, 2012).

4.1.2. Online open-ended questionnaire

Posting the questions online in a form of open-ended questionnaire has its benefits and downsides. The main benefit is that it allows the researcher to collect a big amount of information in a short time. Online communities nowadays, especially those concerning international matters such as bilingualism, include thousands of people from all over the world. Online questionnaires do not require to establish

close relationships with the respondents as filling in such a questionnaire takes a short time, do not need any special preparation, is done anonymously and the topic is personally relevant to those responding. The disadvantage is that this type of data collection is very close to a structured interview that limits the degree of openness and the researcher is not able to ask follow-up questions that could have resulted in interesting insights.

4.2. Game probes

Critical play is a term introduced by Mary Flanagan in her book “Critical play: radical game design” (2009). It discusses how game and play can be used to examine social issues or as instruments of conceptual thinking. She defines critical play as:

...to create or occupy play environments and activities that represent one or more questions about aspects of human life.

(Flanagan, 2009)

Flanagan writes that critical play can produce an analytical framework to examine a specific issue. For example, subversion of the rules is a mean of self-expression and therefore it becomes a creative act and provoking a player to subversion is a powerful tool for critical game design.

Critical gameplay originates from Dunne and Raby (2001) philosophy of critical design. Yet another scholar that discusses critical gameplay is Grace (2010). She discusses the idea of using basic principles and elements of gameplay in video games in a critical way (Grace, 2010). Such concepts as shooting the potential enemy, cooperation vs. competition and game flow are abused and exaggerated to provoke and question the user.

Some critical games are called abusive games for their provoking, irritating, unfair mechanics or exploitation of human senses and breaking the flow (Wilson & Sicart, 2010). Abusive game design establishes personal relations between the player and the designer. It creates a close dialogue between them and that makes it related to the technology probes and critical design: provoking discussion and dialogue. While common gameplay is a relation between a player and a system, abusive game design includes the designer into this relation and dialogue (Wilson & Sicart, 2010). In abusive game design, the game is a mediator between the designer and the user instead of creating a game-centred systems (Wilson & Sicart, 2010). This overlays the idea of communicating with a potential user through a piece of technology with an intention to provoke them and get fresh insights for further design exploration. The goal of a game as a probe would be to challenge the mindset of the user and to provoke them for unexpected exploration.

Flanagan (2009) argues that critical game design process is going through iterative stages as any other game design, but instead of design goals, critical game would pursue value goals and the rules have to support those values (see figure 2).

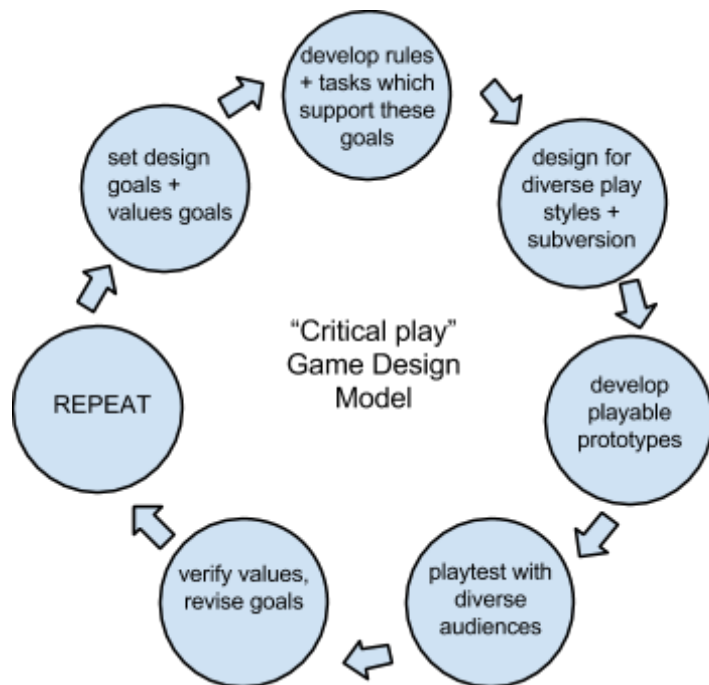


Figure 2. Model of Critical Play Method (Flanagan, 2009:257)

Designing for subversion and different play styles makes critical games different from common game design, opens them for player's creativity and alternative points of view. However, I see *designing for values* as an important part of artistic exploration but not something relevant for the goals of technology probes. An artist promotes social and cultural issues and trying to point out those issues through playful artistic interaction. When we create technology probes, the position of the designer is absolutely neutral; the goal is not to support certain values but to let people explore the whole space of possibilities and perspectives. Critical design in its core is a way to critique some social, cultural or psychological issues which differs from the goals of the current study. Inviting to exploration and co-creation in positive and user-friendly way is a positive way of provoking exploration, reflection and creativity. Another point is that critical design usually aims to make people pay attention to something that they usually take for granted in their everyday scope or in society. Multilingual communication in a family is not taken for granted. According to the surveys and interviews from the initial fieldwork, it is fully realised by the parents and occupies a big part in the everyday life in terms of planning, discipline and internal family discussion. It is also a conscious choice of the family members as a general direction of communication tactics and upbringing of a child and as a daily choice of behaviour.

On the other hand, the main point of critical design and critical games is embodied experience where materialising a question or an issue in the form of game or object provides a person with more profound experience and encourage transformation of behaviour, actions or mindset. This element of critical games is a core of the current project, as I am creating a playful experience that would inspire transformation of players' behaviour and enable changing the rules and game mechanics.

Technology probes are not looking for the best intended user experience, but rather encourage re-interpretation and use in unexpected ways. Moreover, a deliberate lack of certain functionality can be chosen on purpose to encourage user to re-think and co-create interactions. Thus, iterative process which mainly focuses on improving intended interactions and meetings defined design goals does not take place in development of the technology probes.

Brandt and Messeter (2004) describe how board games were used as a tool for participatory design in various contexts. Games in participatory design are not a novelty and have been used since the late 1980s (Ehn & Sjögren, 1991, Habraken & Gross, 1987). Habraken and Gross (1987) used game in more of a social study, observing architects playing games to understand their actions in the development of urban design concepts. The games were not related to the design itself but facilitated ethnographic research. One of the design games used by Brandt and Messeter (2004) was *The User Game*. They involved different stakeholders in a board game activity to create a better understanding of potential users and use contexts. It was facilitated through storytelling and search for the relationships between keywords written on some cards and images on the other cards. In one of the examples, the gameplay provoked arguments between the two playing teams as one of them did not accept the story of another. It showed strong engagement and an attempt of re-interpretation of the rules. Though it was not a focus of that experiment, for the current project such turn in playful behaviour is relevant.

Coming back to Salen and Zimmerman (2003) definition, the game probe that is designed in this project will combine all three categories of “play”:

- Being playful: the game probe should encourage a playful behaviour disregarding of the established frames of the game, playing with words, language and playful references to the everyday life events.
- Ludic (playful) activities: role-playing and make-believe games should be available through the offered set of artefacts or altering the rules transforming the game into a play of chance and probability.
- Game play: an important point here is leaving a space for a player to decide on the outcome of the game and fill in missing elements of the rules. While basic rules and goals are predefined, children and parents are encouraged to change the game’s rules, elements and mechanics making it more fun/easy/difficult etc.

These different categories also refer to *designing for diverse play styles* from Flanagan’s (2009) model of critical game design method. The goal of implementing the game probe is to be flexible in its interpretation and use it in different ways from playful behaviour to a game play.

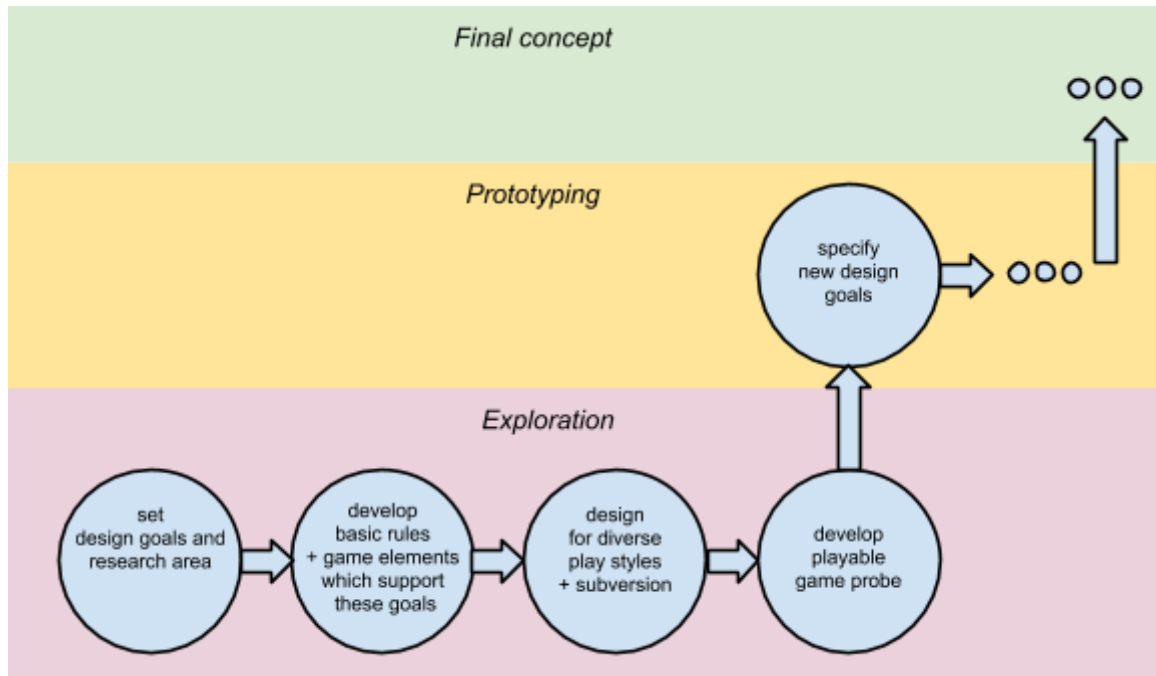


Figure 3. Model of the Game probe method

Overall structure of the game probe design is shown in figure 3. It is based on the elements of critical game design but does not entail iterative nature of problem solving through design, as its goal lays in the area of exploration rather than concept development.

4.2. Design space exploration

The research question of this thesis aims at creating a design space and suggestions for the design openings in the area of multilingual family communication. Comprehensive definition of what design space is was given by Botero et al. (2010):

the design space should be conceptualized as the space of possibilities for realizing a design, which extends beyond the concept design stage into the design-in-use activities of people.

Botero et al. (2010) describe design space as a network of factors and circumstances such as stakeholders, social processes, technologies and materials. They shape the space where new design potentials are emerging. Design space is structured by the activities that the stakeholders do in the range from use to creation through re-interpretation, adaptation and reinvention.

One of the most common definitions of the *design space* was given by Westerlund (2009) and it describes a range of possible solutions. Typical design process starts from a problem definition and designing a solution for this problem is the goal. According to Westerlund such an approach makes the design process very rigid which contradicts with a common notion of a wicked problem. Wicked problem is a complex problem that does not have only one true solution therefore this method of design becomes irrelevant. Westerlund (2009) argues that the design which evolves from possibilities rather than problem solving can be efficient, desirable and successful. These multiple possibilities create the

design space (see fig. 4). Exploration and experimentation are the core ideas of opening the design space. Experiments can include interviews, probing, prototyping and what is important is to enable the user create meaning for a particular artefact, therefore offering the user a solution or a possibility.

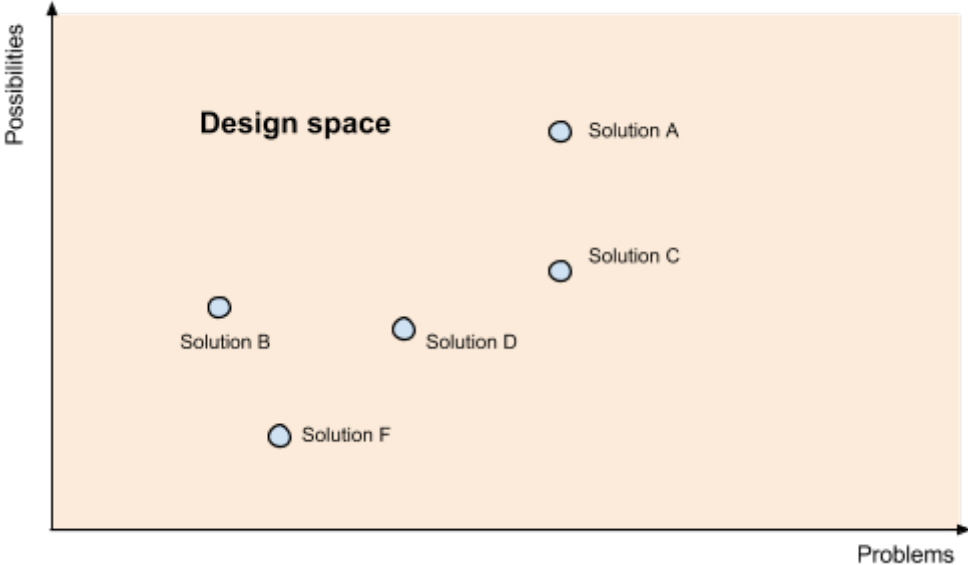


Figure 4. Simplified model of design space

The position of the design space in relation to the design process is illustrated in the Human-centred design model by IDEO (2008). Though they do not recognise the area of abstract themes and opportunities as the design space, it clearly relates to the Westerlund’s (2009) definition. This model however, does not implement the notion of *problem statement* while the solutions are one of the key points on the process timeline.

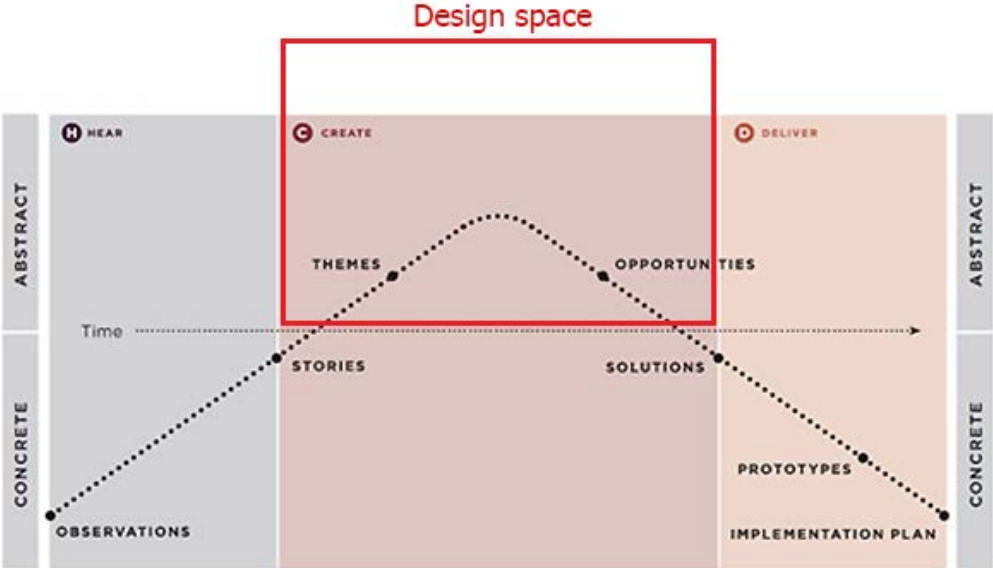


Figure 5. IDEO Human-centred design model.

Westerlund also mentions the IDEO design process in his article on design space and he argues that the process of brainstorming and coming up with multiple ideas is basically a design space exploration (Westerlund, 2009). In the current project I am planning to explore the design space of multilingual communication between children and parents through similar brainstorming process and generation of opportunities. The goal of the game probe is to provide stories, themes and directions for this ideation on multiple opportunities.

Throughout this thesis I am going to talk about design openings. Design openings are those opportunities that the design space provides and the closest definition of it was given by Beyer and Holzblatt (1998). They outline a user-centred ethnographic approach to design at the office workplace and use the notion of design hypothesis as a stage that precedes design idea generation:

From the fact, the observable event, the designer makes a hypothesis, an initial interpretation about what the fact means or the intent behind the fact.

Design openings however can be more flexible than design hypothesis which is described as an interpretation of a fact that needs to be elaborated into a design idea. Design opening is less of a specific statement like design hypothesis (“the chart of account is placed next to the [computer] screen... is just a holdover from paper accounting system”) rather it encourages some sort of action through user-centred design such as enabling, supporting, creating or performing.

Theoretical work on design space and understanding of design openings is not rich enough at the moment and requires further exploration and development.

5. Process

5.1. Initial qualitative research

Initial experiments were held in the form of qualitative research with included online surveys and individual interviews with different stakeholders. Seeing the research area from as many different perspectives as possible but maintaining focus of child-parent playful communication in a multilingual family was a goal of these experiments. It was decided to include the following people in the initial qualitative research:

- parents of multilingual children;
- researchers in the area of multilingual children's development, education, psychology and social studies;
- teachers;
- adults that grew up in multilingual environments.

5.1.1. Online survey: parents of multilingual children

The online survey was spread through social networks of the parents of multilingual children (on Facebook) from different countries all over the world. The survey is based on open-ended questions and its purpose was to get interesting stories, practices and thoughts of the parents from different cultural and language background in different locations.

The questionnaire consisted of 13 questions, two of which were demographics (languages spoken, age of the children) and one field for open comments.

General information:

What languages are spoken in your family?

How old is your child/children?

Communication with others

How does your child choose a language when meeting other multilingual children (speaking the same languages as your child)?

How does your child choose a language while playing or talking to the toys or animals?

What are the most frustrating or confusing moments of your communication?

Do you use any special techniques or tricks to encourage multilingualism in your family?

Can you think of what would make it more fun for your child to practice the minority language?

What can you say about emotional attachment of the child to the languages spoken in your family?

Use of interactive artefacts

How do you use toys to support and encourage multilingualism?

How do you use games to support and encourage multilingualism?

If it was possible to create any magic device or toy for your multilingual communication, what would you think of?

Final question / feedback

Here you can add any other comments or stories that you would like to share.

The survey was answered by 23 respondents from different countries. Data analysis was made through sticky notes session aiming at interesting details and unusual stories rather than noticing tendencies and narrowing down as it would be done in a traditional ethnographic approach.

A notable point was that many parents talk about themselves when asked about frustrating or confusing moments. Their emotions and state of mind is heavily affected by unusual environment. They felt guilty because they felt like they were asking too much from their children, got tired of correcting the children's speech and consequentially gave up, which caused self-reproach. "People look at us" was mentioned a few times in different context but negative attitude from external people seemed to really bother some parents.

Interestingly most of the people are using some language apps for smartphones and tablets but they did not express much enthusiasm towards it. The question about magic device for multilingual communication got frequent answers such as robot, talking cars or dolls and only one respondent mentioned a computer game. Parents seem to consider a tangible toy as a preferred artefact while using screen based solutions as something accessible.

In general it was very intriguing and inspiring to be a part of this Facebook community for two months and see people entering it for the first time. Usually their first public message contained the short story of their family and some form of a question, fear or seek for support from the other members. They seemed to be very satisfied getting the answers to even quite obvious questions and the fact of this exchange of thoughts and ideas feels very rewarding.

5.1.2. Interviews: parents of multilingual children

Semi-structured interviews help to get into more details of the everyday communication than the online survey. Relaxed home settings and open conversation creates more informal atmosphere and the participants were able to talk more specific about their experience mentioning small details, unusual, difficult or funny situations.

Two interviews with mothers of trilingual children were held in the casual domestic environment. Both conversations took about one hour and were based on an open-ended semi-structured interviews, audio taped. The interviewees felt very comfortable and enthusiastic about the interview. The interviews started with introducing my research area and explanation why the point of view and perspective of the parents of the multilingual children are so important in this study.

One interesting story was based on the use of a minority language as a "secret language". A russian-

speaking 8-year-old child living in Sweden was using Russian when she wanted to communicate something “secret” or intimate to her mother or sister. The minority language was used by her as a sort of superpower that others did not have. However it could lead to awkward moment when the family was visiting Russia. The girl would forget that all people actually did understand her and she could say something awkward or offensive about a third person assuming that this person did not understand what she was saying. Overall, such behaviour has clear playful qualities (see chapter 4. Method) that might have a potential for implementation for critical game design.

Another playful behaviour through language exploration was creating a fantasy “language” by a 4-year old three-lingual boy. His parents are coming from Russia and Greece and the family lives in Sweden. The boy invented his own language at the age of 4 and referred to it when communicating with his parents up to the age of 8. He called the language “mattiska” and the “words” were usually based on visual and sound associations with a particular object or action. While playing with his mother, she used to tell him the meaning of unfamiliar Russian words and he could respond “...and in Mattiska it is...”. This language did not have any system and the child did not actually use the same word referring to one object. Though the verbs sounded Swedish with their -a endings and stress on the first syllabus. His mother explained this behaviour as searching for “the language of his own”. Everybody in his surroundings had an own language: the mother had Russian, the father had Greek, different children in the kindergarten had Croatian, Arabic or Spanish so he felt a need of a special own language.

5.1.3. Interviews: multilingual adults

Interviewing adults who had grown up in the multilingual families provided insights from another perspective and enriched the ethnographic data. It is also interesting from emotional point of view: events and details that adult people remember from their childhood was a powerful emotional experience that remains in the memory for many years.

What was the most challenging growing up as a bilingual?

What was the best about growing up as a bilingual?

Was it fun?

Do you remember any confusing, funny or unusual stories from your childhood in connection to your bilingualism?

What was the most frustrating?

What advice would you give you parents if you could come back to your childhood now?

What was the best motivation for you to speak the minority language?

In one of the interviews a 26 year old man who was born in Italy and moved to Sweden at the age of 9, mentioned that the hardest part for him was to “look for words” while those children who continued living in Italy did not have to do it. Another thing that he as a child used to be upset about was to be corrected by his mother when he accidentally translated Italian expressions into Swedish, word by word. The frustrating part was not necessarily being corrected but realising that he had confused the language

and forgot some basic constructions of the language that he grew up with. As an older brother he remembers another negative emotion when his younger brother refused to speak Italian to him because he got used to speaking Swedish.

Another interviewed person was a 34 year old female who was born and grew up in the UK in a family of Indian immigrants. For her the most challenging was to be in between the *camps* as she called it. Growing up in two very different parallel cultures was hard but interesting in terms of self-identifying. This reminded me of a conversation with a Russian-latvian 23 years old, who described it as a hard experience being neither accepted in both cultures, when in her teenage years there was a strict separation between native Latvians and native Russians and one had to choose one of the groups and make friends in this group. The English-born Indian, described that it was rather embarrassing for her as a child when her grandfather picked her up from school and was shouting to her loudly across the playground in Punjabi.

5.1.4. Educators and researchers in the area of children's bilingualism

People professionally working with multilingual children have another perspective of the situation. Moreover, teachers have relevant theoretical background that the designer is lacking. That is why their opinion has to be taken into consideration.

What are the biggest challenges of your work in terms of multilingual communication?

In your opinion, what area of the research on multilingual children's communication is insufficient?

Why do you think this area of research is not covered enough?

Interview: teacher of multilingual children.

The perspective of a teacher is in a way an opening to a new angle of the problem. They are an external party of the family communication but they need to understand and see children's habits and skills that they have learned in a family. Teachers are a sort of inheritors of the consequences of how parents handle the issue of multilingualism in a family. Teachers are adjusting their programs according to the general situation in the classroom and at the same time taking into account each child, his or her level of language proficiency and family background.

The interview took place at the Sunday school for Russian speaking children in Malmö, Sweden, and took about one hour. The conversation was focused on her experience with multilingual children, peculiarities of families and how they affect the development of the children's language skills, social and learning aspects of their lives. It is important to mention that this teacher sees the most appropriate and effective the "one person - one language" system when from the early childhood a child is used to communicate strictly only one particular language with each parent. What she particularly pointed out was the role of a parent who is a native speaker of the minority language and common problems that those parents face. There are a number of issues both psychological and social that many parents have to struggle with.

A few times she mentioned that raising a multilingual child is a hard stressful work that requires much mental strength from the parent. While children are under 10 years old they are not biased with social pressure of being different from many others and those children are actually proud of being able of speaking many languages that sometimes even results in attempts of teaching friends and kindergarten nurses the minority language. This is an interesting controversy with the perception of many parents of being a speaker of the minority language. Social pressure often prevents parents from practicing in the minority language in public because of a fear of being considered as an “alien” or “immigrant” which still has a mostly negative connotation in western society. As soon as a parent uses two or three different languages depending on the environment and social circumstances, the child starts neglecting the minority language.

Interview with a researcher

Interviewing the researchers was relevant because the expected knowledge contribution of this thesis project refers to the practices of language, cognitive and social studies. It is important to understand current state of the art in the applied knowledge within the area.

I have interviewed a professor at Malmö University, Lena Rubenstein Reich, whose area of academic interest is pedagogy, children’s perspectives, democracy, migration and children’s rights.

The conversation was mainly covering the goals and ways of doing research about multilingual children in pedagogy and social sciences. Nowadays it is mostly based on long-term observations of groups and individuals. In Sweden, studies are largely focused on acquisition of Swedish as the second language in the families of immigrants. However, she found the method and goals of the current project interesting and promising not only for design but also for social sciences. There was a very important question that rose through the discussion:

What qualities and elements should the game probe have to open the design space of multilingual family communication?

This became one of the secondary research focuses that are inevitable to explore through creating a critical game and experimenting with it.

The interviews together with the literature overview were analysed in visual form and the most outstanding statements and keywords were taken into consideration when designing game probe.

5.2. Designing game probe

The process started by analysing data that was received from the initial fieldwork. The key words and statements of the audio logs of the interviews were put on the sticky notes and grouped in terms of their relation to a certain topic such as playfulness, frustration, provocation, games etc. This was done not to synthesize the key words into some bigger group but only to simplify working with them. More key words and statements were brought from the literature study and related work of different authors.



Figure 6. Making sense of gathered data.

These sticky notes were used as inspiration for the game probes design that has to maintain flexibility and openness to re-interpretation as a core (figure 6). Some of the insights that were received from the interviews are described below.

Passive and active provocation was a big part of the interview discussions. However, it was decided not to use the provocative manner of probing like in critical games for example (see section 4.2. Game probes), rather, turning these potentially negative emotional experiences into playful activities and finding positive elements that can be elaborated through game probes. Moreover, provoking negative emotions and making people going out of their comfort zone can create misunderstanding and poor outcome of the probing experiments. The goal of game probes is not to create philosophical discussions about a concrete social issue but to create clear fruitful information for further exploration. Encouragement and engagement must be an essential part of probing artefact.

Board games and computer games were found promising as they allow manipulation with visual symbols that creates easy possibilities of re-interpretation and altering the rules. Visualisation and tangibility can motivate creativity and easy handling of the game probe. Also those kind of games create communication between players through visuals, sounds and speech.

Multilingual communication and necessity to teach your child different languages from birth is often perceived as a burden. Such words as “stressful”, “hard work”, “busy”, “tired”, “discipline” very mentioned a few times and adults often victimise themselves in such situation. Here the focus is on the parent, a native speaker of minority language.

Playful use of language is one of the core elements of the future game probe. This can vary in many different ways. The aforementioned *secret* language playful behaviour or assigning a toy one of the languages seemed to be important way of embodiment and active use of the language that parents described with enthusiasm and in detail. One of the most impressive insights here was the creation by child of his own language and playfully using it in everyday life through several years.

A big cluster of insights that were got mainly from the literature research were use of digital media and digital games in language development. Avatar as a representation of self in many video games can be a solid grounding for looking at multilingual children and how they perceive themselves in general and in different situations.

Based on this knowledge, a few game ideas were created and evaluated from the perspective of their potential for the goal of the project (figure 7).

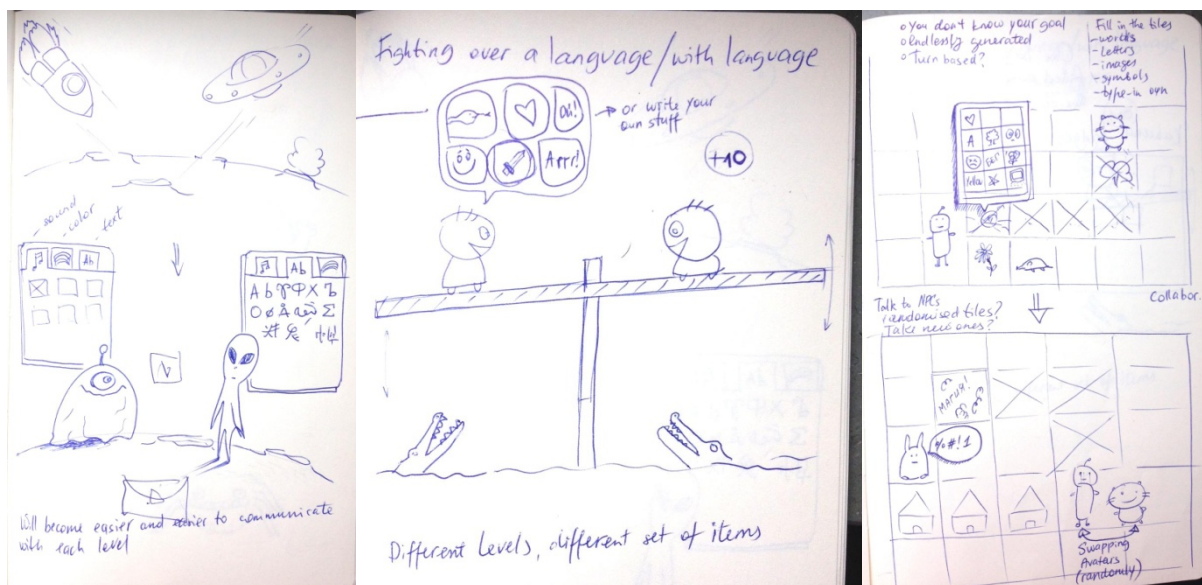


Figure 7. Initial ideas of game probes.

Most of the proposals were based on a digital game inspired by technology probes, which can have different outcome depending on the players' interpretation. One of the games would be based on creating and solving puzzles in order to enable communication between two aliens from different planets. Their communication tools include different images and symbols that the other player does not have. There is one bigger puzzle that they have to be solved together and they need to find some kind of understanding and common language to reach their goal. This idea was deemed as too limited in its implementation and not really having a potential of a game probe.

Another game draft was a game that can be either competitive or collaborative depending on how the players would interpret it. It can be represented visually as a surface where the two characters are balancing and each player can change the position of another one. The game would be turn-based and with each turn a player can use a symbol from his or her pool of symbols to control the balance of the surface. If the players decide to compete against each other, their goal would be to make another character to fall from the surface; if they choose to collaborate, they should try to keep the surface in balance.

One of the ideas evolved into a board game with rules that allow players to make decisions based on verbal interpretation of images, symbols and words. The board game used as a design and probing tool creates more freedom of re-interpretation and possibilities to transform and create new rules and mechanics. Board game enables more direct communication between the players than a computer game for example, it is easier to grasp and get started. Both technology and cultural probes imply ease-of-use and flexibility; the artefacts and tools must be simple and clear. Another advantage of a tangible board game against the technology probes approach is that digital logging of the players' actions would not reveal as much insights and it cannot be as easy to modify as physical artefact and tangible manipulation with elements of the game.

Game mechanics of the created game probe are strict enough to call the concept a game (see section 4.2.) but the rules give space for re-interpretation and freedom of choice. The game for 2-4 players consists of

- Playing board
- Octagon-shaped cards with images / words / symbols / colours equal to the amount of empty cards on the board (see figure 8)

The rules of the game are described as the following:

1. Cards are mixed up and divided equally between the players. All the cards are unique.
2. Player 1 (P1) chooses starting and ending cards by placing two cards of your choice onto the board.
3. Player 2 (P2) has to fill in the path between the cards with his/her cards
 - a. The lengths and direction of the path are up to the P2.
 - b. The path has to create a story / logic / sensible sentence

today's communication and significance of a single person in a crowd of like-minded people. Arguably, Emoji showed its potential in substituting languages and common alphabets.

Symbolic language such as Emoji brings us to the large concept of *semiotics* which describes the meaning of a sign or symbol to an individual or interrelation of those signs. The concept of semiotics evolved in the early 20th century from the studies of the Swiss linguist Ferdinand de Saussure. Salen and Zimmerman (2004) in their canonical book "Rules of play: game design fundamentals" talk about semiotics as one of the core concept of any game. Semiotics is a big part of visual games such as computer games or board games. One visual can create different meaning depending on the interactions that are available in a digital game and the context and iconography of any visual game. Another way of interpreting a sign or symbol is connotative which is based on individual associations with a particular sign and depend on cultural background of the player disregarding the game context (Sennersten, 2008). Every word as a sequence of sounds and letters gets its meaning through the interpretation of this sequence by a group of people and recognition of this word as certain object. This object can be called different if a smaller or bigger group of people agree so. The game probe that has been created implies this interpretation and agreeing on the meaning of a sequence of signs.

When the game is introduced to the players - a child and parents - it is described as a tool of creating and tweaking their own games and play styles. They are allowed to break the rules and create their own, use the materials of the game in new games, dismiss those that are less needed and come up with additional images and artefacts that would make their game more interesting and fun. It is stated that this game is not an educational game and that the players are encouraged to create any kind of meaning through this game.

5.3. Implementing the game probe

Game probes were given to the two families for 1 week to have it tested in the domestic environments.

Family 1: Russian mother, Danish father, daughter 6 years old, living in Sweden;

Family 2: Russian mother, Greek father, son 9 years old, living in Sweden.

After a week of playing around with the game probe, the families were interviewed about the details of their experience.

Family 1 described their experience as a very positive and exciting. They liked the game a lot in its original rules though they have added a more defined and quantifiable winning state. They have agreed that the winner is the person who has managed to get rid of all his or her cards earlier than another player. These rules also helped a parent to cheat so that the child would always win. That was quite an important consideration and this kind of cheating was a part of the game mechanics. Stories that both player have created were a part of the game mechanics but not the measurement of the winning state.

Most stories resembled classic fairy tale structure or some images were identified with existing characters from fairy tales. Interestingly, when playing with her mother the girl used some traditional

Russian characters in her stories. For example, quite a neutral image of an old lady was called Baba-Yaga which is a well-known character of a witch in many Russian folk fairy tales.

Considering the game flow, it was also changing through the playing process. In the beginning the stories were more elaborated and intriguing. Players used up to 6 cards to complete the path and the girl chose the longest way when going around a monster on the board. Each image on a card was verbally expressed in an elaborated manner creating a sort of sub-stories that then were put together in a path of cards. When the board got more filled with the cards, the stories became shorter and each card described just an object or a character. As fewer cards are left, as more boring and uncreative the playing process became; it got harder and less fun to come up with the stories when the choice of cards was too little.

Usually the cards were distributed by the girl. According to her mother, she was probably choosing some cards for herself and gave the rest to her mother. For example all the cards with letters would almost always go to the mother. She usually used them to describe a word that starts with this letter or an sound or an interjection.

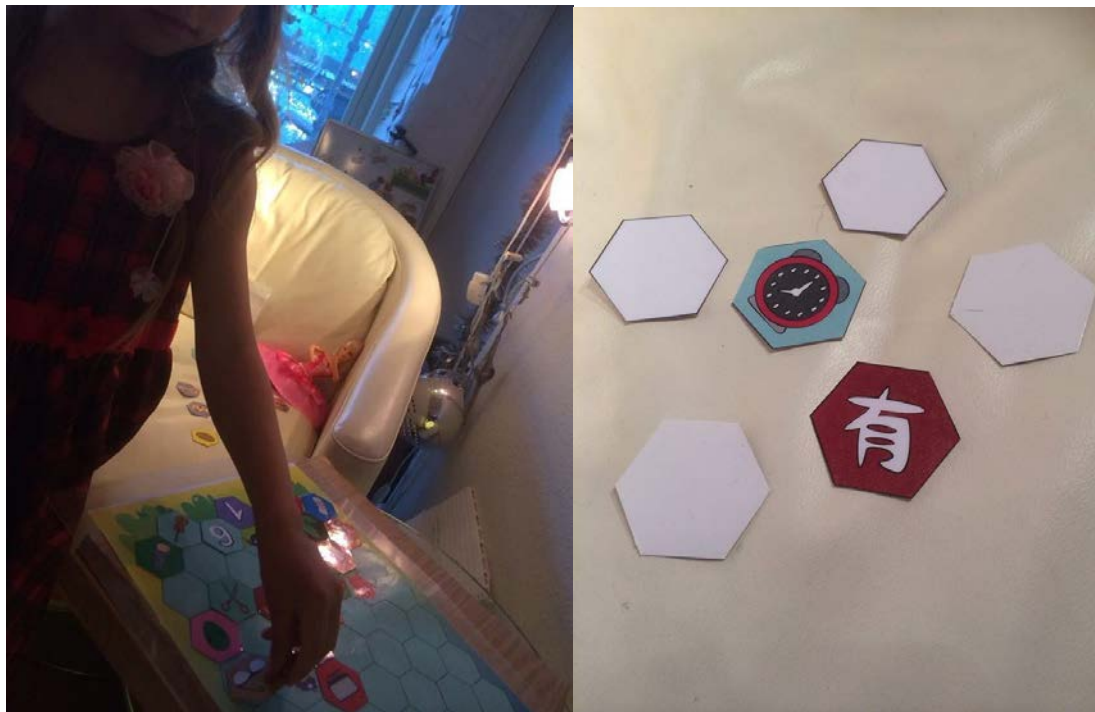


Figure 9. Playing the game probe based game. Unused cards (right).

Family 2 was using the game probe in a rather different way. After the first attempt to play it by the offered rules, it did not work out well. It became more of a random combination of nonsense, and game mechanics, as well as rules, lost any meaning. The 9-year-old boy did not feel that the default rules made an interesting and fun game, it was easy to cheat and to complete the board. The solution was to

go with a turn-based game so that the story would be created by all players together.

In their case the excitement and fun of the game was growing as the game was getting closer to the end. The less cards were left, the more creative one had to be to complete the story and at the same time the story became more funny and silly but would still make sense and keep its logic and shape. Even if the story was generally making sense and every card was a logical continuation of a previous one, the stories would still be based on absurd narratives such as:

“Once upon a time there was an egg.... [turn goes to the next player] The egg lived in a tin can.... [turn goes to the next player] and it loved honey.....”



Figure 10. Favourite cards (top left), the least used cards (bottom left); playing process.

After a couple of games played, the boy had also defined his favourite cards (figure 10) that he sorted out among all the cards and when the new game would start and it was time to hand out the cards, he used to chose those favourite ones for himself and divide the rest between his parents. Most of his favourite cards were quite abstract and could be interpreted as different types of actions or conditions (burning, wet, raining, walking, buying, selling etc.) However, the card with a running person on it was the least used by him. It would be unscientific to assume the reason of this choice without a proper

psychological knowledge but the level of abstraction seemed to be one of the factors of this choice. Similarly to the Family 1, cards with letters were used to express sounds and speech.

In the case of this family, they found it educating in a way that the game was based on phrases. They have a family communication rule that it is ok to speak different languages to the same person (for example mother and son can speak both Russian and sometimes Swedish) but one should never mix words from different languages in one sentence. This is a big *no* in their family and this rule was also transferred into the game.

To make meaning out of data I used a basic methodology of the design analysis. Based on the works of Jon Kolko (2011) who systematised methods of analysis and synthesis in design and IDEO practical recommendations (IDEO Toolkit, 2008) I followed the steps of structuring the data.

After managing all the interview transcripts it became easier to externalise the relevant data, key words and phrases and underlying meaning. A common technique to externalise the data is to put those key conceptions and point on sticky notes and therefore to create a tangible physical space of information.

Tangibility of data is an important element of the design process. Physically moving the sticky notes around the board helps to find interesting relationships and patterns. Tangible data is more visually coherent and easy to handle. Creating those patterns and relations allows the designer to transform the data into knowledge that can be used for the insight in the design process; in other words transforming what I saw or heard into what it means.

In case this game was a mock up of a concept idea, the next step would be clustering, grouping up and prioritising the information. Instead, when working on design openings, I wanted to explore those relationships that were found and focus equally on each of them. Further on, it was necessary to choose a few of the most promising design openings to build different concepts. Some openings based on the data from probing as well as previous knowledge from initial qualitative research are outlined in the next section.

5.4. Design openings

Design openings can be described as concrete directions extracted from the design space of possibilities. The game probing and fieldwork process created a rich data that needs to be turned into insights through synthesis of this data.

Decreasing the feeling of burden through pervasive game

Fieldwork clearly showed a common feeling of burden that parents experience in their everyday communication. Negative emotions, doubts and self-discipline create hidden frustration which might result in giving up on bilingual upbringing of a child. At the same time, some successful interactions involved everyday playful activities that involved communication in minority language such as assigning a language to a toy or awareness that a language is not understood by the others. Those activities evolved naturally and they are non-continuous, brief and do not have any purpose or goal and are

embedded in everyday life. I see a strong potential in such kind of communication and if it was systematise in a pervasive game type of experience, this could be applicable to more families, also those who could not come up with their own playful traditions.

Example:

A secret agent game based on codes, secret messages and wordplay. A parent and a child are secret agents on a mission. They have to communicate in a way that nobody else can understand them. Everyday there is a mission to accomplish that is based on everyday life encounters such as school, playground, food store and similar.

Another topic could be looking for a treasure orienting by the map with secret codes and looking for signs in everyday life. Such games can continue for several days with low intensity so that playing is merged with real life like many LARP games (Jonsson et al, 2006).

Supporting everyday multilingual practices with a digital narrative based platform

The experiment with the game probe resulted in an enthusiastic embracing of an open-ended storytelling by the players. However physical limitation of a cards pool can make the game boring after a few play sessions. Today's children surrounded by digital media might need a faster flow of information and continuous motivation to maintain interest. Digital generation of the content or multiple user generation of content would create a possibility of novel experience with every game session. A related example is a game by Molleindustria called Trademark Ville⁴ where a user have to create a new name for everyday objects and therefore get points (see figure 11).

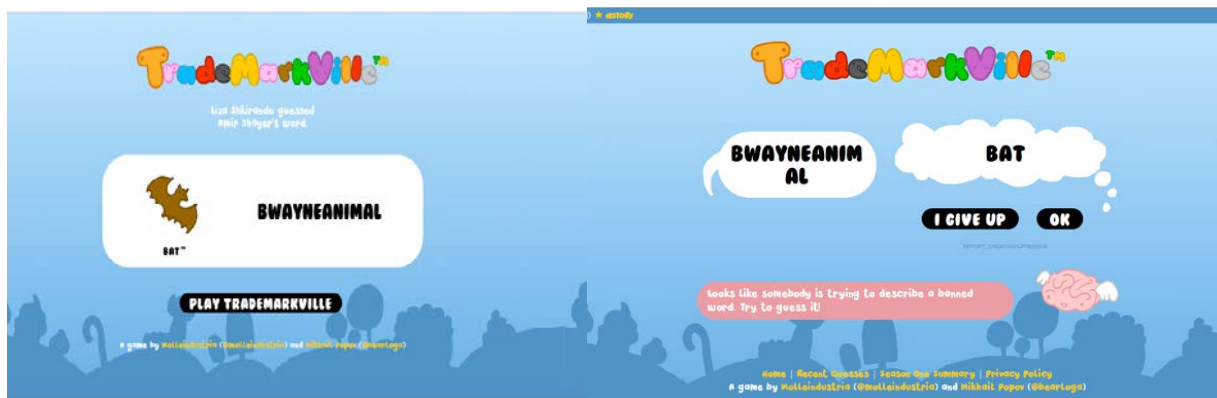


Figure 11. TrademarkVille by Molleindustria.

The other way of playing the game is to guess what the original objects behind the names created by other users are. Such playful user generated visual and verbal input can be a part of collaborative language-based storytelling.

Example:

⁴ <http://tmville.com/>

The platform can connect family members and for example they can create a comic-like narrative by adding a sentence every day. A child creates a sentence in images chosen from a pool and a parent who spends his or her day away from the child has to guess or create a meaning for the sentence and send an audio message that will be saved in the platform. The images combined by a child will be verbalised by parent in a form of a audio comic strip.

Tangible interface to encourage multilingual learning

Several researchers in cognitive development of children as well as interaction design argue that physical tangible interface such as a 3D toy has greater influence on child's immersion with the play situation and create deeper and more effective interaction than screen-based interface (Shkirando, 2013). A toy could become a medium between children and parents while communicating in different languages. This opening was inspired by how multilingual children assign languages to toys. Parents who participated in the interviews mentioned that a toy "speaks" certain language based mostly on which person that gave this toy to the child. When children give names to different toys such as dolls or stuffed toy is an indicator of language and cultural preference and the image of this toy. This is a cultural influence that was also pointed out by game probes.

Example:

A toy that can gradually "learn" a new language (figure 12). The child has to teach the toy another language. The toy records the child's speech and the parent can listen to the recording using a special smartphone app. The parent becomes a voice of this toy by recording voice messages through the app which then turns into the toy's speech.



Figure 12. Toy interface for child-parent remote communication

Create more opportunities for multilingual communication in families through distributed, mobile platform.

According to official statistics, 89% of children in Sweden between 10 and 12 years of age are the users of mobile telephones (Statistics Sweden SCB, 2013). Qualitative research based on online questionnaires pointed out that a major problem of giving up on multilingual communication in a family is the fact that one of the parents does not understand the second language. Another negative factor is that many parents are too busy and do not spend enough time with their children. Mutual language teaching based on fun and simple interactions regardless of distance and physical presence of all family members can be a solution here.

Example:

A smartphone app (figure 13) that is based on photo sharing between family members can inspire language learning.

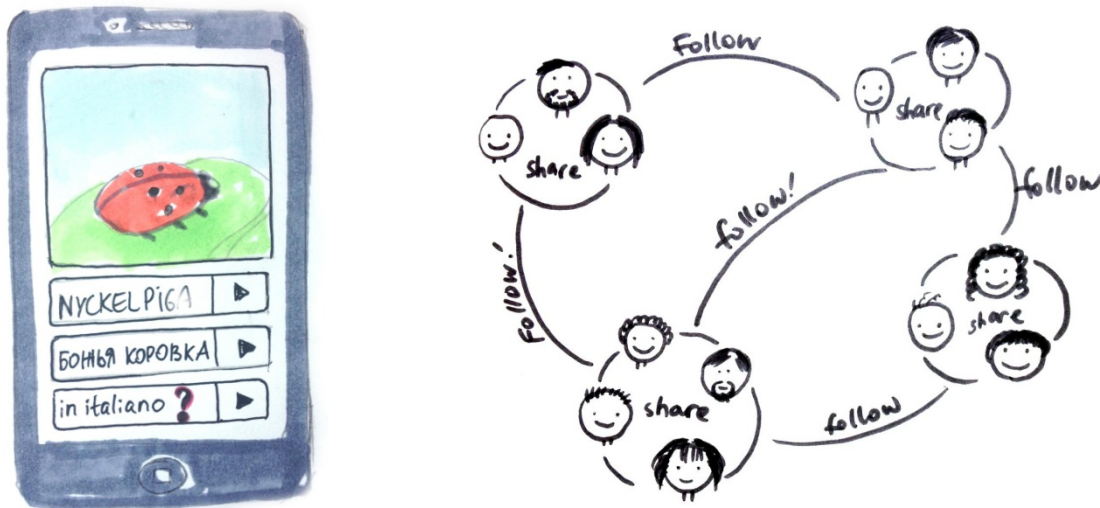


Figure 13. Mobile photo album for multilingual family communication.

Basic functionality follows these steps: 1) take a picture of something, 2) add description in as many languages as you can, 3) if you cannot describe a picture in a certain language, ask one of your family members to fill in that gap. The app creates communication between family members, mutual language learning and live photo blog of everyday events. Also, the app can have a *Follow* option when a family circle can follow other families and communicate with them.

Reducing the feeling of embarrassment through a public cooperative game

Children at pre-school age can find it fun and entertaining speaking different languages, they can easily transform it into game or some playful activity. At a certain age between 6 and 8 children can deny their multilingualism, not see any point of speaking a second or third language or just be embarrassed by being different from the others. A few distinct evidences of that were mentioned in the interviews, such as:

“When we were young our grand father used to pick us up from school and he had this habit of shouting across the playground to us and letting us know that he was there. This would embarrass us sometimes...”

Another problem is that many parents feel uncomfortable speaking their minority language at the public place “...people look at us on the bus...”. A way to go out of this comfort zone and create a public situation when children and parents speak their minority language aloud is to create a public game activity where different language is an advantage and something to be proud of.

Example:

A place-specific treasure hunt type of game based in an town terrain or big public space such as libraries or schools can involve many families. The point is to gather families speaking different languages and divide them into two or three teams. They need to look for keys around the area that would lead them to the treasure. The keys can be words or phrases in different languages stencil-sprayed on the streets, written on posters or stickers or even using existing city surroundings like billboards or shop signs. Different language skills of different team members are crucial in the game mechanics because each key is written in different language or can have different meaning depending on the language. Another element of game mechanics can include the possibility of trading of the language skills and helping out the competitive team in return of their skills.

5.5. Exploring design space through design proposals development

In this section I will introduce the concepts that were developed based on the design openings. The exploration of the design space includes different concepts that show possible different directions of the design development.

In order to identify detailed concept, I used the method of iterative analysis and synthesis of the design openings. It was facilitated by breaking down the data as design openings are created to lead the design to multiple ideas. After that the goal of brainstorming sessions was to come up with a few ideas, iteratively analyse them and finally get a few solid design concepts. As the core of this project is to explore the design space, in other words to explore different possibilities in the area of multilingual child - parent communication the design concepts have to show those different design possibilities and direction. Some key concepts for developing the design proposals emerged from the analysis of the openings:

- active involvement of two or more family members
- simplicity and engagement
- playful approach to language practicing
- visual, verbal and embodied interaction

The design proposals that are presented below are not final products and require iterative user testing and improvement of the interaction mechanics and core idea. However these proposals satisfy the goals of the current project which is exploration of the design space. Both ideas were developed up to the stage of proof of concept using simple digital mock-up and wireframing software.

Facilitating collaborative language learning through a multiplayer tablet game

One of the comment of the parents after playing with the game probe was that the parent always cheated in the game in such a way that her daughter would win. They actually changed the rules of the game so that the winning condition would be very clear. Another family has also mentioned that the fact of winning is very important for them. According to the literature competitiveness is one of the core concepts that make a game meaningful (Salen & Zimmerman, 2004), moreover every game involves artificial conflict or some degree of struggle which mean competition of a player with themselves, or between several players or groups. Eagerness to competition is rapidly developing when children are between 8 and 12 years old together with the need to succeed and be acknowledged (Markopoulos & Bekker, 2003).

Simple visual used in the game probe were engaging and provoked creativity in children. Using such simple images in a fast-paced language game can be another implementation of this idea. Some interesting points from the interviews with different stakeholders gave additional inspiration for this concept:

- children do not like to be formally taught and corrected when it comes to languages;
- many parents are actually busy learning a language of the country they live in but they do it in a completely different way that the children for whom acquisition of a second language has a more natural flow;
- some parents experience frustration because they and their partners do not speak each other's mother tongues and it creates difficulties in everyday communication with a child;

Building on design openings together with permanent reflections and keeping track of research questions, resulted in a game for 2-4 players that encourages practicing 2 or more languages at the same time by different players. Touchscreen tablet facilitates multiplayer game using the same device which is convenient for the domestic settings. The game is based on reading skills and is targeted at developing reading skills and reaction. The game is described on the figure 14 and it is based on the following rules:

- 1) choose difficulty level (based on language level and speed)
- 2) insert the names of the players
- 3) each player chooses a language
- 4) the game starts by tapping the button
 - a) an image appears on the screen and the words start moving across the screen
 - b) among the words each player has to find a definition of an image in his/her playing language
 - c) the player has to tap on the word before it disappears in the bottom part of the screen
 - d) the faster the player taps on the right word, the more points he/she gets.
- 5) the game continues for a limited time depending on the difficulty level

6) the score of the players is shown as soon as the game stops



Figure 14. Language game: early stage design proposal

The final design proposal called *Catch-a-word* was improved on the detail level in terms of gameplay and usability. To visualise the time based play, the image and words move along the invisible curve paths, gradually approach the edge of the screen and disappear (fig. 15). Starting and ending points of the words and objects are located on all four sides of the screen so that the players can sit around the tablet and the game would make sense for all of them. Same starting and ending time point for each word make the game fair and equally easy or difficult for each player⁵.

⁵ Video prototype of the Catch-a-word game <http://vimeo.com/96640080>

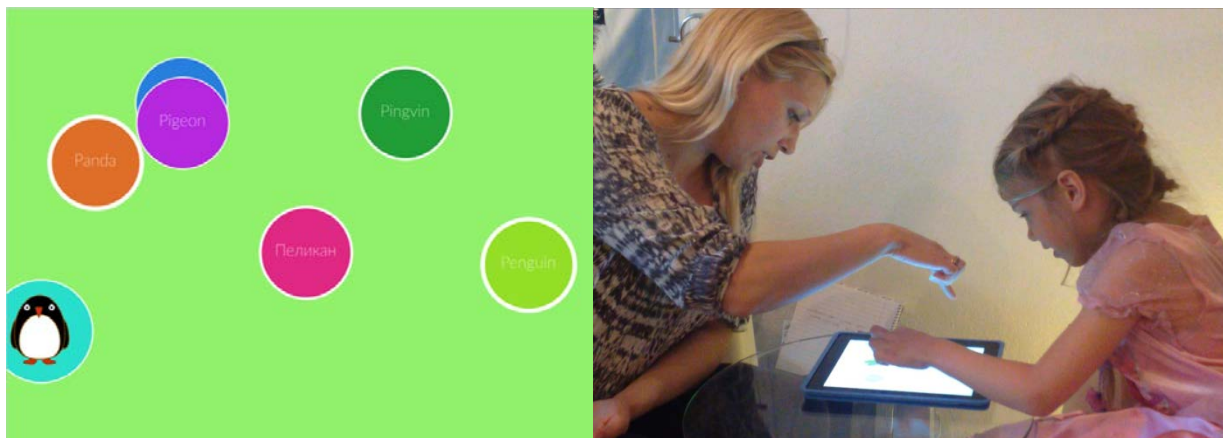


Figure 15. Main interface of the Catch-a-word game and use situation of the mock-up.

If a player taps the wrong word, the current image and words are replaced with a new one so that those players who did not make it before the mistake also fail. This condition is not the best way to manage the penalty in a fail state and it requires more adjustment but as it is a design proposal rather than final concept at this point it is not a goal in this project. To fine tune all the elements of game mechanics the idea needs multiple iterative playtesting and re-shaping.

Novel way of encouraging collaborative reading through an animated narrative

When it comes to practicing a new language, the main activity for most of the parents is reading. Through reading a child does not only develops his vocabulary but also learns about the culture of the country where the story originates from. Visuals are easily connected to certain fairy tale characters based on the cultural background of a child and depending on the social situation, for example the language of the interlocutor.

The teacher of multilingual children mentioned in the interview that the physical presence of books in the minority language is very important for domestic setting with a multilingual child. Books are the physical embodiment of the language and books facilitate more close sensual experience of seeing and touching the language.

For those who cannot read, interaction with a book is also important. Seeing your parents reading a book and experiencing how a story is born from a book, seeing and recognising the letters is a first step to language development, according to the interviews and literature reviews (section 3).

The tablet app (figure 16) includes a set of stories and books for each story. A parent reads the book and a child uses tablet interface. Each page of a book refers to a set of images on the tablet screen. As the parent is reading the story, the child finds image that shape the story, a simple illustration of each phrase or sentence. The goal of the child is to understand the story and be quick and agile putting the images in the correct order simultaneously with the story progression. Choosing a wrong picture is

indicated by the sound feedback and in this case a parent can help the child or the child can try choosing another image. When the parent has read a page of a story and the child compiled all the pictures in the right order, the app shows a short animated summary of what just has been read. Therefore, the child together with the parent creates an animated story through collaborative reading - understanding - choosing images. When the story is read to the end, the entire animated film is shown.

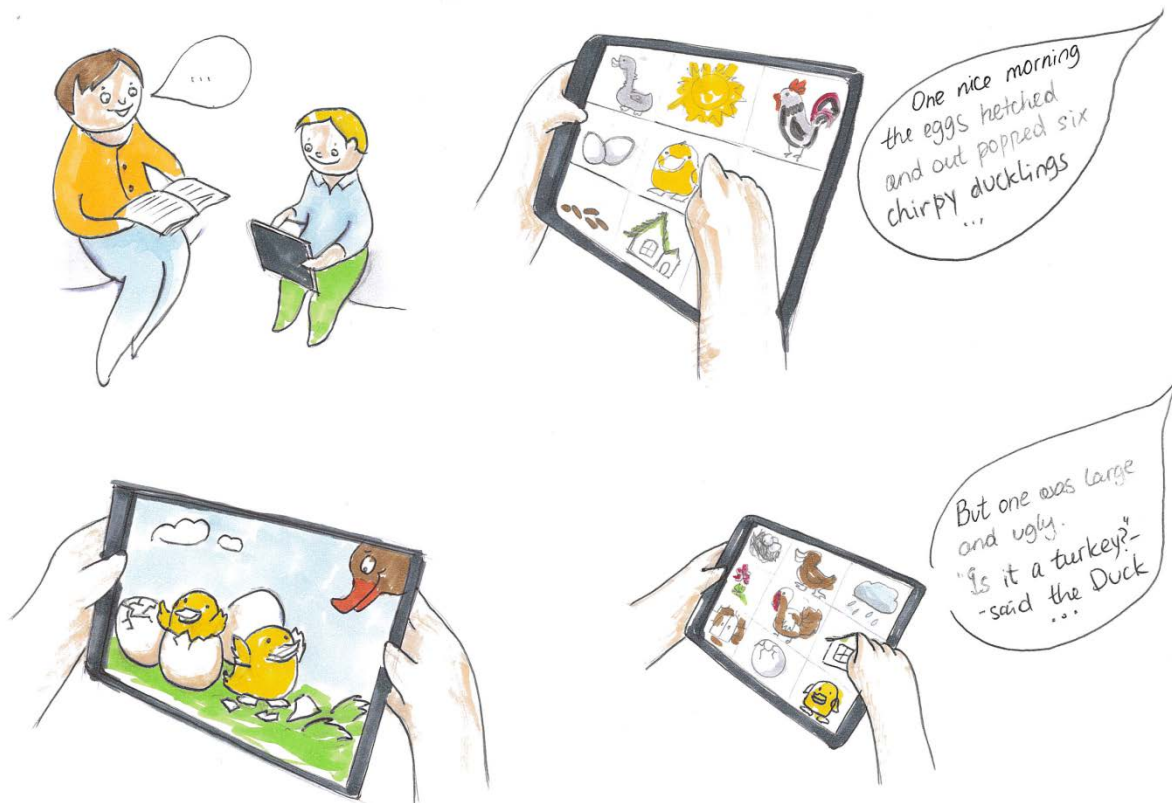


Figure 16. Book and app used for language learning through a narrative.

This idea has its benefits and disadvantages. Having a real paper-based book and embodiment of the story through reading, seeing and hearing the sound of turning pages is an important part of experience the book reading. However there is an important personal contact that would be achieved more fully if both users were experiencing the story through a single medium. The screen of the tablet can be divided in two pages, one of them contains the text and another is filled with images ⁶(figure 17).

⁶ Video prototype of the concept <http://vimeo.com/97032989>

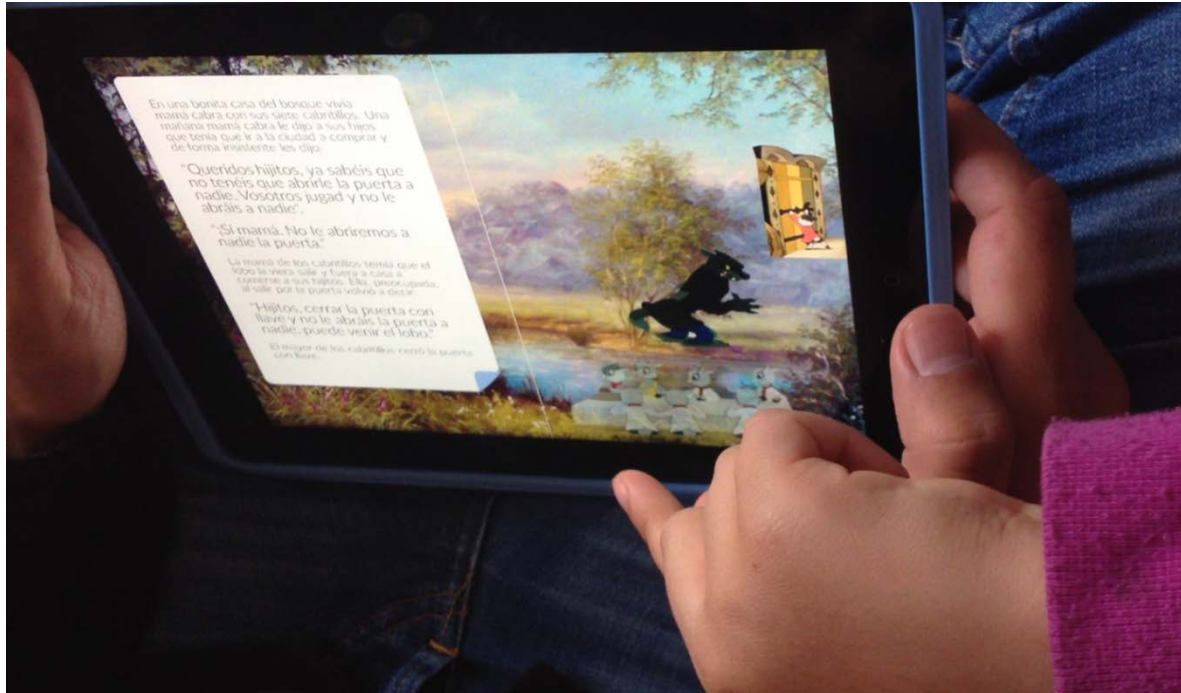


Figure 17. Tablet based language learning through a narrative and images

As all the images are used and all the text is read, a full screen animating pops up in the same window. Transition between the reading and watching the animation should be smooth and fluent without unnecessary tapping and swiping moves. The animation should be seen as a logical repetition of what has just been read rather than something that break the story flow. Another interpretation of this design idea can be based on the statement that there is no wrong consequence of the images and any combination of images can produce a short animation clip. If the chosen sequence of images does not match the storyline, the animation can have a touch of nonsense and humour, resulting in funny, thought-provoking visuals that would encourage discussion between the child and the parent and giving them an opportunity to go back and re-choose the images so that the animation makes sense.

Those design proposals are examples of possible outcome when implementing the method of design space exploration through game probes.

6. Conclusion and future research

This project was aiming at exploring two research questions. Firstly: *What openings are there for interaction design to facilitate multilingual family communication?* This question has been answered through the proposal of a handful of different design openings that covered a part of the design space of multilingual child-parent communication. These openings showed different directions of how interaction design can facilitate or encourage this type of family communication. Many openings included playfulness as a facilitating factor as the most direct, natural and comprehensible kind of interaction for children. At the same time the openings can lead future design are different areas of interactivity, such as mobile and touch screen technology, embodied pervasive play, social innovation, digital games or tangible interfaces.

The second research question considered methodological approach to producing design knowledge, namely *How can probes based on playful interactions be used to explore the design space of multilingual family communication?* The project explored different elements of methods as cultural probes, technology probes, critical design and critical games and implementing those elements to the method of game probes with an additional layer of transformative play that enables changing the rules and game mechanics as the game progresses. One of the ideas was that enabling player to transform the game that was designed for visual and verbal communication, might help getting insight about the research area and thus exploring the design space. Embodiment, tangibility, flexibility and playfulness formed the basis of the method that enabled user-centred design exploration through a board game.

Critical or radical games are aiming at creating social, political and artistic discussion and critique of certain issues. It is quite similar to an artistic approach when the artist expresses their opinion and point of view at some particular topic. This idea however is not relevant to this thesis project but the relevant part of the critical game design is its ability to work as a tool for future game designers and scholars. The word “critical” also implies critical thinking and reflecting during and after play (Flanagan, 2009) which I was trying to inspire in players through the game probe.

This project introduced a notion of game probes. “Probing” has been considered and argued by its main theorists Gaver (2004) as unscientific method that provides inspiration but not solid grounding for a specific design problem. Game probing needs re-visiting as well in terms of what are the use cases for this method and what kind of knowledge it gives to the designer. It is not obvious if this method can be used on the same level as ethnographic approach or participatory design. The designer is not physically present while the interaction with probe is happening and cannot give investigate the research area in close contact with the potential user. How crucial is this factor and can game probes provide solid grounding for developing an interaction design solution is a topic for further research.

As design space and design openings are not strong enough and established concepts, it would be wrong to say that the formulating of openings as it was done in this project, is the only right one. To define one or another design opening I have been using question *what* and *how* a certain part of the design area

can be addressed through interaction design. It is fair to assume that other researches can use different terminology and level of digitalization when talking about design openings.

As stated before, the conception of the *design space* is not mentioned in the literature very frequently, there are only a few papers explaining it in detail. One of the goals of this thesis project was to explore the notion of design space having as an example of multilingual child-parent communication.

Design openings as design possibilities that create design space are not a well-developed concept at the moment either. In my opinion, focus on design space exploration is one of the priorities of the user-centred design approach and the deeper and wider the design space is explored, the more opportunities are open to the designer, whereas too early focusing on a problem and narrowing down the area of design might limit the designer and result in neglecting of those potential openings and possibilities. Another area for further research in terms of methodology would be to explore other ways of creating design openings and design space rather than traditional ethnographic approaches. It would be useful to see the possibilities, benefits and disadvantages of different method to approach design area.

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