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Evaluation of TellMe, a three-way communication tool for the Special Education Context

Master's thesis in Interaction Design & Technologies

LIZA ARVIDSSON

LINDA PERSSON

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LIZA ARVIDSSON, LINDA PERSSON

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Supervisor: Eva Eriksson, Interaction Design and Technologies

Examiner: Staffan Björk, Interaction Design and Technologies

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Department of Applied IT

Division of Interaction Design

Chalmers University of Technology

SE-412 96 Gothenburg

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Liza Arvidsson, Linda Persson. Department of Applied IT, division of Interaction Design.
Chalmers University of Technology.

ABSTRACT

There is a growing interest for involving developmentally diverse children in the design of new technologies. The aim of this thesis was to investigate the socially situated design recommendations of TellMe, a three-way communication tool for the special education context, through an evaluation together with how developmentally diverse children can be included in the design process. This was done through a situated evaluation approach in collaboration with three distinct special education schools. A total of 23 children participated, together with their parents and teachers. The data collection was executed using interviews, observations and an interactive questionnaire tool. The evaluation resulted in a set of socially situated design recommendations for a communication tool in the special education context as well as a theoretical discourse on how children in special education can be involved and contribute in evaluation. The main conclusion is that TellMe has potential to enhance the communication between teachers-parents-children, however consideration must be taken to allow for flexibility in configuration and use, due to the high variability within the special education context. Additionally, the study shows that it is important not only to consider how the children can contribute to the evaluation, but also how the children can be involved and how to make the involvement meaningful for both the children themselves and the outcome of the study.

Keywords: special education, interaction design, evaluation, situated evaluation, developmentally diverse.

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1

INTRODUCTION

There is a growing interest for involving developmentally diverse children in the design of new technologies, and several studies have been conducted to explore how to involve these children in the design process (Alper et al., 2012; Guha et al., 2008; Kärnä et al., 2010). By including the child in the development of the technology that they are going to use, they get the opportunity to contribute in shaping their own environment (Frauenberger et al., 2012b). Therefore, it is important to let their voices be heard and to include them in the design process. By doing so the child can get a feeling of ownership and empowerment, which can be especially important for a developmentally diverse child due to the skewed power relationship that exist between them and the adults around them (Frauenberger et al., 2012b).

Evaluation is an essential part of interaction design, and described by Preece et al. (2011) as one of the four core activities in the interaction design process. By involving the users in the evaluation of technology they have the possibility of expressing their opinions on the artifacts that they will use, which allows for designs that better meet their needs (Preece et al., 2011). Further, evaluations performed with the target group may showcase unexpected difficulties and use of the technology (Druin, 2002). Bruce et al. (2009) introduces the situated evaluation approach, as an alternative to traditional formative or summative evaluations. The situated evaluation focuses on finding out how innovation emerge through use, and how the social practices and the context of use affects how the innovation is appropriated.

The perception of the world is different for a typically developing adult than for a developmentally diverse child which increases the importance of involving developmentally diverse children in the evaluation phase (Frauenberger et al., 2012b). Several studies have been made in exploring how to involve developmentally diverse children in the design process, where the most common form of involvement is related to evaluation (Frauenberger et al. 2011). Still, there is a lack of research focusing explicitly on the involvement of developmentally diverse children in the evaluation phase. Additionally, a systematic literature review performed by Börjesson et al. (2015) on the involvement of children in the design process showed that most of the research that has been conducted is focused on children with autism spectrum disorder. As the children who attend Special Education School are a heterogeneous group there is a call for further research with focus on children other than those with autism spectrum disorder and how to develop and adapt design methods that accommodate their needs.

One of the projects concerned with involving developmentally diverse children is Touch AT (www.touch-at.se), who has developed a diary application called TellMe. The development is based on Harris (2008) proposal that family conversation plays a key role in children's emotional development and that a frequent discussion of emotions between parents and children is fundamental. TellMe is a tool for both the purpose of improving communication between parents and teachers at school as well as for enabling communication between the children and their parents about their school day. Traditionally this is achieved by the use of a textbook or similar, which the parents and teachers communicate through by writing about the day and sending it back and forth between home and school in the child's backpack. However, it is easy to forget to both write and read in the contact book, as to why it loses its purpose. Thereby, TellMe aims to effectively simplify the communication between teachers, parents and children, giving the parents access to children's daily activities and the child's experience of it. This in turn opens up for family conversations about emotions related to the school day that in turn can support children's emotional development. An interactive prototype of TellMe has been developed through user involvement of children in a special education school, their teachers and parents.

1.1 Problem statement

Performing evaluations activities with developmentally diverse children involve several challenges. Difficulties involve issues of communication and maintaining participation (Hourcade, 2015). For children in special education these factors are especially important to consider since their communicative and intellectual abilities are very varied. Harrison et al. (2007) argue that when designing interactions, the study of the local, situated practices of the users should be the focal point as meaning is created in the context and situation, often in collaboration between the people, the artifact and the environment and resources available where it is used.

Consequently, this thesis aims to contribute to the knowledge base of the involvement of children in the design process through the evaluation of TellMe, using a situated evaluation approach. By doing so we will examine both how developmentally children can contribute in the evaluation phase of an interaction design process as well as what possible improvements that can be made to the application TellMe.

This leads to the following research question:

- *What are the socially situated design recommendations based on an evaluation of a communication tool developed for the special education context?*
- *In what way can children in special education contribute to this evaluation?*

Subsequently, the study will focus on the involvement of developmentally diverse children using a situated evaluation approach including interviews, observations and an interactive questionnaire. The interactive questionnaire will be used as a method within the situated

evaluation together with interviews with the users and observations of the innovation in use. The expected contribution of this thesis is twofold. Firstly, the results of the evaluation will yield design considerations on how TellMe can be improved. Secondly, the use of the methods will produce a theoretical discourse of how children can be included in and contribute to the evaluation process.

1.2 Thesis outline

The aim of this chapter was to give an introduction to the subject and the research question, in order to create an understanding of the discourse of the thesis. In *chapter two* we will present and describe situated evaluation, the target group and the application which is subject to the evaluation. *Chapter three* presents the settings in which TellMe is used, namely special education schools in general and the three schools where the evaluation has been conducted in specific. In *chapter four* theory about evaluation is presented both regarding general evaluation theory as well as challenges, methods and considerations for involving typically developing children and developmentally diverse children in evaluation activities. *Chapter five* describes research and applications relating to TellMe as well as related research on the inclusion of developmentally diverse children in the design process. *Chapter six* describes the methodological approach used both in terms of research view and research strategy, presenting a selection of appropriate methods to use. This is followed by *chapter seven* where the planned procedure for data gathering and analysis is presented along with the initial ethical considerations. In *chapter eight* our research process is presented with a description of the various phases of the study and the procedure of data analysis. The findings are outlined in *chapter nine* and in *chapter ten* the realization of TellMe in each school is presented. This is followed by *chapter eleven* where a discussion of the process, the results, ethical issues and the studies reliability and validity can be found. Lastly, *chapter twelve* summarizes the contribution of the study by concluding the findings.

2

BACKGROUND

2.1 Interaction Design

The subject of interaction design concerns the interplay between people and technology (Preece et al. 2011). It is an interdisciplinary field, influenced by both engineering, behavioral science as well as traditional design areas and art (Hallnäs & Redström). The core of interaction design can be described as the focus of developing digital artifacts and systems that the user finds easy, pleasurable and effective, thus eliminating the negative perceptions of the product, like frustration or annoyance (Preece et al., 2011). The focus lies on the user's interaction with the technology, and how to design products that guides the user in knowing what they can do, what will happen when they do something and what has happened (Norman, 2013). Consequently, interaction design is about creating a user experience that is enjoyable, and to reduce the negative aspects of it (Norman, 2013; Preece et al., 2011).

2.2 Situated evaluation

There is a growing interest in situatedness and situated accounts of interaction (Ekbia, 2012). By studying the interaction between humans and artifacts in the socio-cultural context it is possible to get a greater understanding of the ever growing complexity of these interactions (Ekbia, 2012). In 1999 Bruce identified ten challenges related to the evaluation of communication and information technology in education. One of these challenges was *re-creation of the technology*, which concerns the issue of technology being appropriated within its social setting (Bruce, 1999). Bruce et al. (2009) argue that the current practice of using formative and/or summative evaluations are limiting in several ways. Firstly, these evaluation forms do not identify the reason for an observed behavior or use. Secondly, they do not account for why changes occur, hence the findings may not be generalizable across different settings. Lastly, these evaluation forms ignore the fact that development often continues after the evaluations which leads to results that are only valid for a short period of time (Bruce et al. 2009).

As a complementary approach Bruce et al. (2009) propose the use of situated evaluation for evaluating interactive systems. Situated evaluation is defined as: “*an approach to articulating the emergence of innovations through practice, assuming that innovations are mutually constituted by social practice and some external input.*” (Bruce et al. 2009 p. 686).

Consequently, the focus is to understand how innovation emerges through use; building on the idea that programs are used and act differently in different contexts. Thus, the core of the approach is to consider diverse uses, the setting of these uses and the underlying cause for the diverse realizations. Compared to standard evaluation forms, situated evaluation aims to uncover the emergence of innovations through practice rather than how the innovation interacts with practice. Rather than seeing users as passive recipients of technology, situated evaluation realizes users as active creators. Accordingly, users actively interpret and repurposes the meaning and use of technology within the social and cultural setting where it is used (Bruce et al., 2009).

Bruce et al. (2009) concludes that as situated evaluation is concerned with discovering relationships, the process cannot be proceduralized. Nonetheless, according to Bruce et al. (2009) the process consists of three key elements: the idealization of the innovation, the setting in which it appears and the realization within each setting. However, situated evaluation is an iterative process where the findings from one part of the evaluation may lead to reanalyzing previous results.

The first aspect of situated evaluation is to study the idealization of the innovation (Bruce et al., 2009). This serves as an indication for the intentions of the developer's as they often are important participants throughout the creation of the innovation. Further, this element is used to identify how the innovation is perceived by the participants of the study. *“Users act the upon the innovation, shaping it to fit their beliefs, values, goals, and current practices”* (Bruce et al. 2009, p.688). Compared to summative evaluations an innovation is not believed to be more successful if the use fits the developers intentions (Bruce et al., 2009).

The second aspect is the setting in which the innovation appears (Bruce et al., 2009). This considers aspects concerned with the social context of use including cultural, institutional, and pedagogical aspects. This element serves to understand the social setting where the innovation is used. As the central node of situated evaluation is the diversity of settings affecting the emergence of the innovation it is especially important to realize how the setting impacts this. This includes the goals and expectations of the participants, the institutional practice, constraints, and resources (Bruce et al., 2009).

The third aspect is the realizations of the innovation in distinct contexts (Bruce et al., 2009). Where the goal is to study how the innovation is used, how the use changes and the reason for these changes within a context. Accordingly, another part of this element is to study the use in multiple, diverse contexts to identify the differences in how the innovation is realized or re-created by the users. Lastly, this element involves examining how to change the design with consideration of the findings regarding the actual use of the innovation (Bruce et al., 2009).

Consequently, a situated evaluation approach emphasizes the appropriation of a technology. Therefore, the evaluation aims to answer the following questions, as asked by Bruce et al (2009):

- What do people do as they use the innovation?
- How do social practices change, in whatever direction?
- What are the various forms of use of the innovation-in-use?
- How should the innovation be changed and how can people interact differently in order to achieve educational goals?
- How does the community fit the innovation into ongoing history?

2.3 Defining the target group

As this thesis was carried out in the special education school it is important to establish what this implies and who it involves. Defining the target group is not without problems. Firstly, there are several terms used interchangeably within the research community ranging from an explicit focus on a specific condition, through the use of the terms special needs, special educational needs, to specifying that the children have intellectual, cognitive or learning disabilities (Börjesson et al., 2015).

In this thesis both the term *developmentally diverse children* and *intellectual disabilities* will be used. *Developmental diversity* is an overarching term used by Börjesson et al (2015) which is a combination of the terms ‘developmental disability’ and ‘neurodiversity’. The term is used broadly to include diverse groups of children, with different conditions such as Attention-deficit/hyperactivity disorder (ADHD), Autism Spectrum Conditions (ASC), Down Syndrome, Cerebral Palsy, Intellectual Disabilities, or combinations thereof (Börjesson et al., 2015). However, as the focus of this thesis is the Swedish special education context, (which is described in section 3.1), *developmentally diversity* is too broad involving children who do not necessarily attend special education school. Although the term *intellectual disability* is better used to describe the children in this context the term *developmentally diverse children* or *children in special education* is most frequently used. This is done since we did not focus on or take note on explicit diagnosis. However, when the term intellectual disability is used it is in accordance with the definition by American association on intellectual and developmental disabilities (AAIDD, n.d): “*a disability characterized by significant limitations in both intellectual functioning and inadaptive behavior, which covers many everyday social and practical skills*”.

Yet, the practical involvement of children in thesis work will be solely with children in the Swedish special education school.

2.4 Idealization of TellMe

TellMe was developed by the research group working with the Touch AT (www.touch-at.se) project. The design of the diary application was based on research on Harris' (2008) notion that family conversation plays a key role in children's emotional development and that frequent discussion of emotions between parents and children is fundamental. The project was initiated as a reaction of a degree project by Robert Fohlin (2014), who encountered this issue when working within the special education context. The work of Fohlin (2014) resulted in the foundations of which TellMe is based, and a first version of the application. TellMe serves two main purposes. Firstly, it aims to improve the communication between parents and teachers at school and secondly to enable communication between the children and their parents about their school day. TellMe consists of two applications, **Kontaktboken** and **Dagboken**. **Kontaktboken** provides the teachers and parents with a way to communicate with each other and to read the children's diaries. The diary (**Dagboken**) lets the child create diary entries, alone or together with an adult. This opens up for family conversations about emotions related to the child's daily activities and how they were experienced by the child which in turn can function as a support for the child's emotional development.

Consequently, the application TellMe consist of two basic components: a diary and a contact book. **Dagboken** is a tablet based application that the children can use, on their own or with help from an adult (e.g. a teacher or parent), to post diary updates about their day. The diary entries are composed by text and pictures. **Kontaktboken** is a smartphone application through which the parents and teachers can read the student's diary updates and communicate with each other through a messaging function.

2.4.1 Dagboken

The diary component of TellMe allows the students to post updates about their day. These diary entries can later be used by the parents as a support to talk with their children about their school day. Every school has an individual configuration, with the home view displaying the school's classes (see figure 1), and when clicking on a class the different students in the class is shown (see figure 2). By clicking on a student the user can see that student's diary (see figure 3).

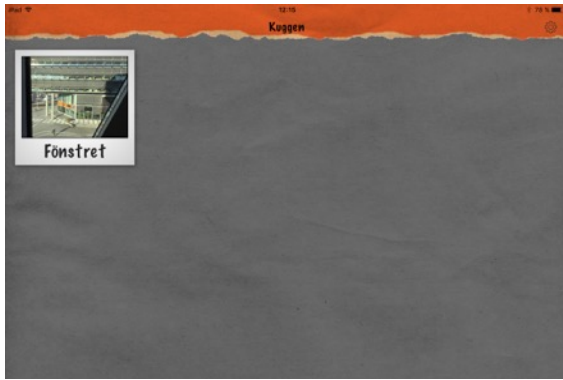


Figure 1.

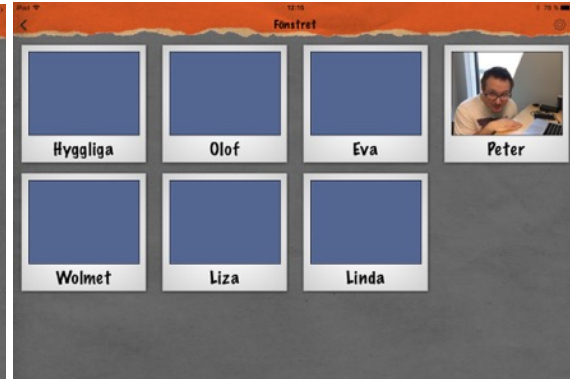


Figure 2.

From the diary view the student can add entries by clicking on the plus-icon in the top right corner (see figure 3). The creation of entries for the diary consists of three steps. Firstly, the student can add a picture by either taking a new picture with the built in camera or upload a picture from the tablet's gallery (see figure 4). Secondly, by pressing the arrow to the right a text field comes up which allows the student to add text information to the entry (see figure 5). Thirdly, when the user is satisfied with the entry they can upload it to the diary by clicking the right arrow once again. Lastly, the diary is displayed, now with the new entry (see figure 6).



Figure 3.

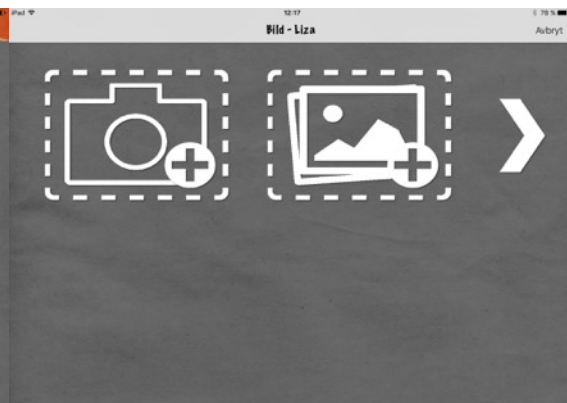


Figure 4.

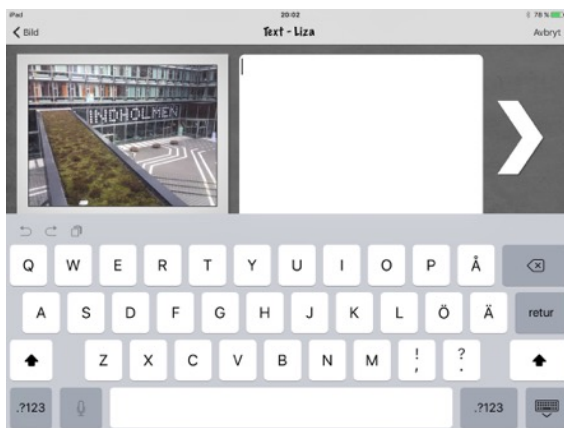


Figure 5.



Figure 6.

2.4.2 Kontaktboken

The contact book allows the parents and teachers to communicate with each other, e.g. about their child's mood, health-related problems or schedule. It is composed of two main parts: messaging and diaries. The teachers can communicate with their students' parents and see their students' diaries, while the parents can communicate with their child's teacher and see its diary.

The parents' messages automatically go to all teachers connected to their child, it is not possible to send individual messages to the teachers (see figure 7). By clicking on the diary button in the lower right corner their child's diary is displayed. If the parent would have more than one child connected to TellMe a list would be shown instead, similar to the one in figure 9.

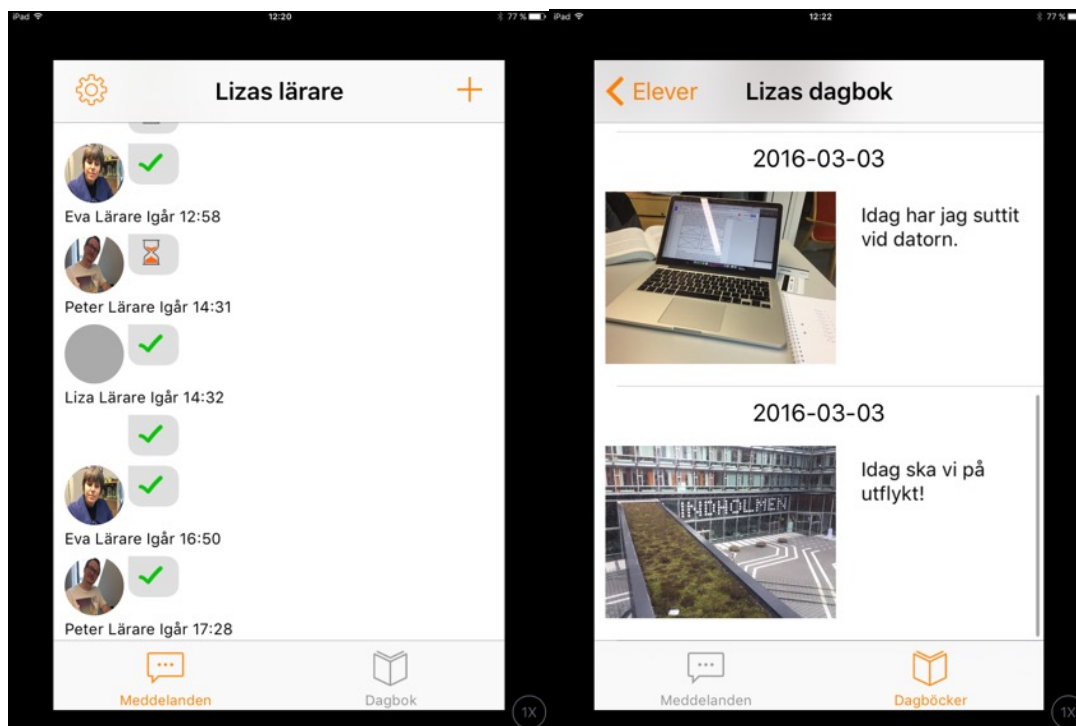


Figure 7.

Figure 8.

When the teachers sign in they see a list of their students' parents (see figure 9) where they can choose a parent in order to read and send texts (see figure 10).

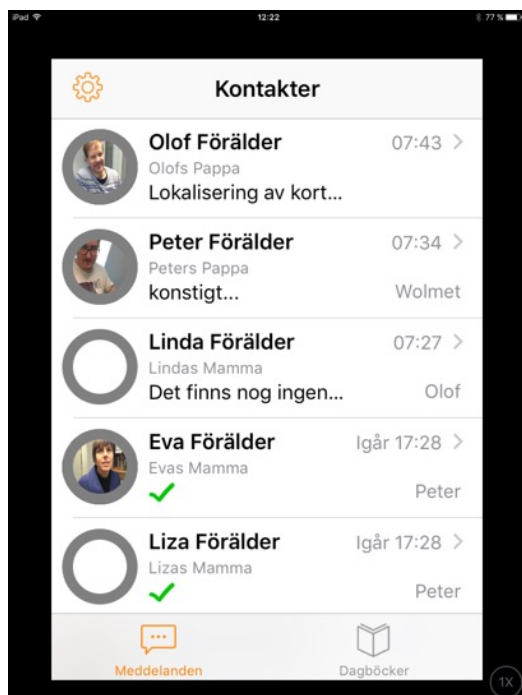


Figure 9.

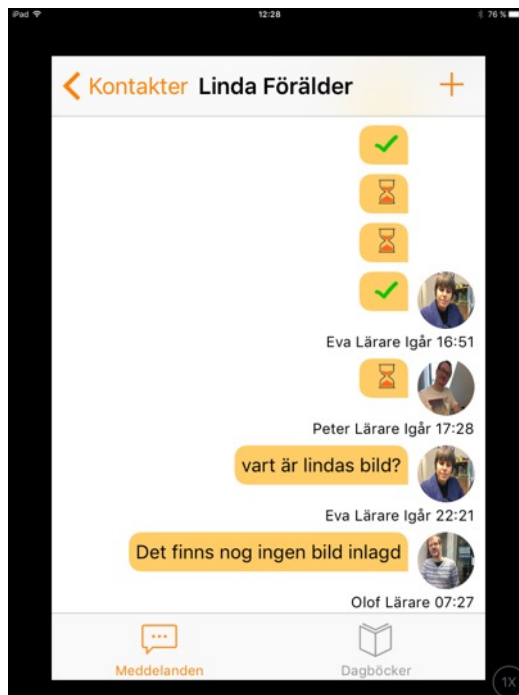


Figure 10.

By clicking on the diary-button the teacher can see a list of their students and their diaries (see figure 11) and by clicking on a student they can see that specific student's diary entries.

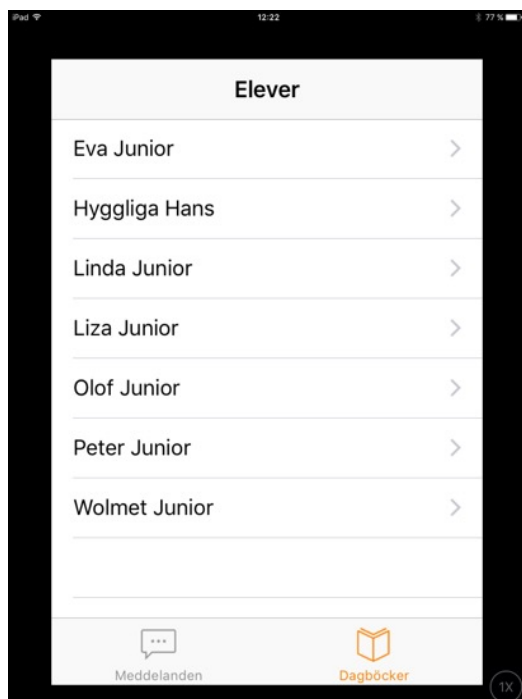


Figure 11.

3

SETTING OF TELLME

The evaluation of TellMe was conducted at three different special education schools in the Västra Götaland region. Thus, this section aims to describe Swedish special education schools in general and the three schools where the study was conducted in particular, with a presentation of each school and how they communicated in prior to TellMe. In order to protect the integrity of the participants of the study, all schools are presented anonymously.

A total of 6 teachers and 23 students participated in the study. Table 1 shows a summary of how many teachers, student assistants, students and parents who participated. Not all children in all schools participated since either the parent or the teacher did not leave their consent.

	School 1	School 2, Class A	School 2, Class B	School 2, Class C	School 3
Teachers	1	1	1	1	2
Student assistants	3	4	3	1	6-7
Students, total	4	5	4	3	12
Students, participating	4	5	3	3	8
Parents	5	6	4	5	9

Table 1. Overview of participants.

3.1 Special education school

Swedish special education school is its own school form, with its own curriculum, separate from the ordinary school. It is composed of three parts; elementary special education school, secondary special education school and adult special education school. Elementary special education school includes mandatory grades from 1-9 and an optional 10th grade, and is an option for children who, because of an intellectual disability, are incapable of reaching ordinary elementary school's curriculum. There is also an additional orientation called

training school, for children who are considered having difficulties reaching elementary special education school's curriculum. Like elementary special education school it includes nine grades and a tenth optional grade, but its curriculum is more focused on social training and practical skills (Skolverket, n.d).

Special education school can be separately located or integrated in an ordinary school, and children in special education school can attend classes together with children in ordinary school or in classes with children in special school exclusively. What defines it is not where it is placed, but that children in special education school follow a specific curriculum. The school activity in special education school is individually adapted to each child, but it should as much as possible correspond to ordinary school education (Skolverket, n.d).

As the children in special education have very diverse developmental abilities the degree of and type of support varies within the group, and is individually adapted to the child. One kind of support is student assistants, making it easier for the student to assimilate the education. Additionally, personal assistants can be present in special education, as it is an assistant which follows the child in all aspects of its life (Skolverket, n.d).

Commonly, special education involves working with various means of communication, such as Augmentative and Alternative Communication, as well as working with social and emotional development. One of these aspects include working with color coding to structure the week days, the colors are used within Special Education (see figure 12) (Habilitering & Hälsa, n.d).



Figure 12.

3.2 School 1

The first school was a small special education school. It consisted of one class with four students, of which one belongs to preschool and the remainder in elementary special education school and training school. The children's ages differed between five and eight years. The school had one special education teacher that was in charge of the class and three student assistants that were responsible for one child each.

The school did not have a contact book of any kind in prior to the introduction of TellMe. Instead they communicated through phone calls, text messages, email and direct conversation. Since it was a small school the teacher and the student assistants had the opportunity to talk to the parents every day when they left or picked up their child. However, since the child often was present or the parents were in a hurry it could be difficult to find the

time and opportunity to go through all information. Phone calls and texts were mainly used for more important or urgent topics like things relating to health or short-notice schedule changes, while direct-contact and email were used for things relating to the child's school day. In addition to this they had performal reviews once each semester.

School 1 used pictures as a tool to document the child's school day. The teacher and assistants printed pictures which were put into a binder, or given to the children to take home. In School 1 they also communicated in other languages than Swedish and not all parents could speak the Swedish language.

3.3 School 2

The second school was a larger school, and three classes participated in the study. Each class had one responsible special education teacher and one or more assistants. A total of three teachers, eight assistants and eleven children participated in the study.

All three classes used a contact book, which they wrote in once every day. They also printed pictures and glued into the book. The child brought the book back and forth between the school and their home every day. The information in the contact book mostly concerned general non-confidential information about what the child had done in school. More sensitive information was communicated through email or phone calls. Some information was also shared in relation to the parents leaving and picking up their child. The parents responded to the teacher's information in the contact book or through email. Weekly letters were also sent to the parents about what they had been working on the previous week as well as information about the coming week. In addition to this performal reviews were held every semester to inform about the pedagogical aspects of the child's education.

At this school the communication was straightforward since all of the parents had internet connection and used email, and they did not experience any obstacles such as language that could complicate the communication. However, due to the special needs of this group the children could have difficulties retelling what had happened during the day in school day to their parents.

3.3.1 Class A

Class A consisted of one special education teacher, four assistants and five children. The teacher of class A preferred to use mail rather than the contact book, especially as the contact book was open for anyone to read since it did not have a lock. Therefore, the contact book was mostly used to write information about what the child does in school. Further, the teacher found it difficult to use several means of communication. There were issues with both the contact book and email. The contact book was easily forgotten at home or somewhere else.

When parents change jobs they might get a new email address which was not always communicated to the teacher.

3.3.2 Class B

Class B consists of one special education teacher, three assistants and four children in grade 4-7, some in elementary special education school and some in training school. However, only three children participated in the use of TellMe. The parents and teachers communicated every day. Therefore, the special education teacher wrote in the contact book daily and the assistants read the book before it was sent home with the child. The teacher sent emails to the parents with the most important information, and then used reception notice to ensure that the parents had received the information. Most of the important information from the parents was received when they left and pick up their child.

3.3.3 Class C

In Class C there was one special education teacher, one assistant and three children. As for the two other classes a lot of the information was shared through the contact book and emails. The teacher explained that the contact book may be perceived as a bit out of date, but that it had a personal touch. Sometimes information was also shared in relation to the parents leaving and picking up the child.

3.4 School 3

School 3 consisted of one class with twelve students and two teachers. Only eight of the children participated in the study. However, all of the children had Dagboken installed on their tablets. All of the participating children were in the elementary special education. School 3 did not regularly use a contact book, but some of the children had used analogue books previously. Additionally, this school was involved in the previous version of TellMe. Thereby, the participants of this school had some prior experience of using an application as a contact book.

At this school most of the communication was through email. Similarly to the other schools, weekly letters were also sent with general information about what had happened during the week. Some information was also shared during leaving and picking up the children. Some of the parents did not use email, so for some parents the weekly letter and other information was written on notes and given to the parents. Phone calls were only used for more serious matters and if something was urgent. However, the teachers sometimes felt that it was problematic to receive phone calls during the lessons since it could have a disturbing effect. The parents communicated with their children every day after school. Similarly to in School 2, the answers from the children were often short. The parents explained that they would like more information about their child's school day to be able to guide the child in the conversation.

4

EVALUATION

Although evaluation is one of the four basic activities of the interaction design process (Preece et al., 2011), situated evaluation is not yet common practice within interaction design. Thus, this section will introduce how evaluation is typically conducted in interaction design with a focus on children in general and developmentally diverse children in particular, as well as how to formulate suitable questions for children with intellectual disabilities.

4.1 Evaluation in interaction design

Evaluation in an interaction design project refers to the activities that are performed in order to give guidance and feedback to the development process (Markopoulos et al., 2008).

Evaluation is conducted through an iterative process that occurs in all stages of the process (Te'eni et al., 2007). Further, evaluations can be classified from several different perspectives depending on when, how, why and with whom the evaluation is conducted. These perspectives include formative or summative and controlled or natural setting (Markopoulos et al., 2008; Preece et al., 2011).

Commonly, evaluations are either classified as formative or summative (Bruce et al., 2009; Markopoulos et al., 2008). Formative evaluations are used during the design process where the result shape the design. Naturally, formative evaluations are exploratory, seeking to uncover areas where the product can be improved (Markopoulos et al., 2008). Further, formative evaluations are implemented in the design process in order to see if the evaluated product meet the user's needs. Formative evaluations can be performed in most stages of the design process, using both sketches and prototypes in purpose of finding out how to improve the design (Preece et al., 2011). Summative evaluations are conducted on a finalized product to measure efficiency, or to identify improvements on a competitor's product (Bruce et al., 2009). Summative evaluations can be performed in order to decide on what to improve in an upgrade of a product, and can result in new features which in turn can result in new usability problems (Preece et al., 2011). These are what Bruce et al. (2009) summarizes as standard evaluation, with the proposal of using situated evaluation as an alternative, since standard evaluation often intend to either improve a product or appraise how effective it is based on the innovation as a fixed object (Bruce et al., 2009).

Another way of classifying evaluations is to define them according to the setting where it is conducted. Commonly, these are divided into controlled or natural settings (Preece et al. 2011). Controlled settings involve laboratories and living labs and are often used for usability testing and experiments. In controlled settings the user's activities are monitored and tested to measure or observe certain behavior. Natural settings involve online communities and public places and are often conducted in the form of field studies. Compared to controlled settings the activities are far less controlled and serve to identify how the product would be used in a real world context rather than measuring effectiveness (Preece et al. 2011).

4.2 Evaluation with children

Children differ from adults in several ways as they have different learning skills and emotional maturity (Markopoulos et al., 2008). Children interact with technology in a different way than adults, which is something that needs to be considered when carrying out evaluations of technology with children (ibid). Also, in the current time, for large parts of the population in the Western world, children have grown up surrounded by interactive products, unlike adults who have been discovering it (ibid).

In the book *Evaluating Children's Interactive Products: Principles and Practices for Interaction Designers* Markopoulos et al. (2008) present and discuss how to involve children in evaluation. The book covers everything from ethics, methods and challenges of involving children. One of the models described by Markopoulos et al. (2008) is the PLU-model which defines how children interact with technology. The PLU-model consists of three relationships children can have with technology; *children as players*, *children as learners* and *children as users*. Additionally, Markopoulos et al. (2008) identified some key differences between adults and children in evaluation settings relating to these relationships. The differences are important to consider when evaluating technology with children.

Firstly, Markopoulos et al. (2008) describe that in the relationship of *children as players* there is a difference in how adults and children experience playing. For children play is a natural part of their everyday life whereas for adults playing might feel silly. Play is an important part of child development and for children play is used for learning, compared to adults who play to relax and have fun. As play is an important part of learning children do not always recognize that they have learned something if the learning was a result of play. When evaluating it can be difficult to understand when a child is playing. As children often have a rich imagination they might say that they have been playing even if it was not possible for the evaluator to see.

Secondly, in the relationship of *children as learners* Markopoulos et al. (2008) argue that there is a difference in how much adults and children learn. Children need to learn more quickly and efficiently than adults simply because they have much more they need to learn.

Therefore, it is easier for children to learn and what they learn is often informal. Children are not always aware of what they have learned, with a high motivation for learning they see it as a natural part of life; often curious to learn more. In an evaluation setting it is important to be aware that children often learn unintended things. Further, children do not have complete mental models why it might be difficult for them to explain the reasoning behind their actions or behavior.

Thirdly, Markopoulos et al. (2008) claim that in the relationship of children as *users of technology* it is important to consider the differences in motivation between children and adults. Children only use technology if they want to, whereas adults often have to use technology even if they do not like it. Further, adults are more delicate in their actions. If a child does not want to use a product they may simply walk away and leave it, which would not be viewed as appropriate actions of an adult. Additionally, the difference between various ages is vastly prominent for children and with that their needs of technology change more rapidly. Therefore, it is important to design in accordance to age. Lastly, children may have higher expectations of technology which can lead to the child being discouraged if the expectations are not realized. (Markopoulos et al., 2008)

4.3 Methods for evaluating with children

Due to the differences between children and adults there can be challenges in involving children in the design process. These challenges include interpreting their input and ideas as well as handling the risk of the child trying to satisfy the expectations of the adult (Frauenberger et al., 2012a). There are several approaches of involving children in the design process as a way to overcome these challenges, including the use of inspection, observation, verbalization methods and survey methods (Markopoulos et al., 2008).

Although there is an extensive amount of evidence suggesting that direct involvement of children in the evaluation of technology is beneficial, this is not a common practice (Druin, 2002). Typically, evaluation is done with teachers or experts due to time-constraints or recruitment issues (Markopoulos et al., 2008). These type of methods are called *inspection methods*, which are performed by an adult analyzing the designed interaction with the goal of creating a list of design improvements. One common way of evaluating without involving children is to use heuristics which are generic design guidelines (ibid). These are a rule of thumb for good interaction and are used to examine the product or prototype to discover whether, how and how severely it violates the heuristic (ibid). Another way of performing evaluation without involving children is to use child personas which shows age specific guidelines related to children childhood needs and developmental abilities. However, the evaluations performed by experts only serve as an educated guess, why involving children at least as testers of technology is superior (ibid).

Another common and relatively simple way of involving children in evaluation is to use *observation methods* to gain new insights and evidence to support design recommendations or conclusions based on the evaluation (Markopoulos et al., 2008). Observations can be more or less structured depending on the goal of the evaluation. Unstructured observations on the one hand answers to open questions, identifying and recording interaction aspects in a holistic way to uncover unexpected findings and allow for surprises. Structured observations on the other hand have a clearer focus on specific events, activities and behaviors (ibid). Additionally, observations can be classified according to how and where the evaluation is performed. Observations can be direct, relying on the observer's own senses, or indirect, by studying records of use through technology such as logs of user interaction and eye gazes. Further, observations can be performed in a natural or controlled setting, with or without actively interacting with the participant (Markopoulos et al., 2008).

One way of getting additional detail from observation methods is to combine it with *verbalization methods* which are techniques to encourage, prompt or require children to talk about the experience of interacting with the product (Markopoulos et al., 2008). This can be done either by teaching the child how to verbalize their thoughts or simply by providing an environment in which the verbalization happens spontaneously (ibid). Think-aloud methods are commonly used with adults to gain insights in how the user understands and experiences the interaction with the product being tested. However, children may find it difficult to reflect on and evaluate their experience (ibid). Therefore, it is important to motivate and teach the child to think-aloud and to put the child at ease. Other methods include retrospective think-aloud, where the interaction is divided into small chunks allowing the child to describe their thoughts after completing the task and the picture cards method which portrays different experiences that the evaluator wants the child to focus on (Markopoulos et al., 2008).

Apart from the previously mentioned methods, *survey methods* can be used for evaluating with children. Surveys are especially useful when collecting demographic data or data from a widespread group of people. It can be difficult to formulate good questions, since the interviewer usually are not present the questions need to be precise and specific (Preece et al., 2011). For children it can be especially hard to interpret and understand the questions, and also to know how to give an appropriate answer (Read & MacFarlane, 2006). Language ability, reading age and motor skills influences the question answering, and also temperamental effects like the desire to please, confidence and self-belief (Read & MacFarlane, 2006).

The question-and-answer process that a person answering a questionnaire goes through consist of three steps: *interpreting and understanding the question, retrieving the relevant information from memory and integrating the information into a conclusion* (Markopoulos et al. 2008, p.241). There is also a fourth step, translating the answer into the format of the response scale and reporting it, if the answer needs to be coded (Markopoulos et al. 2008).

When conducting surveys with children there are four major issues that impact how well children manage to complete the question-answer process. Namely, satisficing & optimizing, suggestibility, specific question formats and language effects (Read & MacFarlane, 2006).

Firstly, *satisficing & optimizing* refers to the processes that explain some of the differences in the reliability of responses. Satisficing is when the respondent gives responses without having gone through all the steps in the question-answer process while optimizing, which is preferred, is when the respondent goes through all four stages in a thoughtful and careful way (Read & MacFarlane, 2006). Secondly, *suggestibility* refers to the effect the interviewer has on the respondent, thus extra important when it comes to interviewing children. It is difficult to not affect the child's answers, both gender and age have an effect on the reliability but also what role the adult has, e.g. an authority figure or not (Read & MacFarlane, 2006). Thirdly, *specific question formats* is about the effect the way the questions are asked and what impact it has on the reliability. Children has a tendency to answer yes to questions, no matter of what the question is. Further, Read and MacFarlane (2006) lifts that free-recall questions has been shown to have a higher reliability compared to more specific questions. Finally, *language effects* need to be considered since children's spoken and written language skills varies. Therefore, vague and ambiguous words should be avoided in surveys. Also, children tend to take things literally, Read and MacFarlane (2006) exemplifies this with a group of children that were asked if they had been on a 'school field trip'. The children did not call the trip a 'school field trip', and therefore answered no.

4.4 Evaluation with developmentally diverse children

In addition to the challenges and differences between children and adults in general, there is a difference between involving typically developing children and developmentally diverse children in the evaluation of technology. Developmentally diverse children are specifically beneficial of being included in the design process (Frauenberger et al., 2011). Yet, inclusion involves several challenges.

First and foremost, as the name implies, developmentally diverse children are a very heterogeneous group with a high variability within the group (Hourcade et al., 2014). As argued by Alper et al. (2012) children who are the same age and gender, from the same socioeconomic background and with equal disability could need opposite design solutions. This has great effect on how to design and carry out evaluation studies.

Further, the high variability increases the need of understanding the world from the perspective of children who are developmentally diverse. Designers and developers often think that their memory and assumptions of childhood is sufficient for designing technology

for children (Druin, 2002). Yet, these personal experiences about youth are often not enough to support the needs of children today but can be useful for creating a sense of empathy for the user group. When designing for a population which greatly differs from the typical designers, developers and researchers own experiences it can be particularly difficult to create technology with a deep understanding and empathy of their needs, requirements and wishes (Frauenberger et al., 2011) By giving developmentally diverse children a role in the evaluation of technology it is possible to empower them in creating their own world; a world which is often determined by adults (Frauenberger et al., 2011). Nonetheless, when involving developmentally diverse children it is especially important to ensure that the risk of involvement does not outweigh the benefits of being involved (Frauenberger et al., 2011).

Additionally, technology developed for and not with developmentally diverse children are at risk of being neglected by the target group. When designing for developmentally diverse children, the design process can get more complex due to the fact that there is usually a considerable amount of stakeholders involved (Hourcade et al, 2013). In addition to the child himself the stakeholders often also includes family members, teachers, classmates, therapists and caretakers (Hourcade et al, 2013). Thus, there is an enhanced risk of disappointment due to expectations not being met (Frauenberger et al., 2011). By involving the user group in the design process it is possible to explain and build up realistic expectations for what the technology can and will do, which in turn has a positive effect on the acceptance and further use of the product (Frauenberger et al., 2012b).

Further difficulties involve issues of communication (Hourcade, 2015). This issue is two part; on the one hand for the researcher to accommodate and use a language which is appropriate for the specific individual that is involved in the evaluation, on the other hand for the children to be supported with the right tools for being able to communicate their answers and opinions in a satisfactory way (Lewis, 2004a; Markopoulos et al., 2008). As evaluation always involve some degree of communication between adults and children it is important to consider how to find a suitable level for the descriptions and questions, supporting the child to communicate in a way that is natural for the child (Frauenberger et al., 2012b). As previously mentioned there is a high variability within this population, why each individual will have different requirements and challenges regarding communication (Frauenberger et al., 2012b). Consequently, it is vital to adapt and facilitate the communication in order for the evaluation to be successful.

Another challenge relating to communication is the risk of misinterpretations. When working with developmentally diverse children the challenges of interpretations are further deepened, especially if their social and communicative skills are limited. Therefore, there is a great risk that the interpretations are biased by the expectations and goals of the designer (Frauenberger et al., 2012a). Much of the input generated by children will require interpretation and translation to become viable design. This interpretation and translation

process may be particularly challenging because input from children with disabilities can often appear fuzzy and seemingly irrational to adult designers (Frauenberger et al., 2012b). As evaluation is concerned with interpretation, this is especially important to consider (Frauenberger et al., 2012a).

Although challenges of involving developmentally diverse children in design often are described with focus on the intellectual and communicative issues of inclusion it is also important to consider the emotional aspects. Participating in an evaluation study requires sufficient self-esteem in believing that one's contribution is accurate and meaningful (Lewis & Porter, 2004). Children with intellectual disabilities often have low self-esteem and a lack of determination; thus requiring more time to feel comfortable in the evaluation context and the evaluator (Milne & Bull, 2001). Additionally, according to Bell (2007) low self-esteem increases the liability that the child will answer "*I don't know*". Previous experiences of not fully understanding instructions or expectations can have taught them that not answering is an easy way out instead of trying to properly understand the question by asking for clarification (Bell, 2007). This indicates that children have varying needs of support and encouragement which requires sensitive care to ensuring that the participant feels at ease (Lewis & Porter, 2004).

4.5 Formulating questions for children with intellectual disabilities

All of the challenges of communication places high demand on the formulation of questions when involving children with intellectual disabilities in evaluation. This is especially important to consider when using survey methods or when conducting interviews.

Although satisficing is an issue for all children, the risk increases when involving developmentally diverse children. According to Krosnick's satisficing theory there are three factors that influence the success of completing the question-answer-process described previously (Borgers & Hox 2001; Markopoulos et al., 2008). Namely, the motivation to perform the task, the difficulty of the task and the cognitive ability to perform the task. The cognitive ability to complete the task is especially important when involving developmentally diverse children as informants since the intellectual level affects how successfully they are able to complete all stages of the question-answer-process (Borgers et al., 2000). Consequently, the risk of satisficing increases for developmentally diverse children as the issue of satisficing appears if the child finds the questions too difficult or if they lack the ability to formulate answers or understand the questions (Markopoulos et al., 2008). Hence, it is important to consider that ability may greatly influence the responses that will be received, which in turn can have impact on the reliability of the study (Borgers et al., 2000).

A way to reduce the risk of satisficing is to make the questionnaire or interview as short as possible, by doing so a higher motivation grade can be achieved (Read & MacFarlane, 2006). Read and MacFarlane (2006) suggests that for written questionnaires with young children five

minutes is enough, and that the amount of time it takes can be increased with age (Read & MacFarlane, 2006). Therefore, it is important to avoid asking for more information than what is required to fulfill the purpose of the questioning. One way to shorten the length is to remove questions that are objective and therefore can be answered by the parents or teacher of the child with equal accuracy (Scott et al., 2011).

When formulating questions for children simplicity is crucial. Short and straightforward questions are the most effective (Bell, 2007). Many children have limited language skills, making it harder to collect information from them, which applies to an even greater extent for children with intellectual disabilities. This makes children sensitive to failure in communicating (Scott et al., 2011). When formulating questions for children it is important to avoid placing excessive demands on cognition or memory (Bell, 2007). For children with Down's syndrome the short-term memory is four to five words, and in average they have the same grammatical understanding as a typically developing three to four-year-old (Scott et al., 2011).

A study by Borgers and Hox (2000) showed that vague and ambiguous words should be avoided. Ambiguous words are those that will be interpreted differently by each child, such as *sometimes* or *often* (Borgers & Hox, 2000). Even questions that might seem simple such as '*how often do you watch TV?*', can be difficult for a child respondent. By providing clearer parameters the ambiguity can be minimized for instance by changing the question to: '*how many times have you watched TV in the last seven days?*' (Bell, 2007). Another problem with ambiguous language is the tendency of children to interpret questions literally (Bell, 2007; Read & MacFarlane, 2006). Thus, direct questions and questions specific for the respondent is preferred to impersonalized formulations such as '*children in general*' or '*people like you*' (Bell, 2007). Another important implication is that children have difficulties in understanding referents and pronouns (Lewis 2004b). Definite articles, such as *the child*, leads to more positive bias compared to an indefinite article, such as *a child*. Children with intellectual disabilities often misinterpret words such as that, they, them, those, here, there. (Lewis 2004b).

Further, it is important to avoid abstract concepts and double negative as it is difficult for children to comprehend (Milne & Bull, 2001). For the same reason multiple questioning should be avoided. Multiple questioning can be especially problematic for children with intellectual disabilities as they are less likely to ask for clarification if they do not understand a question (Lewis, 2004b).

Lewis (2002) argues that it is important to ask both sides of an issue as children have a tendency to confirm what is given to them. However, Bell (2007) claims that questions with a negative formulation, which force the respondent to make a negative statement in order to

deliver a positive response, are difficult for children. Therefore, Bell (2007) recommends that negative questions should be avoided.

Furthermore, children tend to have a strong acquiescence response bias, meaning that they tend to answer 'yes' to questions with yes and no as answering alternatives, no matter if that is what they think or not (Lewis, 2004a; Read & MacFarlane, 2006). Lewis (2004b) suggest that yes and no alternatives should be avoided when formulating questions for children, especially for younger ages.

Questions can take different forms, Lewis (2002) describes open ended-, free recall-, and specific questions. When asking children with learning difficulties, general open-ended questions seem to give the best response, compared to using highly specific questions (Lewis, 2002; Lewis, 2004a). Also, general but not leading questions gave the fullest and most accurate answers (Lewis, 2004a). Read and MacFarlane (2006) on the other hand argues that free-recall questions works well with children, compared to specific questions, but worth mentioning is that it relates to children in general and not specifically children with intellectual disabilities (Read & MacFarlane, 2006). Yet, Bell (2007) argue that children have difficulties with recalling events, why it is preferable to use questions based on recent or current events. When asking about retrospective events there are several factors influencing the quality of data namely: the length of time since the event, the detail of recall required, and the salience of the event to the respondent (Bell, 2007).

Children often assume that adults know the answer to the questions they ask and have a tendency to want to please them by giving the right answer (Bell, 2007; Lewis 2004b). Therefore, it is important to avoid suggestive questions as they can influence the child's desire to please, give in or impress. Further, the ordering of questions affects how a question is interpreted. If one asks a question about smoking and the following questions concern health the questionnaire will be perceived noticeably different than if the following questions concern socializing (Bell, 2007).

Further, when distributing questionnaires to children it is important to consider the construction of the questionnaire and to thoroughly practice run it to make sure it works correctly (Borgers et al. 2000). An essential issue is children's varying abilities in spoken and written language, which makes question design for questionnaires problematic (Markopoulos et al., 2008). For developmentally diverse children these factors are especially important to consider since their communicative and intellectual abilities are very varied. There are also studies showing a tendency for, when asking questions with a limited set of alternatives, choosing the latter option (Lewis, 2004a). To avoid children choosing the latter option even if it is incorrect, pictorial approaches can be used (Lewis, 2004a). Another way of minimizing this risk is to position those responses expected to be most popular or salient in the less memorable part of the list (Bell, 2007)

5

RELATED WORK

5.1 Roles of Children

There is a growing tendency to involve the target users in the design process of technology. One of the most influential models of involvement is Allison Druin's *onion model* describing the levels of involvement a child can have in the design process. The model describes the four roles: *user*, *tester*, *informant* or *design partner* (Druin, 2002).

Firstly, Druin (2002) describes that when a child is involved in the role of *user* this is commonly done as users of an existing, fully developed technology either to test a concept to inform future technology developers or to better understand the process of learning which may contribute to future educational practices. As the role of *user* often uses observational methods this role is very limiting for the child, not allowing for any direct input from the child. Secondly, in the role of *tester* the child is involved in testing technology ranging from low-fi- to fully functional prototypes of emerging technologies. By involving children as testers it is possible to test certain areas of concern to the developers or to find usability issues. The impact of this role depends on how iterative the approach is. Only testing late in the process greatly limits both the creative impact for the child on the technology as well as the possibility of discovering and implementing the found issues. This is especially true if there is limited time or resources to implement the suggestions found in an evaluation session and in the end it is an adult making the decisions on what parts are important to incorporate. Thirdly, when the child is involved as *informant*, the child participates in various stages of the design process when it is believed that the process will benefit from being informed by children. The child can be involved by using existing technology to give feedback and ideas, by participating in interviews, questionnaires or focus groups to answer questions that the design team have. Thereby, this role greatly increases the impact the child can have on the technology which in turn leads to development of technology that children can and want to use. Lastly, in the role of *design partners* the children are seen as equal stakeholders in the design process with equal opportunity to contribute in any way that adults can to the design process in a way appropriate to children. Thereby, it is possible to increase the children's impact the technology dramatically (Druin, 2002).

5.2 Roles of adults

A systematic literature review performed by Börjesson et al. (2015) identified the roles adults take on when involving developmentally diverse children in the design process. Although the adult's often have mixed roles a distinction can be made between adults as *users*, *proxies*, *experts* or *facilitators*.

First, Börjesson et al (2015) states that in the role of *users* for adults corresponds to the role of users for children. Although the main users are the children, the adults can be involved as users of the same technology. This may include siblings, parents and teachers using the technology for communicating with the child. Second, adults are involved as *proxies* to speak on behalf of a specific child. This includes the adult explaining issues regarding the child's use, behavior or experiences. This role is often acquired by parents, caregivers or teachers. Third, the role of *expert* is when adults are involved to speak on behalf of an entire group of children. These experts may be therapists, psychologists, teacher or similar. Last, adults who are present during the encounters with children take on the role of *facilitators*. The adult is involved to introduce the child to the researcher or designer to establish a relationship and to support practically during the activity (Börjesson et al., 2015).

5.3 Inclusionary model

Guha et al. (2008) have developed an inclusionary model to involve children with special needs in the design process. The basis of the inclusionary model is: “*combining the best educational inclusionary principles with information from past design work involving children with intellectual disabilities to create a model for designing technology with children with intellectual disabilities*” (Guha et al., 2008 p.62).

According to Guha et al. (2008) the inclusionary model consists of three layers: Druin's levels of involvement, the nature and severity of the disability and availability and intensity of support. The first layer serves to define *the level of involvement* that the designers/researchers deems as reasonable. This involves considering the available resources in terms of time and money, as well as access to children. The second layer takes *the nature and severity of the disability* in consideration. In previous research children with less severe disabilities have taken on more involving roles such as design partners, whilst children with more severe disabilities have been in roles such as testers. Without the third level the choices of involvement might seem limited. However, by adding the third layer, *availability and intensity of support*, the choices can be opened back up, if the child is provided with proper support. This can be done in form of assistive technology, by the help of an adult one-on-one or it can be a sign language interpreter for a deaf child or similar (Guha et al., 2008).

5.4 Children in the Center Framework (CiC)

Kärnä et al. (2010) have created the Children in the Center Framework (CiC) for ensuring that the children's needs and interests are considered. The framework is used for multidisciplinary research and design collaboration. It requires participation of people from three backgrounds, namely: the child and their families, researchers from computer science and researchers from special education.

Kärnä et al. (2010) present the CiC framework as consisting of five levels. It starts from the center, as the name implies, with the *children's interests, strengths and needs* as the basis for all activities. At the second level the *children and their families form a partnership with tutors and researchers* and work collaboratively. This results in the third level, *child-centered technologies*, that is created during the design and development process. Thereby, the technology is created based on the child's and their family's needs and wishes. The fourth level, *flexible everyday environments*, involves how to ensure that the technology can be used by the child. This includes both physical environments as well as collaborative technologies. As all parts of the creation of the technology, from goal setting to final evaluation, is carried out in a close partnership with the participants it is important with flexibility for collaboration. The fifth and final layer, *participation in society*, connects the previous levels together. As the framework centers around the child's interests, strengths and needs, the level of participation in society depends on how successfully levels 1 to 4 are realized in the everyday lives of the child and their families (Kärnä et al., 2010).

5.5 Applications relating to TellMe

Apart from related research on how to involve children in the design process there are several applications and research papers on products similar to TellMe. Examples of applications that have similar functionality as TellMe include Niki Diary developed by La Rocca (2015), StoryCreator (Innovative Mobile Apps, 2013) and Mental Note (Zymbiotic Technologies, 2016). Niki Diary is an application developed especially for those who experiences difficulties with describing and explaining what they have done or plan to do during a day. The application supports adding of text, pictures, audio and video-clips linked to a date. StoryCreator is an application for creating stories. With this application the user can add photos, videos, audio, drawing and text in order to create a book. This application was not created especially for children in with intellectual disabilities, but can be used by and with this user group as well. Mental Note is another application which is not explicitly designed for children in Special Education. Yet, the application lets the user create a digital notebook, where pictures, audio, drawings and text can be combined to create content. However, the application can also be used as a contact book or diary for use in special education schools, an example of this can be found in the blog iPads i gymnasiesärskolan (2013). All of the above mentioned applications mainly differ from TellMe by the target group and the purpose of the

application. TellMe is focused on the communication between school-parent-child, thus providing a direct communication between the parents and teachers as well as an immediate insight in the children's education through Kontaktboken.

Additionally, Fotokalendern is an application developed especially for children with communicative disabilities by Landstinget i Uppsala län (2016). The application has been created for supporting people to describe and talk about their day. The application supports adding of photos, pictures, video-clips, audio and text which are sorted by date, and presented in form of a calendar. The days are color coded according to the Swedish color coding system. Fotokalendern is the application which is most similar to TellMe as it addresses the same target group and the same problem. A degree project by Böckman and Flink (2015) examined how Fotokalendern could be used as Augmentative and Alternative Communication by children with Autism Spectrum Disorder. Their study concluded that the use of the application showed an increased activity and participation in conversations with their parents and teachers. However, the success of the application was affected by the attitude and knowledge of communication found in the child's network.

In addition to the mentioned applications a prototype of a calendar application, MyCalendar, was developed by Abdullah and Brereton (2015). This was done through a participatory design approach involving children, parents and teachers in the field. The aim of the application was to provide a communication tool to enable children with Autism Spectrum Disorder to talk about and connect their activities and interest between home and school. Their study concluded that MyCalendar did increase the children's ability to communicate about their everyday life using photos and video, through encouragement of teachers and parents. Further, they concluded that the use of the application was useful for the teachers as it enabled them to model positive behaviours as well as to enrich the learning situations for the child by relating the education to their personal interest and activities. The approach and aim of MyCalendar is similar to those of TellMe, enhancing the communication between teachers-parents-children to bring the two worlds of home and school closer together. Yet, the two applications and research differ in the target group, Autism Spectrum Disorder versus children in special education, as well as in the design of the application. TellMe is composed of both a diary application for the children and a contact book application for the parent's and teacher's whereas MyCalendar is based solely on one application on the child's tablet. Thereby, the success of MyCalendar places a high demand on the tablet being brought between school and home as well as the parent's and teacher's engagement (Abdullah & Brereton, 2015).

6

METHODOLOGY

This study was conducted using a qualitative research approach. In this section the research view and research strategy are presented in relation to other alternative approaches, along with a selection of methods suitable to use within an evaluation study in interaction design.

6.1 Research view

Design is complex and differs from other scientific research, such as natural science, in its very nature. In natural science the Popperian view of theories having to be falsifiable is prominent and suggests that there is a *right* answer to a research problem (Gaver, 2012). Being a synthetic discipline design conflicts with the use of controlled experiments used for theory testing (Gaver, 2012). Design theory is unfalsifiable and thereby, not scientific according to the Popperian view (Gaver, 2012). The term design research has a variety of meanings; it can refer to research about design practice but also to the procedures leading to the development of design practice itself (Hallnäs & Redström, 2007).

The complexity of design is found in the subjective nature of the field. Design complexity is defined by Stolterman (2008, p.57) as: “*the complexity a designer experiences when faced with a design situation*”. All design situations are different, with infinite sources of information and requirements demands (Stolterman, 2008). Thereby, the designer is required to make various decisions on different aspects both regarding the design process (how to frame the situation, who to involve and what to explore) as well as the final artifact (what design decisions to make, what to include and what to focus on) (Gaver, 2012; Stolterman, 2008). All of these decisions are subjective and dependent of the circumstances surrounding the production and use (Gaver, 2012). Therefore, Stolterman (2008) claims that design is about *the ultimate particular*, which implies that designers have to make judgment about the people, the situation, the needs and desires as well as the time and resources constraints.

Similarly, the subjective and complex nature of design situations are described by Rittel and Webber (1973) as *wicked problems* and by Schön (1992) as a “messy” situation. As design theory deals with wicked problems no correct solutions exists before approaching it (Gaver, 2012). Therefore, framing and formulating the situation is an important part of addressing it (Gaver, 2012).

Due to the different and often conflicting perspectives of the stakeholders the problem cannot be addressed using a reductionist approach (Zimmerman et al., 2007). Solutions to wicked problems are not true or false, there is no one answer, rather the solution is good or bad or even *good enough* (Rittel & Webber, 1973). Further, wicked problems generate waves of consequences of the solution over an extended period of time, after being implemented (Rittel & Webber, 1973). Unlike other scientific fields, there is no expectation that reproducing the process would yield the same results (Zimmerman et al., 2007).

As a response to the generative nature of design research and as a way to handle wicked problems, research through design is an approach commonly used where design researchers focus on: “*making the right thing; artifacts intended to transform the world from the current state to a preferred state*” (Zimmerman et al., 2007 p.497). By using this approach, it is possible to identify opportunities for new technology or improvements of current technology (Zimmerman et al., 2007).

A perspective that has gained increased interest in the research community during the recent years is *situatedness* where Harrison et al. (2007) argue for and suggest a third paradigm of Human Computer Interaction. According to Harrison et al. (2007) there has been a move from the first paradigm *Human-Factors*, to the second paradigm *Classical Cognitivism/ Information Processing Based* towards the third paradigm *Phenomenologically- Situated*. In the third paradigm interaction is seen as phenomenologically situated, containing a variety of perspective and approaches. Compared to the two previous paradigms the third is concerned with the social and cultural aspects of meaning creation, focusing on the artifact and the context of use as mutually defining and subject to multiple interpretations. Meaning is created in the context and situation, often in collaboration between the people, the artifact and the environment and resources available where it is used. Therefore, when designing interactions the study of the local, situated practices of the users becomes the focal point instead of attempting to get a correct set of metrics of interaction. (Harrison et al., 2007)

6.2 Research strategy

Creswell (2009) describes three types of design research: qualitative, quantitative and mixed methods. Qualitative research could be described as being framed by words and open-ended questions while quantitative research consists of numbers and closed-ended questions. Mixed methods in turn involves elements of both.

Likewise, when performing an evaluation, the evaluation can be defined in accordance to how the result will be analyzed. Most commonly divided into quantitative or qualitative measures. Quantitative data generally takes the form of numbers, answering to questions such as *how many* or *how long* (Markopoulos et al., 2008). When analyzing quantitative data, the focus is often to find the magnitude, amount or average of something (Preece et al., 2011).

Quantitative evaluation criteria can be useful for measuring performance or usability, especially when comparing to different products (Markopoulos et al., 2008). Qualitative data concerns soft values and subjective experiences, opinions and behaviours of the informants. Qualitative data include quotes, descriptions and images rather than numbers. Thus, the analysis of qualitative data focuses on identifying themes, patterns and stories (Preece et al., 2011). Qualitative evaluation criteria can be useful for finding unexpected reactions, difficulties or issues (Markopoulos et al., 2008).

The goal of qualitative research is to explore and understand a certain topic or social phenomenon. One of the main components of qualitative research is the collection of data in the participants setting. Further, the data is most often gathered through multiple sources, such as interviews, observations and documents. The researchers play a key role as their background, history, values and knowledge shape the interpretations they make of the data. Moreover, qualitative research is often concerned with identifying a holistic understanding of the issue of study. Thus, several factors and aspects need to be considered to create a larger picture. Accordingly, the process is emergent and may change due to the findings and encounters made in the field (Creswell, 2009).

6.3 Selection of participants

When conducting a study it is important to consider who to involve. The use of sampling differs between quantitative and qualitative approaches. Quantitative research is more often concerned with probability sampling than qualitative research. Probability sampling suggests that a sample can be used to represent a larger population (Berg, 2009). This often involves a random sampling, where everyone in the target population have equivalent ability to participate in the study.

In qualitative research *non-probability samples* can be used. Berg (2009) describes the four most common types of sampling, namely: convenience sampling, purposive sampling, snowball samples and quota samples.

According to Berg (2009) convenience sampling is based on subjects that are available or accessible at a given time. Purposive sampling is when researchers use their knowledge to select subjects who represents the population. Snowball sampling is when a set of informants are initially chosen and interviewed, who then point to other possible and appropriate informants. Quota sampling is when a matrix with certain attributes (e.g. age, gender or education), based on the goal of research, is used to create a sample. (Berg, 2009)

6.4 Methods of data collection

After deciding who to involve in a study it is essential to establish what methods to use to collect data to answer the research question. Below is a selection of methods which could be useful when gathering data for evaluation within interaction design (Preece et al. 2011).

6.4.1 Literature review

Literature study is a major part of research. It provides an understanding of the research field as well as a theoretical foundation for the empirical study. Further, the literature review provides the reader with an understanding of research related to the topic and anchors the study in a larger context. Additionally, the literature review can be used as a way compare the findings to previous research (Creswell, 2009).

Creswell (2009) present three ways in which literature can be reviewed in a qualitative study. Firstly, literature can be used to frame the problem in the introduction of a study. Most qualitative research use literature in this way. Secondly, literature can be used as a framework to guide the study. This is typically done in ethnographic studies to set the stage of the study. Thirdly, the literature can be used in a latter stage of the process to contrast and compare the theory that emerges from the study with other theories. This is commonly used in grounded theory or case studies which are inductive and where the participants guide and shape the study, not the literature. (Creswell, 2009)

6.4.2 Interviews

Interviewing is a commonly used method for gathering data. Qualitative interviews are used to gain insight in the informants reasoning, exploring their views and opinions on a certain topic. Interviews can be conducted through different medias: telephone, email, face-to-face, through online forums or in focus groups (Creswell 2009). Depending on what the goal of the interview is, different levels of structure can be used: unstructured, semi-structured or structured (Preece et al. 2011). What differs between the levels of structures is the degree of control the interviewer has over the interview process.

Unstructured interviews consist of open-ended questions, where no specific answer is expected. They often take the form of conversations around a topic. Since unstructured interviews usually generates a lot of data it can be time consuming to analyze, but on the other side it provides in-depth information because of its exploratory nature (Preece et al. 2011).

Structured interviews are usually composed of closed-ended questions, with predefined answers. For example yes or no answers, or questions about how frequently something is done (i.e. once a day, once a week, once a month etc.) (Preece et al. 2011). This type of interview is

useful when the goal of the questioning is clear, using closed questions with set alternatives to ensure that the questions are understood similarly between all informants (Preece et al. 2011).

Semi-structured interviews are a combination of structured and unstructured, where the interview has a higher level of structure than unstructured interview, but not so high that it is structured. Usually the interviewer has a script that is used to ensure that all topics of interest are covered with all informants, but it is not followed rigorously. Semi-structured interviews are useful since they are flexible and enable the interviewer to use probes to get the interviewee to elaborate of especially interesting subjects (Preece et al. 2011).

Additionally, focus groups can be used as a way of interviewing people in groups. This form of interview is used to investigate certain topics, letting several different voices to be heard. When conducting focus groups, it is important to find a suitable formation of individuals to create a situation where everyone gets a chance to, and feel comfortable in speaking. The discussion is directed by a facilitator who is responsible for dividing the attention and conversation to all involved participants. As opinions are often created in a social context and focus groups are useful for topics that require discussion rather than experiences of individuals. (Preece et al. 2011)

6.4.3 Interactive questionnaire

The touch-based, interactive questionnaire was developed in an interdisciplinary research project between Chalmers University of Technology and Gothenburg University, involving both Interaction Design and Psychology (Boström & Eriksson, 2015; Fohlin, 2014). The development followed a human centered design process in co-operation with both students and teachers in a special education context (Fohlin, 2014). The questionnaire was designed in the purpose of allowing children with intellectual disabilities to self-report on psychological health. The design of the interactive questionnaire was one of the major parts of the master thesis work carried out by Fohlin (2014), where a more detailed process of the development can be found.

When using the questionnaire, the researcher first enters the test ID of the child and then gives the tablet to the child. By pressing the middle of the screen the child starts a tutorial, explaining how to navigate through the questions. This is demonstrated using animations and auditory guidance. Each question is presented sequentially to the child, using audio, text and images. By selecting one of the response options in the bottom of the screen, the next question is displayed.



Figure 13. The interactive questionnaire.

The questionnaire is a valid tool for use in self-report on psychological health, when using the same questions, response options and images used in the Vesslan project (Boström & Eriksson, 2015). However, the questionnaire has not been used in evaluations with children and the effectiveness of this has not been proven. Yet, the target group is similar which indicates that it has potential to be used for more purposes than solely in self-report on psychological health.

6.4.4 Qualitative observations

Another way to get a rich and an extensive amount of data about the setting and the participants is to conduct observations. Observations are commonly used both for exploring user needs, activities and goals as well as for evaluating how well a prototype or product supports the users (Preece et al. 2011). As for interviews different levels of structure and different settings can be used depending on the goal of the observation. Creswell (2009) describes four types of qualitative observations namely: complete participant, observer as participant, participant as observer and complete observer. All of these approaches involves the researcher gathering field notes through direct or indirect interaction with the participants and their work.

In the complete participant observation the researcher conceals their role as observer and participate in the work of the observers. This gives the researcher a self-experienced view together with the participant (Creswell 2009). With a hands on experience the researcher might get a better understanding and empathy for the users. However, this approach might be intrusive causing the participants to behave differently than they otherwise would (Creswell, 2009).

When the observer is a participant the role of the researcher is known to the participants. The researcher engages in the activity together with the user but can record the data as information occurs. Yet, with this approach the observer may encounter private information which cannot be reported. (Creswell, 2009).

In participant as observer, the observation role is secondary to the participant role and is beneficial since it allows the researcher to discover unexpected aspects during the observation. However, this approach places high demands on the researcher's ability to observe whilst focusing on participating in the activity (Creswell, 2009).

Complete observer, is when the observation is indirect with the researcher observing with an outside perspective. The researcher observes without participating. This approach can be used to gather data on topics that are uncomfortable to discuss. It also lets the observer focus on one task, allowing for findings which otherwise might have been missed. (Creswell 2009).

6.4.5 Indirect observations: documents and audio-visual materials

Another way to collect data is to study activities and behavior indirectly using indirect observation such as diary or interaction logs (Preece et al. 2011). Creswell (2009) encourages the use of alternative means of data to add richness to the findings, as well as provide useful information that is not possible to capture by relying solely on typical data gathering methods such as interviews and observations. One way of capturing data is to review documents, for instance letters or diary entries created by the participants throughout the study. Another way is to use audio-visual materials which involves examining photographs, cell phone text messages and emails. The benefit of using indirect observation is that it is unobtrusive, providing rich data on topics which may not have been brought forward in an interview. However, studying interaction logs causes ethical aspects to be considered (Preece et al. 2011).

6.5 Methods of data analysis

Denscombe (2009) describes five steps the researcher commonly goes through when analyzing data: Preparation, initial exploration, analysis, presentation, and validation of the data. These steps are usually applicable both to qualitative and quantitative data, distinguished by the actions made in each step and how systematically it is executed.

According to Creswell (2009) a simple analysis of qualitative data consists of six steps: 1) preparation and organization of data, 2) reading through and getting an overview of the information, 3) coding of data, 4) find themes and descriptions, 5) interrelating themes/descriptions and 6) interpret the meaning of the themes/descriptions.

The analysis procedure is an iterative process where the researcher moves back and forth between the steps, especially the steps involving coding and interpretation of the data (Creswell 2009; Denscombe 2009). Further, Denscombe (2009) highlights that the analysis should be clearly derived from the collected data, the explanation of the data should be based on thorough reading of the data and unwarranted bias should be avoided.

The approach of focusing on identifying themes and patterns can also be referred to as thematic analysis (Aronson, 1994). In a thematic analysis the process is similar to the six steps presented by Creswell (2009) with the addition of interweaving the literature with the findings to motivate the identified themes, resulting in a complete narrative of the collected data (Aronson, 1994).

Additionally, in qualitative research it is possible to use a theoretical framework for structuring the analysis of the data (Preece et al. 2011). This can be used to identify another dimension of insights in the gathered material. However, for the framework to fulfill their potential it is important to spend considerable time in order to fully understand how to use it and apply it in a suitable manner (ibid). Preece et al. (2011) presents three theoretical frameworks that are used frequently in interaction design namely: activity theory, distributed cognition and grounded theory. Activity theory is used to establish what tensions that are apparent between various components of a particular activity (ibid). Distributed cognition can be used to interpret and represent what is happening in diverse situation by contributing an analytical framework to define and investigate what is really happening with a larger degree of detail (ibid). Lastly, grounded theory described by Preece et al (2011, p.297) as: “*an approach to qualitative data analysis that aims to develop theory from the systematic analysis and interpretation of empirical data i.e. the theory derived is grounded in the data.*”

7

PLANNING

To adequately answer our research question of what socially situated design recommendations that are evident through the evaluation of a communication tool in the special education context, our planned approach was to conduct a situated evaluation in at least two distinct settings. Further, to investigate in what way children in special education can contribute to the evaluation it was important to consider and find suitable methods to use.

7.1 Early changes in the research approach

Our methodological approach was changed during the initial stage of our study. The original plan was to perform a mixed method study, clearly empathizing the use and outcome of an interactive questionnaire by comparing typical methods use within situated evaluation (observation, interviews) with the questionnaire. However, as the project evolved and the foundation of the study was made clear, we came to focus more on the situated evaluation. This was especially due to the low number of questions being possible to include in the questionnaire and the possible richness of the data collected through the two methods combined.

7.2. Planned research approach

The change of direction caused us to reframe our research aim, leading to a more focused approach. Consequently, our approach matured into a qualitative research which in turn affected what method were chosen for the evaluation and the subsequent analysis. As the study used a situated evaluation approach the methods were chosen in consideration of the aim of our research. Thus, structuring the research to be done through a four- to six-week long study at three different schools in the Västra Götaland region. The study was divided into three different phases: before, during and after the introduction of TellMe.

In the *first phase*, before the introduction of TellMe, the goal was to identify the setting in which TellMe appears to establish the underlying social and cultural settings of the schools along with their current means of communication between the parents, teachers and the children. The plan was to use the results of the first as a foundation for understanding the differences of the appropriation of TellMe in the various settings.

In the *second phase*, during the use of TellMe, the goal was to identify in what way the different schools appropriated the application and in what way the introduction of the application affected the social practices. The results from this phase were planned to be used to examine if the idealization of TellMe agreed to their current way of working as well as to realize how the social setting affected the realization of TellMe in the various settings.

In the *third phase*, after the introduction of TellMe, the goal was to identify how the introduction of the application changed the way the parents, teachers and children communicated and if the use of the application changed over time. The results of the third phase in combination with the results of the two previous phases were intended to be used as the foundation to the proposed changes of TellMe.

As our research aim was to understand the social practices and how the design should be socially situated our planned strategy was to collect data from multiple sources, in the participant's natural setting. Consequently, taking on a qualitative research approach with the goal of identifying patterns and themes to examine how TellMe was appropriated in the different settings. With the use of interviews, observations, the interactive questionnaire and combining and comparing it with indirect observations of the interaction logs of TellMe our intent was to get a comprehensive understanding of the social behavior of the participants. Both children as well as teachers and parents were included in all three phases to ensure that all involved parties are heard.

As qualitative analysis is time consuming and requires time for structuring and familiarizing with the data, the data was analyzed with a thematic analysis of the data. With this approach it was possible to gain a thorough understanding of the data as the emerging themes are elaborated, discussed and motivated. An alternative would have been to use activity theory, but due to our limited expertise and the time and sophistication needed to understand and apply the various components of the framework it was found not to be suitable for this study. However, it is possible that the use of activity theory as an analytical framework would have made the analysis more sophisticated, possibly identifying a larger number of tensions in the different realizations of TellMe.

7.3 Initial ethical considerations

As the project involved work with children in general and developmentally diverse children in particular, the need for ethical considerations was paramount (Frauenberger et al. 2012b). The study was carried out with consideration of the ethical principles for evaluation stated by Farrell (see Markopoulos et al. 2008) namely: *respect for other people, beneficence and non-maleficence*, and *justice*. This implies treating all people as autonomous individuals, minimizing the harm and maximizing the benefits and distributing these as fairly as possible (Markopoulos et al. 2008). It is important to note that ethical decisions are subjective and in

some cases it might be difficult to judge if the principles are met. However, as evaluators we are responsible for ensuring that the work is carried out in an ethical way (Markopoulos et al. 2008). Additionally, the study involved some initial ethical considerations.

First, before involving children in research it is important to ask if they agree to participate. All involvement should be voluntary. As children generally are not able to give written consent to take part in a study, an adult can sign a written consent agreeing for the child to take part in the study. However, the children should always be asked if they agree to participate (Markopoulos et al. 2008). Even if one is given written consent from the adult, one should respect the wish of the child and let the child decide whether or not to participate. Consequently, written consent from the parents in combination with verbal consent from the children were required before any child was involved in the study (see Appendix 1).

Second, it is important to ensure that the psychological and physical demand does not outweigh the benefit of inclusion (Frauenberger et al. 2012b). By conducting the study in an environment which was familiar to the child and by trying to adapt the questions to a suitable level, this aspect was considered in the planning of the study.

Third, another less common, but very serious ethical concern is the risk of child abuse or accusation of child abuse (Markopoulos et al., 2008). This risk is increased if a child is left alone with the evaluator. Consequently, we designed and conducted the study to always involve two or more adults in accordance with the recommendations of Markopoulos et al. (2008).

Fourth, when using semi-structured or unstructured interviews it is beneficial to record and transcribe the interviews. This in turn facilitates the analysis, and increases the validity of the study (Creswell, 2009). Thus, all of the interviews with the teachers were recorded and transcribed. By letting the interviewees sign a consent for participating and the interviews being recorded it was possible ensure that the informants are aware of and actively agree to take part in the study with informed consent (see Appendix 2). Yet, all collected data was treated confidentially and made anonymous in the report.

8

RESEARCH PROCESS

The following sections aim to present a detailed description of the procedure for the project, focusing on both the procedure of the various data collection methods used with the different user groups in the three distinct schools as well as the findings of the various methods.

BACKGROUND	PHASE 1: Situating evaluation	PHASE 2: Situating evaluation	PHASE 3: Situating evaluation	ANALYSIS
Literature review Preliminary considerations Configuration of TellMe Configuration of questionnaire	Interviews Observations Interactive questionnaire Indirect observation Analysis	Interviews Observations Interactive questionnaire Indirect observation Analysis	Interviews Observations Interactive questionnaire Indirect observation Analysis	Thematic analysis Sketching Wireframes

8.1 Literature study

In prior to carrying out the evaluation study a literature review was performed. The literature was used in two different ways, both to frame the research problem as well as to create a solid foundation to guide the study. All of the searches were performed through the use of Google Scholar and Summon at Chalmers Library.

The initial literature review was based on three different topics: inclusion of developmentally diverse children in the design process, evaluation and the methods questionnaires and situating evaluation.

For the first topic, inclusion of developmentally diverse children in the design process, different terms for intellectual disabilities were used. Thereby terms such as special needs, special educational needs, learning difficulties, learning disabilities, cognitive disabilities focusing on children, were used in combination with words such as design process, participatory design, technology design and design of children's technology. This literature was used to frame the problem. Additionally, we wanted to get a broad understanding of how typically developing children and developmentally diverse children have been and can be included in the design process.

For the second topic, evaluation, the search was divided into three parts. First, evaluation in interaction design in general where the terms evaluation and interaction design, human computer interaction and human centered design were used. Second, evaluation with

typically developing children, where we used the terms child computer interaction, interaction design and children combined with evaluation. Third, evaluation with developmentally diverse children, where we added the diverse terms used for intellectual disabilities to the terms used for typically developing children. Through the literature found in this review we formed a foundation for how to perform the evaluation, what challenges exist and how these can be handled.

For the third topic, questionnaires and situated evaluation, we used the stated terms in combination with previously described terms for developmentally diverse children. This literature was used to understand how to perform the evaluation methods.

8.2 Preliminary preparations

In parallel with our background study we began searching for schools willing to participate in the study. Due to the limited time of this project, our selection of participants was based on convenience sampling. Our first contact was with a school in the Västra Götaland region, who unfortunately withdrew their participation. This is described in more detail under section 8.2.1. Thereafter, an invitation was sent out to 19 principals at Special Education Schools in the Västra Götaland region. As only two schools replied with an interest of participating in the study, these schools were chosen as the subjects of study, in this study they are called School 1 and School 2. According to Berg (2009) convenience sampling is only suitable if the subjects are appropriate for the study. As the two schools represented our target group and the purpose of our study as well as located in different socio-economic areas, differing in size and number of students they were deemed as appropriate subjects. In addition to these two schools we also received data from a third school, School 3. The data collection in School 3 was performed by another researcher in the TouchAT-group, since they already had an ongoing study there, and thereby also an established relationship with the school and the students.

The participants within each school is not a conscious decision made by us. All of the classes of the special education schools, including all their teachers, students and parents, were invited to participate. The teachers sent consent forms to the students and those whose parents signed the form were then involved in the study.

8.2.1 School 0

Initially we were in contact with a special education school in the Västra Götaland region, who showed great interest in using the application and participating in the study. However, after a first meeting with one of the teachers, where we presented the application and our study, the school decided to withdraw from participating.

The major reason for their withdrawal was that they felt that the application would be too time consuming to use. As all of the students could access each other's diaries through their own tablets, the teachers would have to supervise every time they wanted to make entries in the diary. The password function required the teachers to log in every time the application was to be used, and when logged in the students had access to all of the students in the class. For this class this was not a suitable solution due to the limited number of teachers to a higher number of students.

Consequently, we proposed a design suggestion to allow the teachers to choose between seeing the whole class or locking the diary to one child. Thus, the child can only access their own diary on their own tablet. This resulted in the following change of the app:

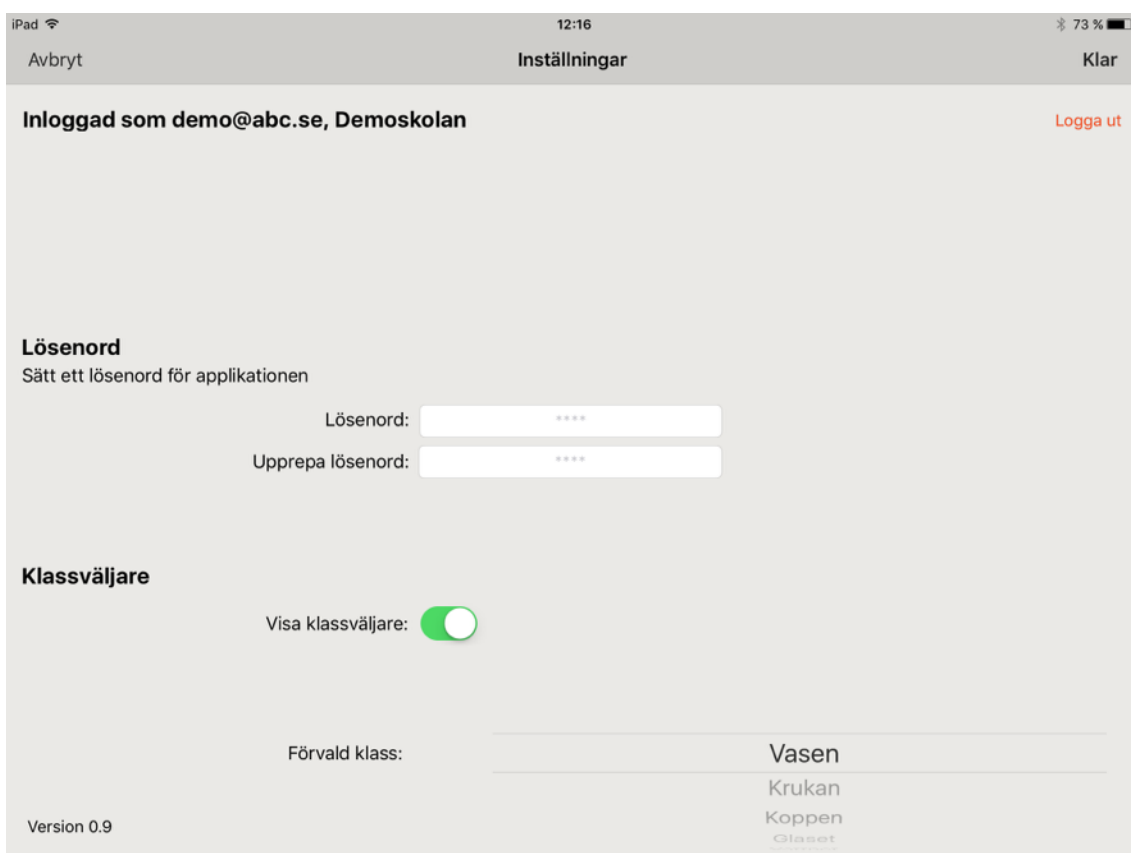


Figure 13.

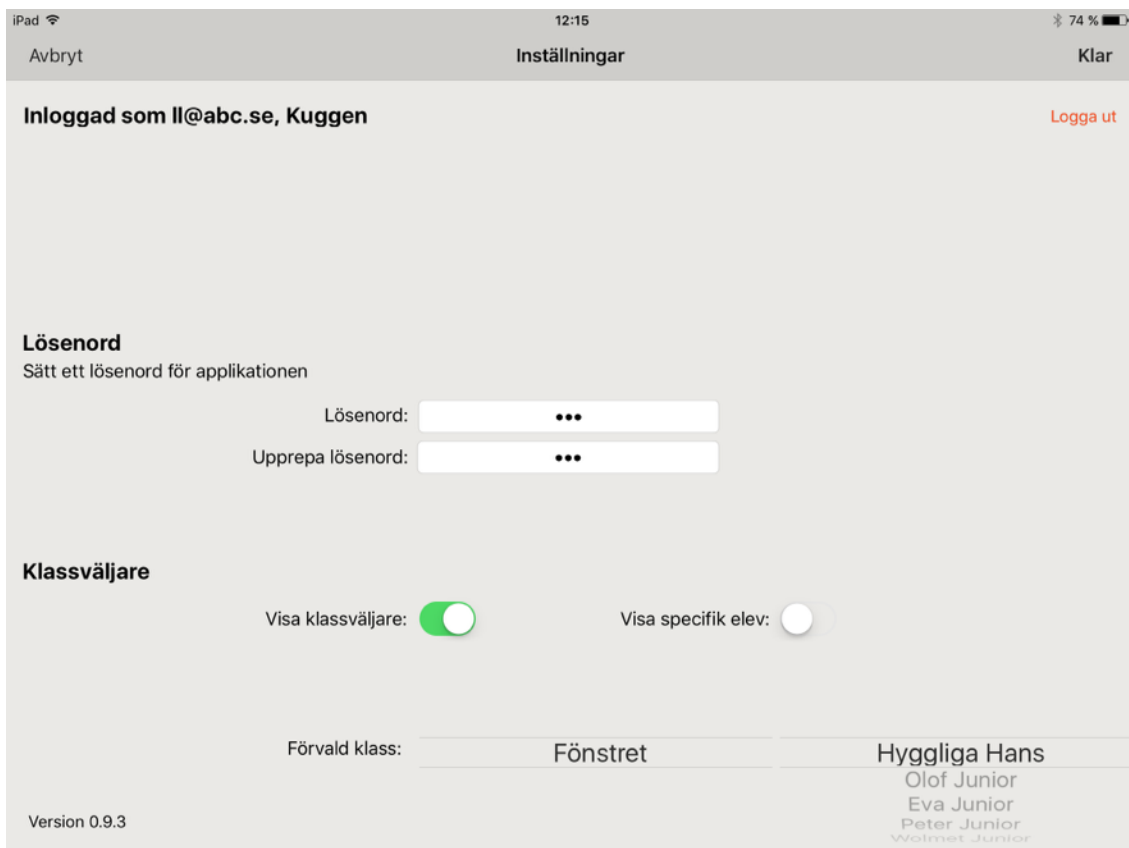


Figure 14.

Unfortunately, the limitations of the application were only one of the reasons for this school's decision to abstain from participating. Hence, the changes of the application were not enough to convince them to reconsider their participation.

8.2.2 School 1-3

Eventually three schools were involved in the evaluation. Before conducting the main data collection, we had a number of initial meetings with each school to introduce the application and the study.

With School 1 we had two initial meetings. For the first meeting we met with Teacher A, who told us about the school and the students. We also got to meet two of the children and present ourselves to them, the remaining two were absent that day. We presented the application and our project to the teacher who decided that they wanted to participate in the evaluation of TellMe. At the second meeting we had the opportunity to meet the parents of the children to show the application and ask if they would like to participate, and to get consent for their children to participate. We also showed the application to the student assistants and asked them to participate as well. All parents, children and student assistants agreed to participate.

With School 2 we had one initial meeting where we met with Teacher E and Teacher G to whom we presented ourselves, TellMe and the project. Unlike in School 1 we did not get the opportunity to meet with the children. The teachers liked the application and decided to participate in the study. We gave them prints of the informed consent form to give to the parents. The parents filled in the consent forms at home, and then gave to the teachers who handed them to us during the first phase of the evaluation.

As previously described all contact and data collection of School 3 was performed by another person in the TouchAT team. This person had been to the school regularly during a two-year period with weekly visits. Thereby, a solid relationship had been built.

8.2.3 Configuration of TellMe

In School 1 each child had one personal assistant. Therefore, the school wished to connect each child to one assistant, the main teacher as well as their parents. However, the application did not allow for different teachers for different students in the same class. Therefore, each child was configured as a separate class to make it possible to connect the assistant to separate children. A total of five accounts for the parents were created, where Child 2 had two parents connected and the remaining one parent each. Child 1 and its parent were connected to Assistant B, Child 2 with parents were connected to Assistant C and Child 3 to Assistant D. Child 4 did not have a separate assistant. All of the children and parents were connected to Teacher A (See figure 15).

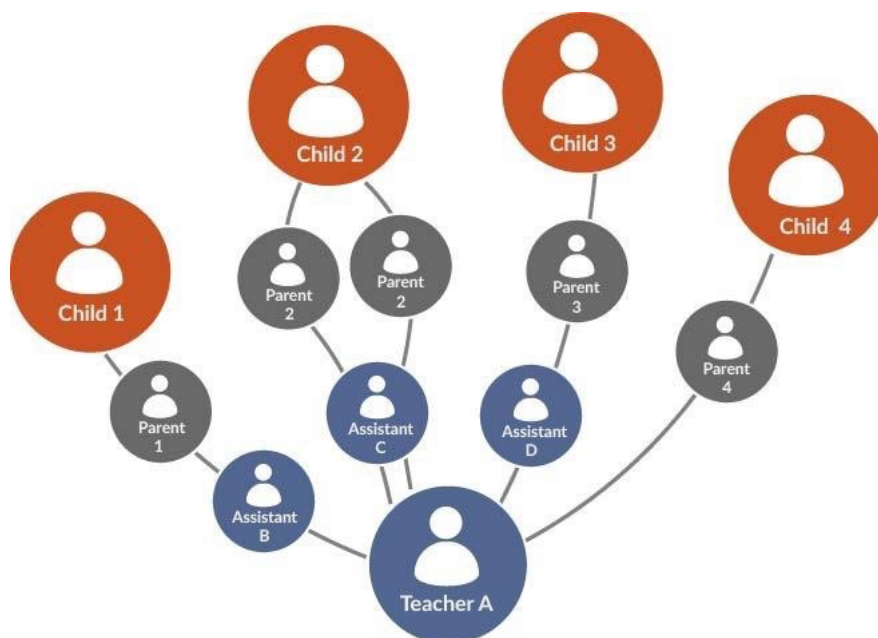


Figure 15. Configuration of School 1

School 2 had a mobile phone policy that prohibits the teacher's from using their own phones during work hours. Due to this Kontaktboken was installed on the teacher's tablets instead of

their phones. Since the student assistants did not have their own tablets we installed Kontaktboken on the children's tablets as well, in order to give the assistants easier access. Consequently, both Dagboken and Kontaktboken were installed on all of the children's and all of the teachers' tablets. A total of 11 children and 17 parents were added to the app. However, that does not mean that all parents downloaded or used the application. For instance, the parent of Child 5 had to resign from the study since s/he had a windows phone, and TellMe so far was only developed for Android and iOS.

In Class A five children were added to TellMe, Child 11, Child 12, Child 14, Child 15 and Child 16. All of the children had one parent each added to the application, except Child 14 who had two parents connected with separate accounts. Everyone was in turn connected to Assistant K, Assistant L, Assistant M, Assistant N and Teacher F (See figure 16).

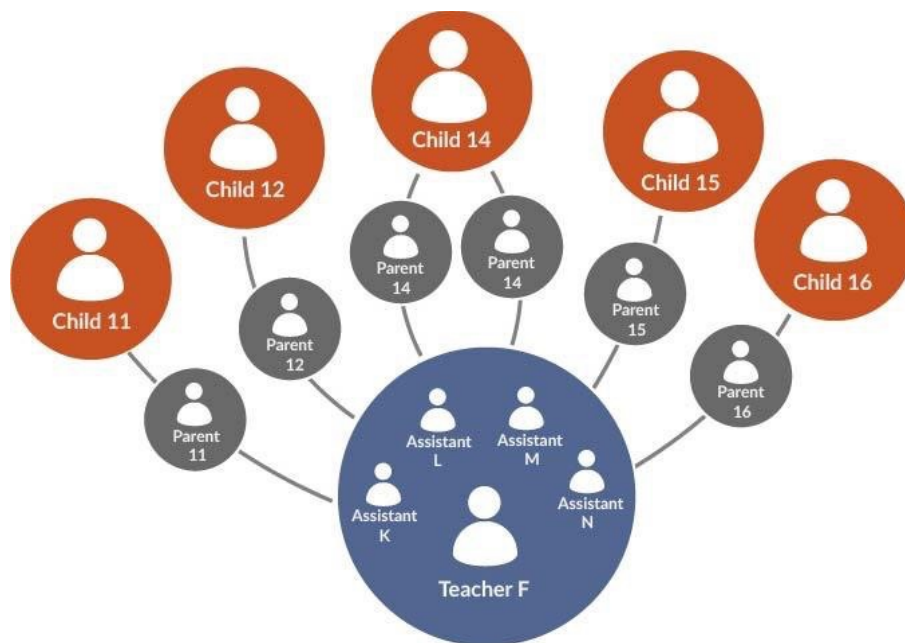


Figure 16. Configuration of School 2 Class A

In Class B, three children participated in the study. Child 5 and Child 7 had two parents added to TellMe, and Child 6 had one parent participating in the study. All of the parents were connected to Assistant H, Assistant I, Assistant J and Teacher E (See figure 17).

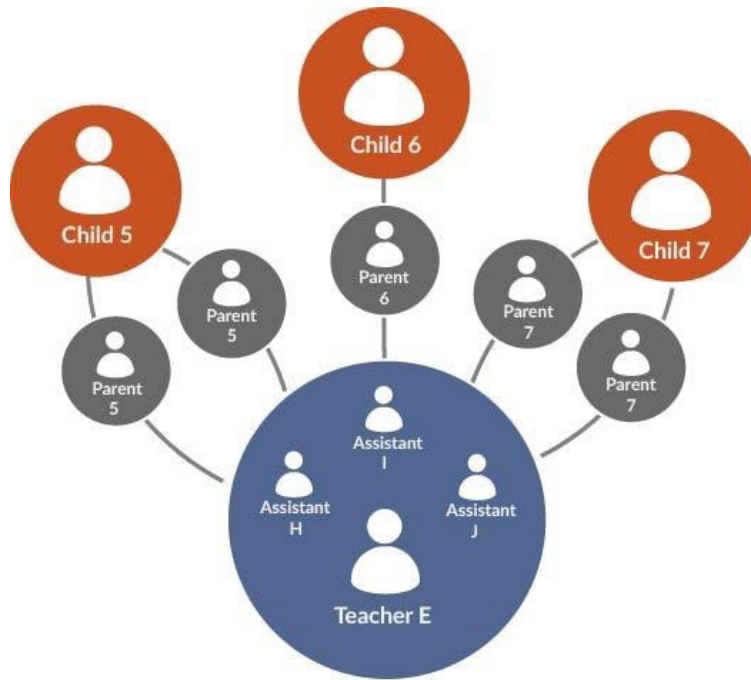


Figure 17. Configuration School 2 Class B

In Class B three students participated in the use. All of the children had two parents connected to the application. The parents of Child 8 and Child 10 had separate accounts, whilst the parents of Child 9 had a joint account, i.e. two people using the same login. All of the parents were connected to both Assistant O and Teacher G (See figure 18).

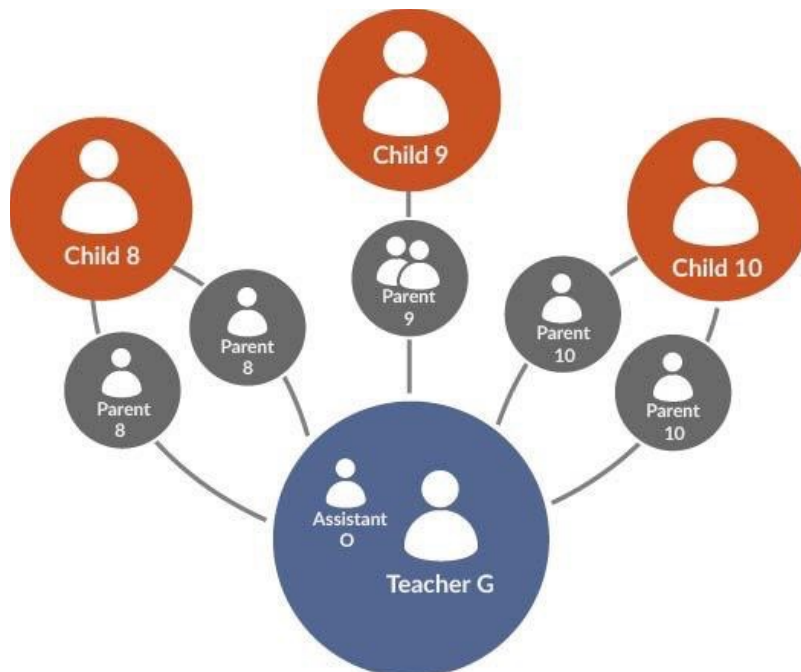


Figure 18. Configuration School 2 Class C

In School 3 all of the children were a part of one class. As in both School 1 and School 2 Dagboken was installed on the children's individual tablets. The application was set so that the children only saw their own diary. The teachers had Kontaktboken installed on their own personal phones. In addition to their own phones they requested a phone to use during extracurricular activities where Kontaktboken also could be installed. Three of the children had two parents connected to the application, with separate accounts. Four children had one parent connected to the application and one child did not have any guardian who used Kontaktboken.

8.2.4 Configuration of the interactive questionnaire

As one part of our research question was to investigate how children in special education can contribute to the evaluation an interactive questionnaire was used to explore this. The interactive questionnaire developed by Boström and Eriksson (2015) presented in section 6.4.4 was designed with the purpose of allowing children with intellectual disabilities to self-report on psychological health. This questionnaire was incorporated to investigate if and how the questionnaire could be adapted to be used by the target group in additional contexts, such as for evaluation. Thus, in prior to carrying out the study the interactive questionnaire was adapted to our study and filled with content.

When formulating the questions for the questionnaire we performed a literature search within the field of question answering with typically developing children in general and developmentally diverse children in particular. This resulted in a set of questions which were formulated with consideration of the findings of the literature search and was based on the same questions as those in the interview framework. This led to the formulation of the following questions:

- Pratar du med din familj om din skoldag? (Do you talk to your family about your school day?)
- Tycker du om att prata med din familj om din skoldag? (Do you like to talk to your family about your school day?)

For School 2 where an analogue contact book was used, two additional questions were added:

- Tittar din familj i din kontaktbok? (Does your family look in your contact book?)
- Tittar du i din kontaktbok tillsammans med din familj? (Do you look in your contact book together with your family?)

All of the questions were given JA, IBLAND, NEJ (Yes, Sometimes, No) as response options. After formulating the questions, all of the questions were recorded and added to the questionnaire. Thereafter suitable pictures were found and added as well.

By examining and comparing the results of interviewing the children and by letting them complete the questionnaire we wanted to get a better understanding of the possibilities of using the tool within evaluations with children in special education.

8.3 Phase 1: Before the use of TellMe

Social practice and social contexts are central within situated evaluation (Bruce et al. 2009). Therefore, the first phase served to identify the setting in which TellMe appeared. The goal was to establish the underlying social and cultural settings of the schools along with their current means of communication between the parents, teachers and the children. The results of the first phase were then used as a foundation for understanding the differences of the appropriation of TellMe in the various settings.

8.3.1 Procedure for the data collection

During the study different levels of structure were used for interviews with the various user groups. A framework of questions was created which included three sets of questions, one for each phase and three kinds of questions, one for each user group (see table 2). These questions were later rephrased according to the results of the different phases.

	Children	Teachers	Parents
Phase 1	Do you talk to your family about your school day?	Can you describe how the parents inform you about important things concerning the your child?	Can you describe how you communicate important things to the teacher?
	Do you like to talk to your family about what you have done in school?	Are you happy with how you communicate with the parents or is there anything you would like to change?	Are you happy with how you communicate with the teachers or is there anything you would like to change?
	<i>Does your family look in your contact book?*</i>	Can you describe how you inform the parents inform you about what happens in school?	Can you describe how or if you talk to your child about school?

	<i>Do you look in your contact book together with your family?*</i>	Are you happy with how you inform the parents about what happens i school? What could be better?	Are you happy with how you talk to your child about school? What could be better?
Phase 2	Can you describe how you use Dagboken?	Can you describe how you use Kontaktboken to communicate with the student's parents?	Can you describe how you use Kontaktboken to communicate with your child's teachers?
	Would you like to do something differently with the application?	Is there anything you would like to do differently with Kontaktboken when communicating with the parents?	Is there anything you would like to do differently with Kontaktboken when communicating with the teachers?
		Can you describe how you use Dagboken together with the students?	Can you describe how you use Dagboken together with your child?
		Is there anything you would like to do differently with Dagboken when using it together with the students?	Is there anything you would like to do differently with Dagboken when talking with your child about their school day?
Phase 3	Can you describe how you have used Dagboken?	Can you describe how you have used Kontaktboken to communicate with the student's parents?	Can you describe how you have used Kontaktboken to communicate with your child's teachers?
	Would you like to do something differently with the application?	Is there anything you would like to do differently with Kontaktboken when communicating with the parents?	Is there anything you would like to do differently with Kontaktboken when communicating with the teachers?

		Has anything changed in your communication with the parents during the use of TellMe?	Has anything changed in your communication with the teachers during the use of TellMe?
		Can you describe how you have used Dagboken together with the students?	Can you describe how you have used Dagboken together with your child?
		Is there anything you would like to do differently with Dagboken when using it together with the students?	Is there anything you would like to do differently with Dagboken when talking with your child about their school day?

Table 2: the questions used for the different phases in English, for the original questions see appendix 3. **Only used in School 2, as the other schools did not have a contact book*

Involving the children

The children were involved in form of informants (Druin, 2002). Thus, the children were both involved as users of TellMe as well as in interviews and as respondents of the questionnaire to inform their views of the application. During the sessions with the children the adults were also involved in various roles. The teachers often took on the role as proxies to explain certain aspects of the children's abilities and facilitators to introduce us to the children (Börjesson et al. 2015).

The process of interviewing the children differed depending on the circumstances at the schools. Due to the challenges of interviewing children the interviews with this user group were closer to the unstructured form, letting the child drive the interview. The interviewer was responsible for ensuring that all topics and questions in the framework were covered. With the first set of questions, our goal was to get familiarized with the children and to find out about how they communicate with their parents.

In addition to the interviews observations were conducted during our meetings with the children, where we observed the child alone, or with its teacher or assistant. During the observations we took on the role as the observer as a participant (Creswell, 2009). Our level of involvement varied, depending on the child's ability to speak and understand our objective, and also on how involved the teacher was. The children included in this study had a varying

level of speech, where some have little to no ability to speak. This was an important aspect to consider, making it more difficult to include these children in a fair way, as to why observations became an important tool in the collection of data. To get a thorough and deep understanding of the context and setting of where TellMe was used observations were conducted while in the field. The observations were also used to identify how the children used the application, which included observing if they required assistance from an adult and how this assistance played out.

Moreover, the interactive questionnaire was distributed to the children. It was completed independently or with assistance from a teacher or assistant depending their level of autonomy. At least one interviewer was present to give assistance and guidance on how to use the application if requested, but to avoid influencing their answering process we stayed in the background. Additionally, observations were used to study how the children interacted with the questionnaire tool. As the interactive questionnaire only registered data in form of answers to the questions we used observations to identify what struggles the children experienced. The observations were done without a specific framework, but with the interview questions for the current phase in mind. The observations were a secondary source of information, which was used to better understand the children and their inclusion in the study. In School 3, where the data collection was performed by another researcher, all children were interviewed before the questionnaire was introduced. The children listened to the questionnaires using headphones and without assistance. However, as the questionnaire had some technical difficulties at this time the interviewer still was present to solve these issues.

Interviews with teachers and assistants

The teacher and assistants were involved in the study in the role of users of TellMe. Additionally, in the interviews several of the teachers took on the role of expert as well, speaking broadly about their group of children.

Semi-structured interviews were conducted with the teachers. By using semi structured interviews, it was possible to ensure that all interesting topics was covered by all interviewees (Preece et al., 2011). The semi-structured form was chosen since the focus of the interviews was to explore the situated use of the application. With semi-structured interviews it is possible to probe the interviewee to elaborate on a question and to get as rich information as possible without losing focus on the areas of interest (Preece et al., 2011).

The first phase of interviews involved questions regarding their current communication with the parents as well as possible improvements that could be done to the communication. The interviews lasted between 2-10 minutes. At School 1 three of the interviews with the teachers and the assistants we were both present, one leading the interview and the other listening. The fourth interview was performed by one of us. At School 2 all three interviews were

performed one-on-one with one of the authors. At School 3 all of the interviews were conducted by another researcher, and both of the interviews were done individually.

Interviews with parents

The parent's participated in the study as users of TellMe. In their reply they often took on the role of proxies as well to describe certain aspects of their child. With the parents structured, written interviews were used. The parents were sent emails with three to five questions. The motivation for choosing this form of structure was time. Semi-structured face-to-face interviews are time consuming to conduct and need to be transcribed. Finding a time that worked for all parents, at three separate occasions within the six week of the test period was not deemed as feasible. To get as many answers to our questions as possible this form of interview was presumed as most suitable.

In the first phase each parent was sent a set of four questions, similar to those of the teachers, regarding the current communication and possible improvements of that communication. After a week we sent a reminder to get replies. In School 1 none of the parents answered. From the parents in School 2 we collected a total of six replies. At School 3 a total of three answers were received.

8.3.2 School 1: Results of the data collection

In the first phase we visited School 1 twice, due to one child and one student assistant being absent the first meeting. During the first meeting we installed the application on the children's tablets as well as the teacher and assistants' phones. Interviews with the children and teachers were performed during both visits.

Involving the children

Unfortunately, Child 1 was absent for both of our visits, leading to us not being able to perform the interview. Teacher A advised us that it was not necessary to come back again to interview that specific student, since the child has a low verbal ability. As the teacher had seen the questions s/he argued that s/he and the parents could answer the questions accurately for the child. Therefore, a decision was made to not include this child in the first phase.

The procedure for interviewing Child 2 and Child 4 were similar, where we sat down at a table together with Teacher A and each child. We started by introducing the questionnaire. Since this school did not use a contact book the questionnaire only consisted of two questions. Thereafter the questions were asked verbally. The questions were asked in a semi-structured manner. We were both present for the interviews, with one of us leading the interview and the other one observing. Both of us took notes.

Child 2 first said no when asked to participate, but changed the answer to yes when the teacher repeated the question. We clarified that it was completely all right for the child to

leave whenever s/he wanted to, and that we would not mind if so would happen. The child showed a low interest in the questionnaire, but appeared to be listening to the speaker voice. After each question was read the teacher had to simplify the questions, in order to make them more comprehensible for the child. Then the teacher helped the child to answer the questions. After the questionnaire was finished we asked the interview questions. The child gave short or no answers to our questions. Our perception was that the child felt insecure with us since he did not know us well, thus unwilling to speak to us. Also, we felt that we did not manage to adapt the questions to a suitable level for the child, making it more uncomfortable with answering.

With Child 3 we started the interview by socializing with the child and the child's assistant. Both of us were present the entire time, and took equal part in the conversation. The child was playing with its tablet, listening to music and singing along. The questions were first asked verbally, in the form of an informal conversation, and the answers we received were narrow due to the child's limited speech level. Subsequently the child got to answer the questionnaire. The child showed a great interest in it, and we perceived it to be easier to ask the questions through the questionnaire compared to verbally. The child could not choose an answer alternative on its own, but instead said an answer aloud after which the student assistant pressed the same answer on the tablet.

The session with Child 4 was performed under the same circumstances as with Child 2. The child seemed to understand the instructions given by the interactive questionnaire, but the teacher had to simplify the questions. In the first question the child had problems to comprehend the concept "Familj" (family), where Teacher A rephrased it to "mom and dad". However, the child still struggled with the question and answered "I forgot" and seemed uncomfortable, finding the task difficult. The teacher gave several examples, but the child wanted to skip the question and eventually pressed the arrow to move to the next question. Likewise, the next question was too tricky. Yet, the child wanted to answer *yes* and asked which response option that was on the questionnaire. With help from the teacher the child pressed the alternative. Thereafter the questions were asked verbally. The teacher rephrased the questions and asked the child "What is a school day?", but the child had difficulties with answering what it was and understanding the explanation.

Interviews with teacher and assistants

All of the interviewees expressed that most of the communication with the parents was done through daily personal encounters when the parents daily leave or pick up their child. However, Teacher A explained that the child often is present which made it difficult to talk about everything. Yet, Teacher A stated that:

” Of course it is beneficial to meet all the parent's every day, but of course it could be improved. We talk ‘Hi’ and ‘How are you?’ and about food and stuff, but the learning and doing is a bit uncommunicated. It is difficult to convey”.

Assistant B explained that s/he communicated with one of the children's parents in Arabic as the parent did not speak Swedish, and then translates to the teacher and the assistants.

Likewise, when asked about thoughts on how the communication with the parents could be improved Assistant D outlined that s/he had some difficulties in the communication with one parent since they did not speak Swedish: *“Only the problem with language, we try to tell [hir] what happens in a way that [s/he] can understand”.*

Moreover, both Teacher A and Assistant C described that it was difficult to know if the parents read and assimilate the information that is communicated. Also, Teacher A argued that s/he had bad experiences of using analogue contact books from other schools:

“It works well the first weeks, then you get fruit in it and then it disappears completely (..). It is complicated to get it to go back and forth and not get stuck somewhere. And then you only have the written word and that can be misinterpreted.”

Further, Teacher A described that the parent's had a varied interest in the children's education, but that s/he hoped that an application like TellMe could be a helpful tool in increasing the parents' involvement in the child's education. Being able to see more pictures of their child and what they are doing in real time might be more engaging compared to notes on a paper at the end of the day. Besides, Teacher A said that the parents had shown a positive attitude towards using the application.

Interviews with parents

Unfortunately, none of the parents answered our emails. Since we got to speak with the parents during the second visit to the school, we still got some information from them, even though in a very unstructured and unplanned way. We were also able to observe how the teacher and student assistants communicated with each other when the parents picked up their children from school.

8.3.3 School 2: Results of the data collection

During the first phase we visited School 2 at one occasion where we both installed TellMe on their tablets as well as interviewed three teachers and three of the children.

Involving the children

All three interviews were performed by one of us, alone with one child. For ethical reasons we had teachers within eyesight at all times. For two of the interviews we used the children's

traditional contact book as a tool to form the conversation around. We only got the opportunity to interview three out of eleven children. This was a decision made by the teachers, since they believed it was not possible to interview the remaining children. Our understanding was that the decision was based on their belief that the children would experience difficulties speaking to us, e.g. because of a lack of speech.

The first interview was with Child 8. The interview took place in a group study room, and was in the form of a casual conversation. The child told us that s/he enjoyed showing pictures and talking about games, and that s/he talked with its parents when s/he came home from school. Further, the child told us that s/he used a contact book, and that s/he usually wrote on the tablet first, and then wrote about it in the analogue contact book. After the interview session we asked if the child wanted to try the interactive questionnaire, to which we got an affirmative answer. It went well, the child focused and seemed to understand the questions, except for during question two where a teacher entered the room. This made it hard to hear the speaker voice, and it did not work to repeat the question.

The second interview was with Child 12. The child was playing by itself in a small playroom, but said yes to us joining in and asking a few questions. We used the child's contact book as a mediating tool, and asked questions about it. The child did not say much, but did say that s/he shows its contact book when coming home from school. Thereafter the child tried the interactive questionnaire, but did not listen to the questions nor seem to understand what s/he was supposed to do with it. Instead the child pressed randomly over the screen, causing the application to crash repeatedly.

The third, and last, interview was with Child 14 and took place in a kitchen area. Again a contact book was used as a mediating tool, but instead of talking about it the child read aloud from it during most part of the session. The child said that s/he writes in the contact book every day and that s/he usually shows the parent that s/he plays with math and letters. When asked if s/he shows the contact book to its parent we got the answer that it is a secret, and that it is both fun and boring to show it. When trying the interactive questionnaire, the child listened carefully and seemed to understand the questions but not the purpose of it. When the child picked an answering alternative that alternative turned green, whereupon the child said "*I picked the right one!*".

Interviews with teachers

Class A: Interview with Teacher F

The first interview was with Teacher F who is responsible for Class A. In this class both an analogue contact book and email were used, where email works as the main communication channel. They strived to write in the contact book daily, but also sent out weekly letters through email. Teacher F expressed that it can be troublesome to use different

communication paths, and that it would be easier to have only one. Teacher F exemplifies this:

“Parents change work, change email, the contact book is forgotten at home, we visit grandma, it’s forgotten there, it’s left in school, it disappears, and with a physical contact book, a book you flip through, it’s available to everyone. We don’t have any lock on it”.

Teacher F said that their current way of communicating works but that it could be improved. One problem that s/he lifted was that the analogue contact book lay open in the child’s bag where anyone could get access to the information. Further, Teacher F raised the assessment that communication can be easier in School 2 compared to other schools, since all parents have access to email and internet but also because there are no language barriers.

Class B: Interview with Teacher E

The second interview was with Teacher E, the main teacher in Class B. The main form of communication in this class was through the analogue contact book or phone calls. They also sent out weekly information letters. Teacher E said that s/he would like more direct communication, since it could be difficult to know if the parents have read the contact book or not: *“I don’t always know if they’ve read. If I have written in the contact book, they don’t always sign it. So I don’t know if the information has reached them”*. Further, Teacher E expressed that it would be good to have some sort of reading receipt.

Class B writes in the analogue contact book once a day. Teacher E emphasized the importance of daily information, but also expressed that it takes time to write: *“It takes time to sit down and write, and you need to have the books with you. But they need information everyday so that is what you have to choose from”*.

Class C: Interview with Teacher G

In Class C they use the analogue contact book for non-confidential information and email for more sensitive topics. For some subjects they use phone calls, since it can be easier to express things with a more direct communication. Teacher G did not lift any specific thing that s/he would like to change with the communication. Since the parents rarely asked follow-up questions s/he came to the conclusion that the message probably goes through. Further, Teacher G expressed that even though a bit old fashioned, the analogue contact book has a very personal feeling.

Interviews with parents

The parents listed analogue contact book, email, phone calls and spoken communication related to leaving or picking up their child at school as their main means of communication with the teachers. All parents said that they are satisfied with the current communication and

no one mentioned any specific desire to change anything. To the third question, which concerned how they speak to their child about school, most parents said that this was difficult due to their child's low ability to speak. Two parents added that the contact book helps them with communicating, since it provides information about the school day. Still, all parents except two said that they are satisfied with the way they communicate with their child. One parent said that the analogue contact book provides information about the child's day but that s/he would prefer if the child could convey it by itself and not through the words of the teachers.

8.3.4 School 3: Results of the data collection

Involving the children

Although collected by another person, the questions used in School 3 were the same as in the two other schools. The interviewer met with one child at a time, and was present but idle when they answered the questionnaire, due to technical issues.

The interview with Child 17 started with the interviewer explaining the applications. When Child 17 was asked if s/he talked to its parent's about the school day at home the child answered that s/he always answer yes if the parents ask if everything was good in school. The child further explained that s/he did not like to talk about its school day: *“Once I get home I forget what I have done during the day. (...) I have such bad memory sometimes.”*

During the interview with Child 18 the child answered yes to everything. When asked what the child and parent talk about the child answered: “How it went and stuff (...) and that it is fun with math and we make apps.”. The interviewer at School 3 conducted design workshops with the class in parallel to the evaluation study, thus during the rest of the interview the child drifted off to talking about apps.

In the interview with Child 19 all of the questions were answered with adequate responses. Yet when the child was asked if it talks to the parents about the school day the child answered: “Yes, I do. Sometimes i talk about that it is good and fun”. The interviewer then asked what they talk about whereupon the child answered:” I don't know.”

In the interview with Child 20 a teacher was present during the interview. When the interviewer asked the questions the child did not answer, but when the questions were rephrased and asked again to the child the child answered to the teacher. Child 20 enjoyed completing the questionnaire and answered the questions aloud.

The next interview was with Child 21 who answered “I don't know” to all of the questions. The interviewer then tried to ask more leading questions such as “Do you talk about what you do during class or what you do during recess? The child then answered “Yes”. Then, the child returned to answering “I don't know”. When the child completed the questionnaire the child

wanted to answer JA to one of the questions, but the questionnaire did not respond so the child pressed the arrow instead, skipping the question.

Similarly, the after coming interview with Child 22 followed the same procedure. The child answered “I don’t know” to the questions, except when more leading questions were used where the child instead answered “yes”

Child 23 answered “yes” to most of the questions, without giving more descriptive responses. Apart from when the interviewer asked what the child retells about the school day where the child responded: “*What I have worked with*”. The interviewer then asked if they talk about something else the child said “*Different stuff*”.

Interviews with teachers and assistants

In the interview Teacher P explained that they communicate with the parents through email, daily contact and phone calls. More personal information is communicated through phone calls. The parent's call if they have more urgent information to share. Teacher Q expressed similar experiences and described that: “*It is tricky sometimes, remembering what times it is okay to call. All of a sudden someone calls during class, as someone thinks it is urgent. They don't understand how disturbing it is, since we can't turn off our phones*”. Teacher P preferred to use email, but Teacher Q explained that the downside of email was that it is not direct, and it takes time before an email is read and it required that s/he leaved the class to go to the computer.

Interviews with parents

The parents listed phone calls, email and personal communication as their main ways of communicating with the teachers. Two of the parents mentioned that they would like to receive more information about their child’s day in school. Further, all three parents described that they speak with their children about school daily. One parent said that they ask questions but only receive short answers, where another said that they would like to complement the conversations with information from school since it can be difficult to retrieve answers from a developmentally diverse child. One parent said that “*with current info I would be able to guide my [child] in a different way, complement and act as a support for [hir] telling. Now I don't really know how [hir] day has been.*”.

8.3.5 Analysis and outcomes of the first phase

After completing the first phase the collected data was structured and analyzed in two iterations. First with the goal of identifying and understanding the setting of each school and then with the goal of understanding how our approach of involving the children worked and if the methods needed to be adjusted. In summary the first analysis resulted in three major changes in our approach.

First, during our interviews with the children several of them struggled with understanding the questions, requiring a lot of help from the teacher. The children who were interviewed without a teacher present also seemed to have difficulties. The difficulties were apparent both in the interviews and in the questionnaire. Consequently, the questions were altered to the next phase. The alterations were sent to Teacher A who stated that the new questions were better. Thereby, the following questions were used in the second phase of the study:

- Pratar du om vad du har gjort i skolan när du kommer hem? (Do you talk about what you have done in school when you get home?)
- Tycker du att det är kul att berätta om vad du har gjort i skolan? (Do you think it is fun to talk about what you have done in school?)
- Brukar du visa din Dagbok när du kommer hem från skolan? (Do you show your Dagbok when you come home from school?)

Second, since Child 14 said “I picked the right one!” when s/he chose an alternative and the alternative turned green the questionnaire was also altered to instead show a darker grey color when an answer is chosen. This alteration was made in order to reduce the risk of children perceiving the questionnaire as a game or quiz, with a right or wrong answer.

Third, in the first phase the questionnaire tool had some technical issues. The questionnaire did not respond properly, and it did not work in the same way that the introduction stated. Therefore, an updated version of the questionnaire was used in the following phases.

8.4 Phase 2: During the use of TellMe

The goal of the second phase was to identify in what way the different schools had appropriated TellMe and in what way the introduction of the application had affected the social practices. The results from this phase were used to examine if the idealization of TellMe agreed to their current way of working. Further, the results were used to realize how the social setting affects the realization of TellMe in the various settings.

8.4.1 Procedure for the data collection

Involving the children

In the second phase the procedure for involving the children was similar to in the previous phase, using the updated version of the questionnaire tool as well as the new questions. In most of the interviews the children's diary application was used as a mediating tool to focus the conversation around. Also in this phase observations were used as a complement to the interviews and the questionnaire.

Interviews with teachers and assistants

The questions concerned how the application has been used and if they had any opinions or comments on their usage. The interviews lasted between 5-10 minutes.

At School 1 the interviews with the teachers were done in connection to the interviews with the children. After each interview with a child, the assistant was interviewed. Both of the authors were present for all interviews. When interviewing Assistant D Child 3 was present. During the interview with Assistant B Teacher A was also present. As Teacher A knew some of the issues Assistant B experienced s /he was able to help explain these.

When we visited School 2 for the second phase they requested that we began the day with a group meeting, involving the authors of this paper and Teacher E, Teacher F and Assistant O who is the student assistant in Class C which Teacher G is in charge of. The focus of the meeting was the opinions about the applications that the parents had conveyed to the teachers. After the group meeting the teachers and the assistant were all interviewed one-on-one.

In School 3 the teachers were emailed the same questions as those used as a foundation for the semi structured interviews with the teachers at School 1 and School 2. This was done due to the limited possibilities of finding a time for conducting one on one interviews.

Interviews with parents

The parents were sent four questions two weeks after the first set of questions. A reminder was sent in connection to the third set of questions. The questions were adapted a bit from the original since they were unclear as not all children bring their tablet back and forth between school. Thus, the third and fourth questions were adapted to focus on looking at the diary from *Kontaktboken* as not all parent were users of *Dagboken*.

- Can you describe how you use *Dagboken* together with your child?
 - Was replaced by: *Do you look in your child's diary?*

- Is there anything you would like to do differently with *Dagboken* when talking with your child about their school day?
 - Was replaced with: *Is there any functionality missing in *Dagboken* or *Kontaktboken*?*

Five parents at School 2 and School 3 respectively, responded to our questions. Three of them requested a phone interview while the other two answered by email.

8.4.2 School 1: Results of the data collection

Involving the children

We performed the interviews with each child individually, this time all children participated. Both of us were present, together with the child's assigned student assistant or teacher, except for the interview with Child 1 where both Assistant B and Teacher A were present. We used each child's tablet during the interview, as a mediating tool to view the diary on and to observe the child's usage of the tablet in general and the diary application in specific.

Since Child 1 does not speak, Assistant B and Teacher A answered the questions based on what they believed the child would have answered if able. They explained that they usually use the diary application together with the child, but the assistant or teacher chooses and writes the content. Teacher A told us that if the app would twinkle, blink and change colors the child would probably be more motivated to use it. After the interview the child tried the interactive questionnaire. Both the application and the questions were too difficult to use and understand for the child, wherefore Teacher A answered all questions.

Child 2 answered our questions together with its assistant, mainly because of shyness. We asked the questions, whereupon the Assistant C rephrased it to the child, using examples and reminiscing, to which the child responded with a nod for yes or head shake for no. Thus, we learned that the child uses the diary together with its assistant and that the parents reads the entries. The child creates the content together with an assistant or teacher. The interactive questionnaire worked in a similar way, the assistant rephrased the questions, the child shook its head or nodded and the assistant clicked on the corresponding answer.

Also Child 3's speech is limited, leading Assistant D to answer the questions. In order to get more information from the child and not only the assistant we tried to focus more on observing and less on interviewing. The child showed a big interest in the tablet and writing on it but the interest in the diary was low. Child 3 spent a lot of time writing on the tablet. The assistant told us that the child usually does not write on the tablet like that, but that s/he was imitating us since we were taking notes by pen and paper and on a laptop. The assistant told us that s/he creates the content in the diary. Since the parents do not use the application on their phones, s/he sometimes shows the content to them when they drop off or pick up Child 3 from school. After the interview the child tried the questionnaire, s/he listened carefully to the questions but had some issues clicking on the answering alternative.

Child 4 told us that s/he has used the diary, and showed us some pictures from it. The child tried to enlarge the picture, but it did not work. Further, the child told us that s/he thinks it is fun to use the application. This was confirmed several times during the interview when the child repeatedly laughed out loud and said that it was fun. Additionally, we observed as Child 4 and Teacher A created a diary entry. First, the child and the teacher scrolled through the

pictures in the camera roll to find a suitable photo which was chosen by the child. Second, the child wrote a text, typing random letters: “*GHY*”. The teacher then asked if they perhaps should write something more related to the picture, but instead the child wrote more random letters. With this the teacher explained that everything that is written will appear in the parent's phone when the arrow is pressed. Third, the teacher sounded out letter that the child typed to create a sentence, writing hello to the parent. Fourth, the child continued to type random letter which the teacher read aloud to the child. Lastly, the child pressed the arrow sending the entry to the parent. When the interview was done we asked if he remembered the interactive questionnaire from our last visit, to which s/he responded that s/he hates it. We asked if s/he wanted to try it anyway, which s/he did. We observed that the child did not seem to tell the answering alternatives apart, since s/he said one answer but then clicked on another.

Interviews with the teachers and assistants

During the interview with Teacher A it was explained that every student assistant is responsible for one child, and thereby also for their child's diary. This involves taking pictures of and with the child. Assistant B and Assistant C sometimes take pictures without the child, as their children are less conscious of what the app is used for. Assistant D clarified that s/he sometimes creates entries together with the child, but in practice this means that the child is present and the assistant decides what is sent. In the interviews both Teacher A and Assistant C said that they always create entries together with the child, and the child has a say in what is sent, creating a dialogue between the teacher/assistant and the child. Further, both Teacher A and Assistant C were concerned that the children did not fully understand what they were doing. Teacher A described that it was difficult for Child 4 to comprehend that when they press the arrow it appears in the parent's phone.

Further, all of the interviewees described that *Dagboken* was used at least once every day. Assistant C clarified that the application was not used every time they work, but it was used as a way to document what has happened during the day. All of the interviewees explained that they take pictures with the camera first, then adds the pictures and writes a diary entry when they get back to the school. Assistant C claimed that it was better to take a picture with the camera first, since it lets you take more pictures, letting you choose the best one. Additionally, Assistant C described that Child 2 sometimes took pictures independently, but mostly the assistants took the pictures. However, all of the interviewees explained that none of the children have taken initiative to use the application by themselves. Assistant C explained that Child 2 needs repetition to get used to and understand the concept of the application but believes that with more time, Child 2 will understand that s/he wants to make entries as s/he likes to show their parents what s/he has done. The goal of the use of *Dagboken* differs depending on the degree of the child's abilities. On the one hand, Assistant C explains that for Child 2 the purpose is to be able to talk about the school day at home, reflecting back to school when at home, as a way to combine those two worlds. On the other hand, Assistant B

and Assistant D explained that for Child 1 and Child 3 the application is more used as a way to document and give the parents an insight in the lives of their child, as these two children have a very limited language.

Previous to the use of TellMe the teachers printed the pictures and made individual collages that they gave to the parents. Teacher A pointed out that the application made this process easier, as they can upload the images to the diary instead.

Kontaktboken was used sparingly between the parents and the teachers. Teacher A and Assistant C explained that most of the communication was informal messages and greetings. Teacher A was optimistic to the use of the messaging function, but claimed that the parents rarely replied to their messages. S/he elaborates to explain that if the application would be used permanently, s/he would nag the parents about the application until they start to use it since s/he believes it would improve the communication. Further, Teacher A said that the parents which s/he had good communication with in real life, s/he also had good contact with through the application. Teacher B explained that s/he wanted to write in language other than Swedish and English, but since we do not speak that language s/he continued to use Swedish to let us take part of the communication during the study.

Interviews with the parents

As in the first iteration, we received no answers to our questions from the parents. Nonetheless, we did get to have a short, informal and unstructured, interview with a parent to Child 1. The parent appreciated the application, especially that it gave an insight in what the child does. However, s/he explained that they do not use the messaging function that much. As Child 3's parents do not use the application, Assistant D explained that s/he showed the pictures and described what they have done when the parent leaves or pick up their child.

8.4.3 School 2: Results of the data collection

Involving the children

During the second phase we talked to three children; Child 8, Child 12 and Child 14, and observed two of the children; Child 5 and Child 11. Two of the remaining children were not feeling well so Teacher E decided to not have them participating while the rest of the children were asked but declined.

The first interview was with Child 8. The interview took place in a study room and both of us were present. One of us leading the interview, the other taking notes. Child 8 was told by Teacher G that we wanted to talk about the diary application, and then left us. We asked both if the child liked and disliked the application. When asked if it was boring to use the application the child responded that it was simple. After that the child showed us how s/he uses the diary application. As the child used the application more questions were asked about what functionality that the child would want to have and if s/he wanted to do something

differently. Thereafter the child was handed the questionnaire. Initially the child struggled with understanding the introduction and the start screen, as it starts with an example question which the child attempted to answer. The child listened patiently to the questions and chose a response before all of the options were read. However, the questionnaire did not respond so the child tried again after all of the options were read.

The second interview was with Child 12. Both of us were present and the interview took place in a kitchen area. Initially we both had a chitchat with the child about what s/he had done during the day. After talking with the child a bit we moved on to asking about the diary application and if s/he uses it. One of us asked the questions, and the other took notes. When we got no reply we started looking through the child's diary together with the child, talking about the pictures in the application. When looking through the pictures we asked the child questions of who was in the pictures and where it was taken. Thereafter the child was handed the questionnaire. Child 12 listened carefully to the questions in the questionnaire, but then skipped all of the questions by pressing the arrow.

The interview with Child 14 was done similarly to the one with Child 12. Both of us were present and we talked to the child in a kitchen area. Teacher F handed the tablet to Child 14 and told hir that we wanted to talk about it. The child showed us hir diary and how s/he creates a diary entry. When handed the questionnaire the child listened patiently to the questions and directly decides a response before the voice has read all of the alternatives. After completing the questionnaire, the child exclaimed "I did it!".

During the meetings with Child 5 and Child 11 we got to observe them creating a diary entry together with a teacher. First we observed when Child 5 created an entry together with Teacher E. Child 5 described verbally what s/he did in the picture, then by sounding out letters the Teacher E and the child worked together to formulate sentences. At this time Child 5 did not enjoy creating diary entries, but Teacher E explained that it could be due to the limited time of usage.

When we observed Assistant M with Child 11 it was apparent that the child did not like the application. Assistant M explained that Child 11 enjoyed the old way of cutting and pasting to create diary entries. Despite the lacking interest the child became excited when Assistant M scrolled through the old pictures in the child's diary. By looking at the picture the child could reflect back to the event in the picture, stating that it was funny, and by looking at the picture in Dagboken the child could retell what happened.

Interviews with the teachers and assistants

Class A: Interview with Teacher F

Teacher F described that in Class A Dagboken was used throughout the day, posting pictures directly when something is suitable to post. Further, Teacher F described that this was a great

improvement from their previous way of working when they ended the day with writing in the diary. This was illustrated in the following quote: *“It is not sure that one remembers what has been done at half past ten in the morning, but now it’s possible to post immediately when doing something”*. Teacher F further explained that Dagboken was used both from the students’ tablets as well as from a personal tablet. S/he exemplifies this by describing that they went to the movie one day, where s/he took a picture of all of the children with the personal tablet. After that s/he let the students, one by one, come and create entries from the tablet. The text to the entries were created through a dialogue between the teacher and the child, something Teacher F was very devoted to as s/he argued that s/he and the child may have very different views of what is happening in a picture. Teacher F explained that the children showed an interested in the application and that the application created a new process of creating diary entries which was appreciated by some children, but not by others. Further, Teacher F described that the students in the class sometimes used a photo editing software where it is possible to add smiles to indicate in what mood the person was when the picture was taken.

In Class A the analogue contact book was replaced entirely by TellMe for two of the five students. For the children where the parents was not as active in using the application, the physical contact book was still used. Teacher F describes that it was possible to replace the analogue book with TellMe, since the application allowed for a much better sharing of information. Further, Teacher F described that Kontaktboken was used at least by one parent for much more personal information compared to the analogue contact book they previously used. The physical contact book could be read by anyone, thus feeling less private and secure. Teacher F explained that this had improved the communication with the parents, as the delicate information is important to have.

Class B: Interview with Teacher E

Contrary to Class A, the interview with Teacher E showed that Class B used Dagboken once, at the end of the day. Teacher E described that sometime during the day, a picture was taken which is different for each child. At the end of each day, each child describes what happens in the picture and make a diary entry together with the teacher. One child wrote the text with help from the teacher, and two of the children said what they wanted to write and the teacher wrote it.

Moreover, Teacher E explained that the communication in Kontaktboken was working smoothly with the parents. However, sometimes the same information was written to all parents and since TellMe does not allow for writing to several people or scrolling, s/he had to write the text in chunks and copy it to the different parents. Teacher E argued this to be time consuming and cumbersome. As not all of the children in the class were a part of the study and the usage of TellMe the physical contact book was used in parallel to the application. However, TellMe replaced the analogue contact book for the children who used the

application. Additionally, through the use of **Kontaktboken** the communication between Teacher E and the assistants was improved. Previously s/he did not know if they had read the information that was sent to the parents through the contact book, but with the application s/he knew that they can check what information has been shared at any time.

Class C: Interview with Assistant O

In Class C, **Dagboken** was used throughout the day as in Class A. Assistant O explained that s/he or the teacher sometimes took pictures and wrote texts when they were working. How involved the children were in the creation of diary entries depended on the amount of time the adults had to help them. Assistant O described that when there was time, which happened a few times a week, they sat with the students and let them write by themselves. S/he explained that this was more time consuming, but also much more fun and more inclusive, why they tried to do it as often as possible. If there was little time but they still wanted to show the parents what they were doing, they sent the pictures without text.

Kontaktboken was used to write short and concise messages, such as reminders or similar information. Further, the application was used if they needed fast information as the parents often were faster at replying there compared to email or the analogue contact book.

Interviews with the parents

To the first questions about how they use **Kontaktboken** one parent answered that they open and read messages when they remember that the app exists. Two parents answered that they use it for general communication. They did not explain how they used it but instead said that they would like to use it as their primary contact book, and stop using the analogue book completely. All parents said that they read their child's diary, except one parent who did not answer that question. Regarding if the parents would like **Kontaktboken** to function differently the following requests and remarks were made: Possibility to see a weekly schedule and weekly food menu and possibility to search for a specific teacher.

Further, the following changes was requested for **Dagboken**: Possibility to like, print, save and share pictures, improved image display and possibility to write and upload pictures in the diary.

8.4.4 School 3: Results of the data collection

Involving the children

The same questions were asked at School 3 as the other two schools. The interviews were conducted one on one with the children, similar to the procedure in phase two. Child 20 and Child 24 was not interviewed. **Dagboken** was not brought as a mediating tool in the interviews, but with two of children the interviewer paused the interview to get the application. This was done since Child 21 and Child 22 had trouble understanding which application **Dagboken** was. The questionnaire was given to each child directly after the

interview. All of the children completed the questionnaire independently, using headphones. Child 21 was not interested in completing the questionnaire but answered all the questions without listening to the questions.

Child 17 started the interview by telling the interviewer that s/he would like to use the diary at home so it would be possible to view it together with the parents. Further, the child said that they write the most fun thing that they have done during the day in the diary, but that they do not use it daily. The child also requested a function for deleting entries.

Child 18 said that s/he thought the app was “*pretty good*”, and that it was nice to write messages. The child said that it was easy to decide what to write and gave an example of a message: “*Hi, my name is [name], I have the diary, hope you’ll like it*”. The child also made a request for personalizing the diary, where s/he wanted to be able to change the background picture.

Child 19 seemed a little unsure about how frequently they post in the diary, but said that it was almost every day. The child said that it was easy to come up with messages, and that s/he sometimes received help in doing it.

Child 21 first did not know what application the interviewer was talking about, but remembered the diary when the interviewer showed it. The interviewer asked how the child used it to which Child 21 answered that it did not know. Later, Child 21 said that they use the app in school and that it was easy to decide what to write.

Child 22 mainly answered “*yes*” or “*I don’t know*” to the questions, making it difficult to know if the child understood the questions or not. The child answered yes to the question about whether s/he would like to do something different with the app, but it was unclear what the child would like to do differently.

Child 23 said that they usually used the diary to take pictures and write about what they had done in school and that s/he sometimes received help in producing entries.

Interviews with the teachers

In the interview Teacher Q explained that Dagboken was used in the afternoon during the days when they are in their home classroom during the end of the day. Similarly, Teacher P described that the diary application was used to describe an event from the day to the parents. Further, Teacher Q described that the students that are able to write created entries independently, and the others got support from an adult. The students chose independently what to take a picture of, some took selfies, some took a picture of something they had done during the day. However, Teacher Q claimed that they had not gotten into the habit of

writing in the diary. Yet, Teacher P stated that the application teaches the children how social media works today.

Moreover, Teacher Q described that *Kontaktboken* was used more frequently, and that it was used to write short and fast questions which did not require email or more detailed information. Additionally, the parents sent information about changes in leaving or picking up the children, questions about lost things and similar. Also, Teacher Q empathized that s/he appreciated the “Mottaget” (Received) function.

Interviews with the parents

Several parents mentioned that the diary is used too infrequently, and that it has not become a natural part of the school day. Further, the parents requested that the school needs to establish it as a routine, and add more diverse information since it then would function better as an aid in talking with their children. One parent said that if the diary entries had contained more unique information, it would be a better aid in communicating with their child about its school day. Two parents said that they would like to be able to answer the child’s diary entries somehow, to show that they have read it.

One parent said that *Kontaktboken* is good for simple communication, while bigger things needs discussion and therefore still should be done through phone or email. Another parent said that s/he like *Kontaktboken* since it offers faster and more clear communication.

Further, one parent requested a possibility to use figures about how the day has been. The parent told that the child had used a similar function before and found it fun and exciting.

8.4.5 Analysis and outcomes of the second phase

As in the first phase, the findings were structured and analyzed after completing the phase. This was done in three iterations. The first iteration served to identify how the social practices had changed through the introduction of *TellMe*, in other words how it was appropriated in the different settings. The second iteration was done to find what changes needed to be made to the application in order to fit their way of working. The third iteration was done to get a better understanding how our approach of involving the children worked and if the methods needed to be adjusted. In summary the first analysis resulted in three major changes in our approach.

The findings of the second analysis led to one major change in our approach, namely the purpose of the questionnaire and the interviews. As the answers to the interviews with the children and the questionnaire generated little or no data on how the application was used or how it has affected the way they communicate with their parents, our goal with the third phase was altered to investigate the methodological differences between the interviews and the questionnaire. Thus, trying to identify how the questions should be formulated in order to

receive less confusion from the children and in turn more accurate answers. A decision was taken to keep the same questions in the questionnaire and rather focus on which struggles the children experienced in their interaction. The same questions were used as a foundation for the interviews as well, however with a renewed purpose.

8.5 Phase 3: End of use of TellMe

The third phase focused on identifying how the introduction of TellMe had change the way the parents, teachers and children communicate. Further, the goal of the third phase was to discover if the use of the application has changed over time. The results of the third phase in combination with the results of the two previous phases forms the foundation to the design recommendations of TellMe presented in chapter 9.

8.5.1 Procedure for the data collection

Involving the children

In the third phase the children were involved to explore different approaches to asking the interview questions. As in the previous phases interviews, the questionnaire and observations were used to collect data. The questions were the same as in the second phase.

Interviews with teachers and assistants

The questions concerned how and if the usage had changed during the evaluation period, as well as how their communication with the parents had changed by the use of the application. The semi structured manner made it possible to investigate certain areas more thoroughly depending on the topics that the informant had issues with, or opinions about. The interviews lasted between 3-14 minutes.

At School 1 in the third phase Teacher A, Assistant B, Assistant C and Assistant D were all interviewed individually, by one of us. At School 2, we during the third iteration had the opportunity to talk to each class' head teacher and one student assistant from Class C. Teacher E and Teacher F were interviewed one-on-one and Teacher G and Assistant O were interviewed together with one of us. At School 3 Teacher Q was interviewed during a break whilst updating the children's tablets. Due to many teachers being on sickness leave, the time was limited. Therefor the interview was shorter, and not as structured as the interviews in School 1 and School 2.

Interviews with parents

The parents were sent an email with the third set of questions two weeks after the second set of questions. The questions concerned their usage of TellMe and how their communication has transformed through the use of the application, both with their child and with the teachers and assistants. A reminder was sent after one week to gather more replies.

In this phase the questions to the parents were reverted to the original questions as the questions: *Do you look in your child's diary?* was answered with either yes or no, and did not generate any responses that deepened our understanding of how the application was used between the parent and the child. Instead we used the original questions and added an additional question: *Has anything changed in your communication with your child during the use of TellMe?*

Due to the low response rate from the parents at School 1 we asked the teacher and student assistant if they could ask the parents about their usage of the applications when they pick up their children from school. The parents' opinions were communicated through the teacher and the assistants in their interviews. At School 2 a total of seven parents answered the questions. At School 3 one of the parents were interviewed for the second phase in close connection to the third set of questions. As the questions were similar in the two phases the parent was not asked to repeat the answers but still received the questions for the third phase in case they wanted to add something. However, they did not send any additional information. Apart from that parent only one more parent answered the questions.

8.5.2 School 1: Results of the data collection

The third phase at School 1 was carried out at two separate occasions as Child 2 and Child 3 as well as Assistant D were absent.

Involving the children

As the previous encounters with Child 1 were done through the teacher and assistant without the child's attention, it was deemed that talking to this child would not yield any results that would contribute to the aim of this iteration. However, Child 1's way of using the application was communicated in the interview with Assistant B.

Child 2 was interviewed outside by a table on the playground. Assistant C, who usually is responsible for child 2, was absent. Instead Assistant D was present during the interview. The child was shy and faced the assistant throughout the interview. Child 2 answered our questions by nodding and shaking its head. By asking the same questions with both positive and negative phrasing it was possible to ensure that the child understood the questions. When answering the questionnaire, the child struggled with hearing the questions and leaned towards it to hear better. After each question the child nodded as a reply to the question. However, s/he did not know which reply was yes. The assistant asked which reply said yes but the child was uncertain. Assistant D then helped Child 2 find the right answer.

Teacher A argued that Child 3 did not understand the questions either, and requested that his responses would be communicated through the assistant. This was requested to limit their work burden, as our second meeting took place on a stressful day. As for Child 1 this was

deemed appropriate as the goal of this iteration required the children to interact with both us and the questionnaire.

During the first visit one of us interviewed Child 4 together with Teacher A. The child said that s/he finds it fun to use the diary. The interviewer asked if the child uses the diary alone to which s/he responded yes. The interviewer then proceeded with asking if the child gets help to use it, to which s/he also said yes, and then that s/he finds it hard to use. Further, the child told us that hir parents checks the diary but immediately followed up with saying that they don't. The interviewer asked if the child had seen that the parents has the application on their mobile-phones, to which s/he says yes. During the interview session the child scrolled through the diary, clicked on a photo and tried to zoom in on it to show a detail, which did not work. After the interview the child tried the questionnaire. Our aim was to let the child do it on its own this time, but this was a bit complicated by the teacher who helped the child. This could be because we had not been clear enough that it is not only the child's answers we were studying but also how the child used the questionnaire-tool. Still, the child managed to use the application much more individually than previous time. At some points the child showed insecurity about what answer to show, where the interviewer's observation was that the child probably would had solved it on its own but the teacher gave assistance instead. During one question the child seemed to know what s/he wanted to answer, but was not sure which alternative that was which.

Interviews with teachers and assistants

The interviews in the third phase showed that after close to two weeks the diary application was still used in a similar way. Teacher A explained that the application was used with three main goals: for documentation, to increase the parent's interest in their child's education and to increase the child's influence. The use of the application had decreased somewhat from the beginning of the study to the end. Assistant C explained that the goal was to take at least one picture a day, so that there always was something to take home, to create a dialogue there too.

Further, Teacher A described that Child 4 had taken a bigger role in formulating the sentences by itself. If s/he was not in a mood to write Teacher A did it, otherwise they did it together. Child 4 was active both in taking pictures and writing, and Teacher A believed that Child 4 had potential to use the application even more independently. However, s/he argued that this would require a long term use of the application as a routine and a part of their way of working.

Kontaktboken was barely used between the second and third phase. Teacher A explained that since the response from the parents in the application was low, s/he stopped trying. S/he clarified that s/he liked the application more as an idea than in practice. Both Teacher A and Assistant C pointed out that as the school is very small with a high number of adults, the limited use can be explained by the fact that they have the opportunity and time to talk to the

parents every day. Further, they both claimed that they liked the idea of the application and that they could see the potential of using it in bigger groups of children, or in a different area.

Interviews with parents

According to both Assistant B and Assistant C Kontaktboken was used by the parent's even though the messaging function was not used as the parents looked at the pictures in the diary application. Assistant B informed that Child 1's parents had shown a great appreciation of the application and Assistant C explained that although the communication has not changed that much between the parents and teachers, the diary application has increased the parent's interest in their child's education. S/he exemplified this by describing that sometimes when they took pictures of Child 2's school work, the parents asked what it is. Subsequently, Assistant C argued that home and school had come a bit closer together. Additionally, Assistant D describes that the application has been a great support for communicating with the parent of Child 3. As the parent does not speak Swedish language was a struggle in the communication previously. Assistant D explained that the pictures increased the parent's understanding of what the child has done in school.

8.5.3 School 2: Results of the data collection

Involving the children

We started the third phase at School 2 by observing Class B's diary session. The observation was conducted in a classroom by one of us. We observed as Teacher E created a diary entry with Child 7 and as Assistant I created one with Child 5. Through our observation we identified that all of the entries were created through Teacher E's tablet. The main teacher or the assistants chose a picture which was taken during the day. The child was then asked to explain what was in the picture.

After a picture was chosen the approaches differed for Child 5 and Child 7. As Child 5 was able to write and spell some words the child wrote the text, with support from Assistant I. The child needed help in spelling some words, which led to the assistant sounding out the letters for the child. After completing the sentence, the child was asked to press the arrow, and explained that the message was sent to their parent. After creating an entry on Teacher E's tablet Child 5 was handed their own tablet on which they looked in their diary. The child scrolled through all previous entries, retelling what the pictures depicts.

For Child 7 the text was written by Teacher E after being asked to explain what to write. The child had some struggle retelling what was in the picture, but with help from the teacher s/he was able to formulate a sentence. As with Child 5, the child is asked to press the arrow, with an explanation that the image would appear in the parent's phone. Thereafter the child was handed its own tablet and looked through the previous entries.

Child 5 and Child 7 were not interviewed and did not complete the questionnaire. Child 6 refrained from participating.

Both of us was present during the interview with Child 8, one of us interviewed the child and the other took notes. The interview took place in a classroom. When asking the questions both positive and negative phrasing was used to ensure that the child understood the questions. One way of doing this was to ask “Is it fun to use the diary application?” and follow with “Is it boring to use the diary application?”. As the child answered the first question with “Yes” and the second with “No” it seems likely that the child understood the question. Thereafter the child was handed the questionnaire. As in the previous iteration Child 8 listened patiently to the introduction, nodding as a response to the voice. After listening the child clicked on “JA” (yes) as a response to the example question. After the introduction the child listened carefully to the questions and directly after the question was read the child pressed “JA” before listening to the alternatives. When the child had completed the questionnaire we asked if s/he wanted to tell us something more. The child said yes and showed us that s/he wants to be able to use the Contact Book application as well to be able to send messages to hir parents. When trying to do this the child accidentally sent an empty diary entry.

The interview with Child 12 took place in a classroom, with one of us interviewing and taking notes at the same time. Two student assistants were present, but not taking part. There were also a few students there, and a few more coming during the interview session. Since there were other people present in the room, talking and chatting to each other, it was difficult to interview the child. Still, the child talked a bit more than previous interview sessions, this could be because s/he now felt more familiar with interviewer, or because we were surrounded with familiar people. The child did not answer any questions, but instead talked about other topics, like what they had done earlier that day and about pictures in the diary. The child scrolled through the diary and seemed to enjoy watching the content. After the interview the child agreed to try the questionnaire. Initially it went well, the child seemed focused and listened carefully to the questions despite everything going on in the background. After questions two this changed, and the child began pressing forwards and backwards in the app, seemingly without knowing what to do. The child’s focus dropped, and the child showed no interest to choose an answer. After a short while the interviewer decided to stop the activity and told the child that s/he had done great and thanked for its participation in the study.

The interview with Child 14 took place outside, on a bench close to a playground where there were friends and teachers playing. The child sat together with one of us, and even though it was close to the playground it was a calm environment and the child seemed very happy to talk with us. The interviewer asked if the child enjoys using the application to which s/he responded positively. The child then stopped listening to the questions and instead focused solemnly on reading the diary. To gain the child’s attention again the interviewer asked if it

was ok to turn off the tablet for a while, which the child agreed to. The interviewer proceeded to ask a few questions about how the child uses the app. The child answered yes to all questions, independent on if it was a closed or open question, or a yes or no question or not. (E.g. “Do you use the app alone?” or “Who do you use the app together with?”). After the interview we proceeded with the questionnaire. Like previous times the child listened carefully to the questions, and answered “yes” to all of them. After finishing the questionnaire, the child said “Yes, I did it!”, as in previous phase.

Interviews with teachers and assistants

Class A: Interview with Teacher F

Class A were the most frequent users of Dagboken. Teacher F described that the class took pictures throughout the day to document what they do. Later during the afternoons, the teacher sat down with each student, went through and looked at what they had done and added pictures to the application. Some of the students wrote the diary entries themselves, and other got help from the teacher or the assistants. Further, Teacher F explained that s/he asked the children who cannot write what they were doing in the picture, and then wrote the text for them. Besides, if there was not enough time the teacher sent pictures without text so that the children and parents could converse about the picture at home. Additionally, Teacher F claimed that the children enjoyed looking at their diary entries. However, sometimes the children were confused about which day is which as all of the diary entries are displayed in a long list. Teacher F argued that if the diary entries were more structured it would be possible to use the diary as a learning situation by looking at the pictures and explaining that: *“Today it is Monday, and this and that date, and after the 10th comes the 11th”*.

Furthermore, Teacher F explained that the class works a lot with feelings, which is common for children with autism. They usually use regular smileys, which are happy or sad or similar. As almost all children have tablets and their parents have smartphones, the children were used to being able to use emojis. Further Teacher F mentioned that the children were not always picked up by their parents. Sometimes they ride a taxi home, and this means that paper, homework and books always are moving and not always where they are supposed to be. Thereby, s/he explained that TellMe had potential to gather all information in one place.

Additionally, Teacher F outlined what functionality that was missing in the application. Some of the children in Class A have limited speech, and for those parents it might be fun to get an insight in the child's education by adding videos.

Moreover, Teacher F explained that for four children Dagboken was used at home as well during the weekend as these children took their tablets back and forth between home and school. This increased the teachers' insight in the children's lives, giving a more complete picture. Through the use of the application s/he could talk more easily about what the children had done during the weekend.

Hence, **Kontaktboken** was used with four out of five parents in Class A, and with those parents all communication was done through the application. Teacher F had the application installed both on a personal smartphone and on a work tablet, so it was always available. Teacher F claimed that the parents appreciate that both s/he and themselves can respond at any time. S/he exemplified this by saying that it is possible for the parents to send a message on a Tuesday at 11 PM and s/he could reply at 6.30 AM when s/he was sitting on the bus. The child that did not take their tablet home is the child whose parents did not use **Kontaktboken**. Teacher F explained that the parent of this child thought that it was a great application but s/he did not install it and was not interested in getting the tablet home, so with this child the analogue contact book was still used.

Class B: Interview with Teacher E

Teacher E stated that the usage of **Dagboken** in Class B did not change between the second and third phase. As we observed during the diary session in Class B, Teacher E the process was not described in the interview.

However, Teacher E explained that s/he wrote in **Kontaktboken** every day. Each parent got an update about the daily mode of their child, how they had eaten and similar. Further it was used to send reminders, for example about swim clothes. The application replaced the email conversations between the parents and the teacher. Teacher E reported that the analogue contact book was used in parallel to **Kontaktboken**. As not all parents were connected to the application, Teacher E had to keep track of when the child was going to which parent so that the right form of contact book was used.

Only three out of eight parents in the class were connected to and used the application. All of the student had parents who had shared custody of their child, but all children only had one parent who used the application due to technical issues such as having Windows phone or not having the latest update for iOS. Teacher E declared that one of the parents decided not to take part in the study since they appreciated the analogue contact book, and being able to flip through a book, saving and documenting the pictures.

Moreover, Teacher E continued to write a separate weekly letter which was sent to the parents through email. The weekly letter was longer than the messages that the teacher sent in the application and was more overarching concerning what has happened in school and what they have done. Teacher E claimed that the use of **TellMe** in some ways changed the communication between the teacher and the parents as it allowed for more direct responses. Contrary to the analogue contact book the parent's reply to the messages from the teacher, allowing for a two way rather than a one-way communication.

Class C: Interview with Teacher G and Assistant O

Our observation of the application log showed that the usage of the application had decreased from the second to the third phase. Thus, Teacher G and Assistant O were questioned about the reason for this reduction. Teacher G explained that during the best days the diary was used once or several times a day, but that in practice the diary was mostly used to document if they did something fun or out of the ordinary. Both Teacher G and Assistant O agreed that creating diary entries together with the child was very time consuming, why most often the entries were created by one of them. Assistant O explained that as they were not as many adults as children it was difficult to find time to support all the children in writing their own entries. The children had some knowledge of spelling, but only simple words. Teacher G stated that if the application would allow the students to work independently it would be used more frequently.

Kontaktboken was used in similar manner throughout the study, that is to send short and concise messages with reminders and simple questions. Assistant O gave an example where one of the parents asked if it was okay to bring ice cream when their child had a birthday. Yet, Assistant O declared that Class D wanted to use the application to an even larger extent and replace the analogue contact book altogether. However, as the application did not support a simple way of writing longer messages the class refrained from using the application for this type of communication. Thus, TellMe was used in parallel to the analogue contact book, and emails. Teacher G claimed that the application felt unsafe and easily accessible which prevented him from using it to write more delicate information. The application was perceived as unsafe as Kontaktboken was installed on the children's tablets which made it important to remember to sign out between each use. As Teacher G described: *“So I need to be very orderly at all time, and I am not always that.”* The uncertainty of the application in combination with not having managed to make it part of their routine yet was described as the reasons for not using TellMe as the main communication channel with the parents. Additionally, Assistant O mentioned that the lack of possibility to send the same message to multiple parents and the ability to send longer messages were the two main obstacles that prevents him from using the application every day.

Nonetheless, Assistant O stated that the application changed the communication to a certain degree as it provided more direct and faster responses from the parents compared to the analogue contact book.

Interviews with parents

One of the children had two parent's connected to TellMe and both of the parent's answered the questions. They described that they had replaced the analogue contact book altogether with TellMe. Contrary, the parent of another child had stopped using Kontaktboken to communicate with the teacher. Instead they communicated through the analogue contact book and email. This was done since the teacher read and answered emails continuously, so it

was perceived as more simple. Another parent described that the messages in *Kontaktboken* were similar to those that were written in the analogue contact book previously. Further, one parent said that more pictures were used to communicate now than previously. One of the parent' informed that the communication with the teacher increased with the use of *Kontaktboken* and another parent explained that s/he would have communicated more if the application was further developed.

Three parents stated that it would be better if all of the caregivers of a child were connected to the same conversation with the teachers in *Kontaktboken*. Further, some parents explained that they take pictures with their own phones to document what they do during the weekend and that they would like to post these pictures in the child's diary. Also, parents expressed that they would like to post pictures from weekend activities from other units than the child's tablet.

Four parents explained that they looked at the pictures together with the child and talked about what s/he had done during the day. One parent stated that they had not looked in the child's diary together with the child, but that s/he was open to doing it.

Regarding if the parents would like *Dagboken* or *Kontaktboken* to function differently, no new remarks were made apart from those in the previous responses from the second phase. Additionally, two parents answered that they had already responded and given feedback previously.

8.5.4. School 3: Results of the data collection

Involving the children

In School 3 a similar approach was used when interviewing the children as in the other schools. However, as most of the children in this school are older and have a more developed verbal language it was easier to determine if the child understood the question or not. The interviews with the children were carried out with a similar procedure as the previous phases at this school. The interviewer was alone with the children, interviewing them one by one.

The children were either handed the questionnaire before or after the interview in direct connection. Child 18 and Child 23 completed the questionnaire before the interview was conducted and Child 17, Child 20 and Child 22 completed it after the interview. Child 21 completed the questionnaire without listening to the questions and then refrained from participating in the interview. Child 19 and Child 24 was not interviewed.

Child 17 said that they use the diary to show what they have done in school, for example something exciting. Further, the child said that they use the diary when the teacher tells them to, and that s/he would like to be able to delete pictures.

Child 18 said that they use Dagboken often, but that s/he would like to use it more often to get to know it better. Child 18 requested to be able to use the diary from home in order to send diary entries to school. Further, the child wanted to record videos to show what s/he had done in school.

The interview with Child 20 started with the interviewer looking in the diary together with the child. The interviewer asked if the child would like to change anything with the application but received no answer.

Child 21 did not want to be recorded nor answer any questions.

With Child 22 Dagboken was used as a mediating tool. Due to some technical issues the interviewer was not able to login to the application. When the child was asked about Dagboken, the child was at first not clear on what application it was. After being shown the icon of the application, the child knew which one it was and was able to answer the interview questions. Similar to the interview in phase 2 the child mainly answered “yes” or “*I don't know*” to the questions.

Child 23 said that they use Dagboken every day, and that it was difficult to know what needed to be changed with the application since they had only used it for a short while.

Interviews with teachers

According to Teacher Q Dagboken was used at the end of the days, as s/he believed it was unnecessary to use it if they only had one subject. This was also reported as the reason for the low usage.

Moreover, Teacher Q explained that Kontaktboken was used more frequently than Dagboken. The introduction of TellMe decreased the number of phone calls during the day, which was appreciated by the teacher. Further, through the use of Kontaktboken s/he was able to handle the communication differently than before. S/he explained that with the use of the “Återkommer” (Get back to you) option it was possible to respond when there was time without the parent's being concerned about the lack of response. Additionally, Teacher Q stated that as the communication was in written form it was easier to access, reducing the amount of information to remember.

Interviews with parents

The parent said that they mainly wait for the teachers to start use Dagboken more frequently, and for it to become a more natural element in the child's school day.

8.6 Procedure for analysis of the collected data

As briefly mentioned in relation to each phase, the analysis was conducted in several different iterations. Our procedure for the analysis roughly followed Creswell's (2009) six steps described in section 6. The findings of each phase was first analyzed separately, then together with the findings of the after coming phase.

First, the data was organized according to each school and each iteration. The recorded interviews were transcribed, and the notes from the field and the observations were structured and re-written. The data from the questionnaire and the application logs were manually collected and sorted into tables.

Second, a considerable amount of time was spent with a thorough reading of the data to familiarize with the results and get a deeper understanding of the content. Both of the authors read all of the material.

Third, the data was coded according to the goal of the current analysis. At this stage we took notes, writing down ideas and thoughts that occurred during the reading. The coding consisted of both predetermined codes for identifying the setting and realization of TellMe as well as emerging codes for the remaining analysis. The predetermined codes consisted of the questions apparent in situated evaluation.

Fourth, the predetermined codes were used to generate a description of the setting in which TellMe appeared as well as the realization of TellMe. The emerging codes were merged together into themes. The themes were formed through an iterative process, and the final labeling of the themes for the identified changes of TellMe and the inclusion of developmentally diverse children were not finalized before a new analysis phase was started.

Fifth, the themes were interrelated and descriptions were produced. Thus, the codes were formulated to narratives describing the findings. Quotes were found and translated from the transcripts to give a richer description of the findings.

Sixth, the findings were interpreted, with the goal of identifying a higher level of detail in the data. As apps generate a lot of data that is valuable for researchers, by letting the participant use TellMe throughout the entire study it was possible for us to automatically gather data on their usage of the product. This involved photographs, diary entries and written conversations between the parents and teachers. The richness of the findings was increased, contributing to a more thorough understanding of the different schools' appropriation of TellMe. The application logged data on the communication between the parents and teachers as well as the diary entries by the children. This data was both quantitative, such as number of entries in the diary, and qualitative, such as the actual content in the diary. Examining the data

produced by TellMe allowed for a triangulation of the results by studying the actual use of the apps and comparing it with the informants' statements about their use.

To clarify, all of these steps were completed to a varying degree in all of the three phases, including a final analysis after the completion of all phases. Although this description might sound linear, it is important to underline that the process was iterative and overlapping and once a thought appeared or a suitable category was identified it was noted down.

8.6.2. Procedure for analysis of each phase

In the first phase the data was first analyzed using predetermined codes to identify the settings of the different schools. Later the same data was analyzed again to find answer our question of how to include developmentally diverse children in the evaluation.

In the second phase the data was first analyzed with predetermined codes in form of the questions from situated evaluation with the goal of finding out how the different school had appropriated TellMe, in other words the realization of TellMe. Secondly, this was then compared to the findings in the first phase to identify changes in social practice between the two phases. Thirdly, the data was revisited using emerging codes to find what changes needed to be made to TellMe. Lastly, the same data was analyzed again to find answer our question of how to include developmentally diverse children in the evaluation.

The analysis of the data from the third phase was similar to the procedure in the second phase. The data was reviewed in four separate sessions. First the data was analyzed separately to find a description of how TellMe was used in the various settings. Second, it was compared to the findings of the second phase to identify if the usage had changed over time. Thirdly, the data was revisited using emerging codes to find what changes needed to be made to TellMe. Lastly, the same data was analyzed again to find answers to our question of how to include developmentally diverse children in the evaluation.

Lastly a final analysis was performed where the data from all of the phases was reviewed one last time fitting the data in the previous themes and descriptions in order to ensure that no data was missed.

8.7 Development of design suggestions

The design suggestions were developed after completing the analysis of all three phases of the situated evaluation. The wireframes are intended to function as inspiration for how TellMe could be developed in order to fulfill the changes proposed in the final results.

Based on the result from the data collected throughout the study we defined a set of requirements. Those requirements worked as a foundation for developing design suggestions for how TellMe could be further developed.



Figure 20

The process for developing the design suggestions was iterative, where we used pen and paper in order to explore different solutions. We alternated sketching, discussion and going through the requirements in a nonlinear procedure.

8.7.1 Wireframes

When we felt satisfied with the sketches we decided to start producing more high-fidelity wireframes. Even though wireframes usually are considered to have less look-and-feel we still use the term, since we have made no changes to TellMe's existing visual design. Since our evaluation focus on functionality we made a delimitation from the visual design, but as far as it has been feasible used the existing look of TellMe. The wireframes were created in Adobe Creative Suite, using Illustrator and InDesign.

The final pictures displayed below are intended to work as a support for illustrating the final results. They are meant to function merely as suggestions, since they have not been evaluated in any way.

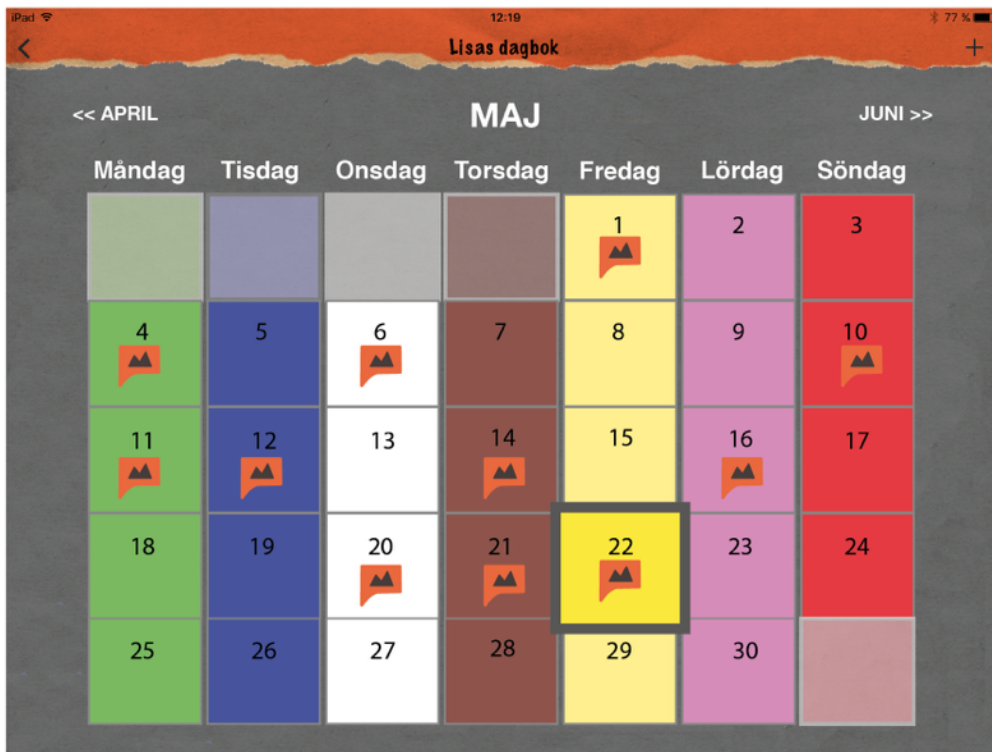


Figure 21: Dagboken

Currently, the diary entries in TellMe are presented in a never ending list. Therefore, we sketched on how to provide a better overview of the entries. This resulted in a calendar view which could be incorporated in TellMe's design, as can be seen in figure 21. The weekdays are color coded, following common practice in the Swedish special education school.



Figure 22: Dagboken

Further, by structuring all of the entries from one day it is possible to get an overview of specific days. As can be seen in figure 22 the pictures have frames following the same color coding as the weekdays in the calendar, in this case green since green is the color code for Monday.



Figure 23. Kontaktboken



Figure 24. Kontaktboken

The current version of TellMe has two menu choices in the top bar; message and the diary. As this functionality was found to be limiting an additional choice was added to the menu bar, with a calendar view of the entries. Further, the structure of the diary menu choice was altered to displaying only one day.

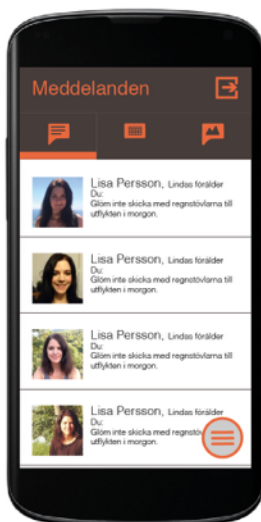


Figure 25. Kontaktboken.

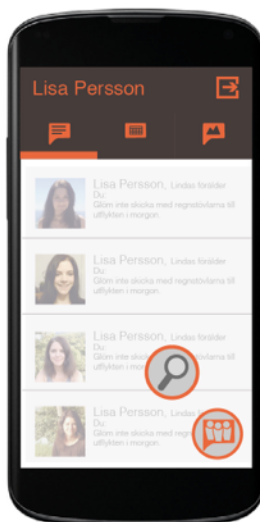


Figure 26. Kontaktboken.



Figure 27. Kontaktboken.

Additionally, another set of options was added to the page where all connected parents are listed as can be seen in figure 25 and figure 26. Thus, making it possible to send the same message to multiple recipients, and to search for specific messages. The search option would enable the users to search for a specific date, word or phrase. When choosing multiple recipients, the user would be able to create a new message, and select whom to send it to, creating a message which appears in the ordinary thread.

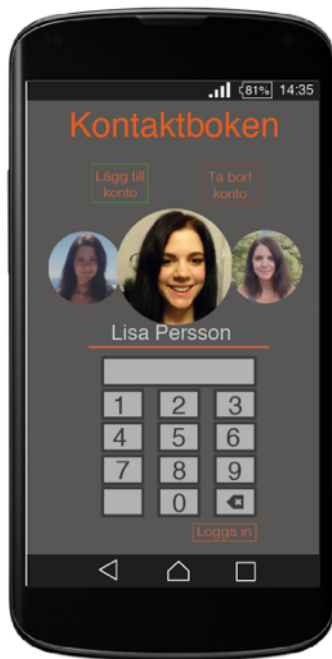


Figure 28. Kontaktboken.

Moreover, the current process for signing in and out in the application is time consuming and lacking in security. By providing a faster way to sign in, where the teachers can save their account on several tablets or phones, the time and effort spent on logging in and out would be shortened. This by making it possible to flip through the list of users, as seen in figure 28, and then use a pin code sign in.

9

FINAL RESULTS

The aim of this thesis was to explore what the socially situated design recommendations based on an evaluation of a communication tool developed for the special education context are, and in what way children in special education can contribute to this evaluation.

The study was performed through a qualitative approach, where a situated evaluation was performed at three different special education schools in the Västra Götaland region.

Through the use of interviews, observations, an interactive questionnaire and the study of the interaction logs of the application TellMe we identified the proposed changes of the design of TellMe presented in the first section of this chapter. The results of how involving the children in special education contributes to the evaluation is presented in the second section.

9.1 Design recommendations of TellMe

9.1.1 Configuration and privacy

The design should be flexible in how the users are configured

The schools that participated in the study differed significantly from each other. Their differences were apparent already in the configuration of TellMe. In School 1 each child had to be configured as a separate class as the current structure did not allow for the children in a class to have different teachers. As special education schools often involve student assistants the configuration of users has to be flexible. At School 2 both Dagboken and Kontaktboken were installed on the children's individual tablets since the school had a no-phone policy. Thereby, the assistants accessed Kontaktboken on the students' tablets. School 3 had a separate Fritids (i.e. after school activity) account which can be used by the staff for the extracurricular activities. Thus, none of the participating schools chose to configure the application in line with the idealization of TellMe.

Several of the teachers explicitly asked for a group chat function to be able to have conversations with several parents. Likewise, the parents of three of the children explicitly requested that they wanted the same conversation with the teachers instead of two separate as it is now. Contrary, some parents were pleased with having separate conversations as they have shared custody of their child.

Hence, the design must be flexible and allow for various ways of configuring the different formations of teachers, assistants, parents and students.

The design should be suitable to use on different units and be easy to access

Special education school is a diverse and varied school form. It was apparent already in School 0 that the idealization of TellMe was customized for the school that it was developed in collaboration with. The limited ability to allow children to access the application independently were not suitable for their social practice, which led them to refrain from participating. At this point there was no password protection of each child's diary, making it possible for the children to view and post in each other's diaries. Consequently, a design change was made which made it possible to lock one diary to a particular tablet. This option was later chosen by all the schools in the study.

Another aspect that was brought forward by School 2, as they installed Kontaktboken on all of the children's tablets, was the request for locking and securing the login to an even greater extent. The current login procedure is cumbersome and logging off from Kontaktboken on tablets is not convenient, causing one of the teachers to refrain from using the messaging function to send personal information. Thus, both of the components must be safe to install and use on the different units and at the same time support a fast and simple way to login and logout from the application. Therefore we suggest a new design of the login-function as can be seen in figure 29.

By being able to save their account on specific tablets and smartphones, the teacher could choose their account by scrolling through a list of users and then use a pin code to sign in. That would allow for a faster login process, since the teacher would not have to write their login name each time they sign on the phone or tablet.

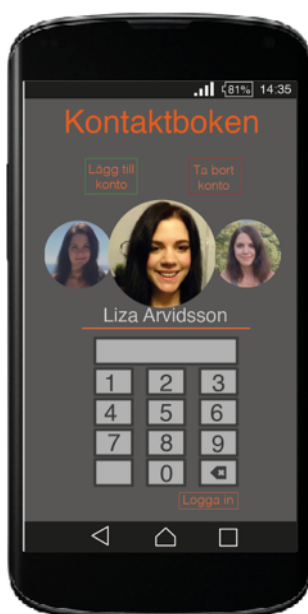


Figure 29. Kontaktboken.

It should be possible to access the application from different units

The application requires that the users have relatively new smartphones, and the diary application is only available for iOS. Some of the parents were not able to participate in the study due to not having a new enough smartphone. Even though we offered them smartphones to use during the study the issue would still remain if the application was to be used full time in the school. If TellMe was to be adapted as the main means of communication between the parents and teachers, some people would be excluded. Although most people today do have access to a smartphone it was evident in our study that not all people do. Further, one of the parent's had a Windows phone on which the application did not work. This issue could be addressed by providing a web application as it is more flexible and accessible to a larger majority of the population.

It should be possible for the parents to make entries together with their child

Some of the children created diary entries from home, using the child's school tablet. One parent used to create entries in the analogue contact book during the weekends, and was concerned over not being able to do this with TellMe. As the diary belongs to the child, the parent's should not be able to create entries through Kontaktboken, but rather have the ability to access Dagboken from home. This functionality is important as the teachers are in need of information about what the child does during the weekend to be able to talk to the child about their life. Further, this functionality is an important part of bringing school and home closer together by creating a dialogue between the two worlds. This is also a function that some of the children requested, where one child in School 3 said that they would like to be able to post diary entries from home so that the school could see them.

9.1.2 Basic functionality

Entries should be possible to delete, edit and scroll

Although the entries are sent directly to the parent's, it should be possible to edit and delete posts. This is especially true since it is very easy to send posts by mistake, as the function is very direct. One of the teachers explicitly pointed out that the children sometimes click the button too rapidly, sending the entry too soon. This was strengthened by our observation where multiple children accidentally sent empty entries when we asked how they use Dagboken. Consequently, the post must be possible to edit and delete. This can be done by simply adding a menu in Dagboken where one can edit or delete a post. Possibly with an added "Are you sure you want to post...?" step to decrease the number of empty or incomplete entries.

Pictures should be easy to view

Further, many of the informants complained at the format of the pictures as they were wrongly proportioned, having difficulties enlarging and zooming the images. These are

functionalities that people expect to find in applications. It is currently possible to enlarge the pictures in Dagboken by press and hold. However, all of the participants struggled with finding this functionality and during our observations three of the children tried to enlarge the image by double tapping it or pinching it to zoom. Only one child managed to enlarge the picture, which was a surprise to us since we ourselves had not discovered this function through our personal use of the application. Thus, the application should use standard interactions which users are familiar with and it should be made sure that the pictures are formatted accurately.

It should automatically be clear when a message has been read by the recipient

It was apparent already in the first phase that all of the teachers struggled with knowing if the parents had received their information. One of the teachers explained that s/he used a reception notice for the most important information to ensure that the parents had received the information. Although some improvements were made using Kontaktboken, with more direct and rapid responses, the teachers still struggled with knowing if the information was read. This could be solved by incorporating an automatic read notice when a message is read. With such functionality the “Återkommer” (“Get back to you later”) and “Mottaget” (“Received”) response option needs to be included in the parent's view as well to make it quick and simple to respond. The received option might be perceived as redundant as the read notice is automatic. However, people are used to respond something to a message. Thus, the received option allows the users to send a check mark as a reply.

The functionality of a read notice was also discussed for the diary component to make it possible to see if the parents have viewed their child's diary. Some of the parents commented on their child's diary entry through the messaging function in Kontaktboken, and both parents at School 2 and School 3 and children at School 3 have requested some way of answering to entries in the diary. However, as stated by Teacher Q: *“I don't think it is a good idea since it can easily turn into a competition of who has gotten a response from the parent and who hasn't.”*. Additionally, this places a demand on the parent's to be able to respond at all-time which is not possible for all parent's. More importantly, the goal of TellMe is to support the children and parents in communicating more at home about school, but with an added possibility of answering to diary entries it is possible that the increased communication is lost. Thus, it would be beneficial to include a subtle read notice in the diary as well to add clarity in if the application is used by the parent's to ensure that the application is used to support the communication with their child, not replace it.

9.1.3 Communication aids

The design should support children to use the application independently

During our interviews with the teachers at all three schools we received several request for audio support. Both for reading text in the diary, speech to text and for recording audio

messages. Further, our interviews and observations showed that the children had a high interest in reading their own diaries. When observing one child in the second iteration, the child showed a low interest in the diary application and turned off the application a few times. When the teacher opened the child's own diary the child seemed visibly happier, and started to talk about the content together with the teacher. If the application would support reading of text, the children could use the diary more independently and thereby also get more control over what is in it.

Additionally, several of our observations of children where they were creating entries together with an adult indicated that the children often needed support in what letters to press in order to create words. The adult sounded out the letters, which was then pressed by the child. An example of how this could work can be found at NE.se, where their application Stava (<https://www.ne.se/info/tjanster/junior>) lets the child create words by drag and drop letters. Each letter is sounded and once the word is completed the application reads the word out loud. By incorporating a similar function in the diary application the child might be able to create diary-entries more independently.

The design should support emojis

School 1 used Kontaktboken for informal communication. Both Teacher A and Teacher F argued that most people are used to being able to use emojis to communicate in a less formal way. As the contact book application is used by all schools for a rapid and direct communication channel it should support a less formal messaging. This is supported by our analysis of the log results where it is apparent several of the participants make smileys using symbols to compensate for the lack of emojis.

The current smiles (red, yellow and green) were not used in the way intended in the idealization of TellMe. Mostly, the smileys were used to communicate the parent's own mood or emotion rather than their child's.

When working with children in special education in general, and children with autism in particular it is common to use smileys to indicate feelings. One of the teacher's explained that they sometimes use a separate software to add smiles to the pictures. As the main goal of TellMe is to facilitate the communication between children-parents-and teachers it was deemed best to delimit the functionality to not including this in the application. However, it should be possible to add emojis in the text part, which then could be used to express emotions. This could make the pictures richer of content.

9.1.4 Media sharing

It should be possible to share media in various ways

One of the more discussed functionality was whether or not to include the possibility of recording and posting videos. Assistant C argued that it would not be beneficial to include videos as it is better for the child to practice their ability to retell events. However, both Assistant B and Teacher F stated that for some children the application is the only channel for their parent's to get an insight in their life and education, as their ability to speak and retell is limited. Thus, the goal of the usage of the application affects if it should be possible or not.

Our study showed that most of the involved teachers still wrote a separate weekly letter with a longer review of the past week's work. In Class C information was shared through the analogue contact book even after the introduction of TellMe since the application did not support longer message, due to the lacking ability to scroll in the iOS version of Kontaktboken. Further, Teacher F argued that one of the benefits of TellMe was that it had the possibility of gathering all information in one place. However, this require a simpler way of sharing larger chunks of information, such as the weekly letter.

The entries should be possible to save and share

Further, the photos and entries in the diary are currently not possible to save or share. The parent of one of the children did not participate in the study as they are very concerned with saving and documenting what the child does. As all of the schools used the diary for documentation it should be possible to save, print and export the diary entries in order to ensure that the content is not lost. This can be solved by simply adding a set of buttons in the diary with options to save, share and export.

9.1.5 Information structure

Diary entries from a specific date should be easy to identify

Teacher E explained that although the current way of displaying the diary entries in a long feed is simple for the children to interact with, it is difficult from a pedagogical perspective. S/he explained that it would be beneficial if it was possible to see what they do during certain weekdays. Teacher F had similar concerns with the current feed of entries. S/he wanted a simpler way of going back to look at previous entries, to be able to go back and for example look at what they did last week. Teacher F said that:

“I believe that the app [Dagboken] could be even better, like a regular calendar. So that it is possible to press and view every day, that would be great! That way it would be possible to make it a learning situation for the students: today it is Monday, and this and that day, and what comes after the 10th? (...). It is not as clear the way the app is now.”

All of the classes in School 2 used the application as a way to document what they do. To be able to talk about a special event, such as a field trip, it has to be convenient to go back and

find the entries from that day. School 1 also used the application for documentation. Only during our six week of study the list of entries grew large and made it hard to separate which entries were from which day: *“It would be nice to have a calendar so that you can go back to a specific day sixth month ago, without having to scroll forever.”* (Assistant O)

It should be clear what day the entries are from, and which entries are from the same day

During our group meeting with the teachers of School 2, the topic of colors of the days was brought up. In special education it is common to work with color coding of the days to make it easier to differentiate between them. Teacher F exemplified this by explaining that they refer to Tuesday as the blue day, which can be seen in one of the children’s diary.

Teacher F stated that it was difficult for the children to comprehend which day the entries were from. The children enjoy looking at their pictures, but get confused about what day the pictures are from. Further, Assistant O argued that if they are on a field trip it would be nice to be able to gather all of those pictures as one day instead of several entries.

Teacher F used the application Fotokalendern (see section 5.5) as a positive example of how colors can be used to differentiate the days. As the color coding of the days is an established way to distinguish the days in the special education context we propose a calendar function for TellMe using color coded weekdays. Further, we propose that the calendar view should be applied to both Dagboken and Kontaktboken in order to simplify the process for finding the correct diary entry, distinguish which entries are from which day and to achieve a consistent interface.



Figure 30. Dagboken.

Figure 31. Dagboken.



Figure 32. Kontaktboken.



Figure 33. Kontaktboken.

It should be possible to find messages from a specific date

A simple functionality which would improve TellMe is to add a possibility of finding messages from a specific date. One of the teachers claimed that sometimes it is good to be able to go back and find a certain message, if there has been a misunderstanding or if it is uncertain if a parent has received all necessary information at some point. It could also be that some information about time for leaving and picking up the children is given in advance, so it must be possible for the teachers to find the information in a simple manner.

This can be solved by simply adding a search function where it is possible to search for both a date and keywords.

It should be possible to send the same set of info to multiple recipients

One of the most prominent and important functions that was discussed by the teachers at School 2 and School 3 was the possibility of sending the same information to multiple recipients. Teacher E explained that the current version of Kontaktboken requires that a message is first written outside of the application, then copied and pasted to each of the parent's conversations. This is time consuming and cumbersome. Likewise, in Class C the application is not used to a larger extent due to the limited ability of sending information to multiple parents. One example of the information that they send can be found in Class C: *“Short update about the day: long walk with Class D and XX. Lunch: Rice and Carbonara sauce. Read aloud and went to the forest in the afternoon.”* This was sent to all of the children in the class. Another aspect of this is that some of the children have parents with

shared custody who have separate conversations with the parents, yet need the same information about their child. By developing a new function which allows for a faster sharing of information to all parents, TellMe has the potential to gather all communication between the parents and teachers in one application.

To resolve this issue, we propose adding a simple menu with a function for sending a message to a multiple amount of recipients. We propose that the user should be able to write a message, and chose an optional amount of recipients. The message will then be sent to each recipient individually, in other words not create a group chat. By doing so it is possible to still keep the application simple and to avoid cluttering the list of possible recipients (see figure 34 and figure 35). However, this is something that would benefit of being explored further.

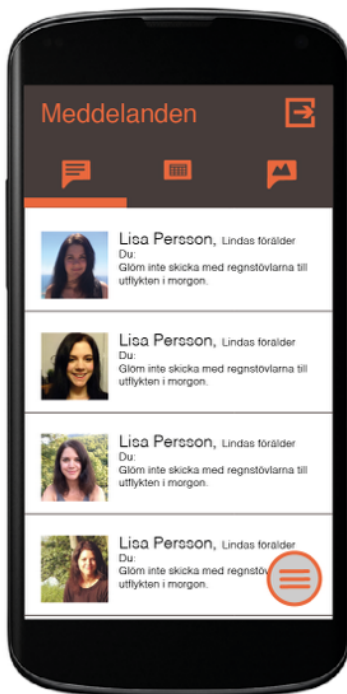


Figure 34. Kontaktboken.

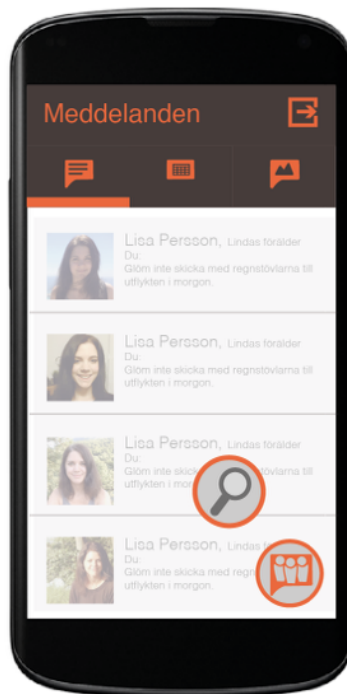


Figure 35. Kontaktboken.

9.2 Including children in special education school in evaluation

The second part of the study involved identifying how an interactive questionnaire and interviews, in combination with both direct and indirect observations, can be used within a situated evaluation approach, and how they can contribute in the inclusion of developmentally diverse children in the design process. When analyzing the data collection, we searched for topics related to the interview sessions we performed with the children, and the use of the interactive questionnaire. The results of the analysis are presented below.

9.2.1 Getting around gatekeepers

The first obstacle to overcome when involving developmentally diverse children in the design process is to get around gatekeepers. Not only is it difficult to find and get permission to conduct a study together with a school, it also requires that the parents give their consent for letting their child participate.

Our experience shows that getting a school to participate is difficult, and you have to present the benefits of the inclusion. Even though we had several contacts within the special education school context it was difficult for us to find a school that was willing to participate. It was apparent at the schools we visited that it requires an enthusiastic teacher to be allowed to conduct the study. How many parents were involved was also largely dependent on the teacher's commitment, which in turn affected how many of the children were involved.

Similarly, some of the children were not asked if they wanted to participate as their teacher deemed it not suitable for either the study or for the child. Due to the children's varied ability to speak, each interview was adapted individually for each child. In School 1 only two of the four children could speak. Thus, the teacher and assistants answered in these children's place. Yet, at School 1 we were allowed to talk to and incorporate all children in the study even though their ability to respond was limited. Child 3 who does not speak, still completed the questionnaire. At School 2 the teacher of one class took a decision to not allow two of the children to participate in being interviewed, and to only let us observe one child in the second phase and an additional one in the third phase.

9.2.2 Getting the children to participate

Once all of the gatekeepers are passed, it is still a struggle to encourage the children to participate. Although the parents have given consent for a child to take part in the study the child still has the last say. Several of the children who we had consent for refrained from participating. This could be explained with a lack of relationship with the children or a lack of motivation due to lack of preparation.

The lack of relationship was apparent with one of the children in School 1 who was shy and did not seem to be willing to talk to us in the first phase. However, with encouragement and support from the teacher the child agreed to participate. In the first phase the child did not answer our questions, but instead answered the assistant when the question was re-asked by them. In the two following phases the child was still shy, but did not hesitate to being interviewed and answered our questions to us directly by nodding or shaking its head. As our visits were frequent enough the child remembered us and felt more comfortable and at ease in the interview situation. Hence, as the relationship was improved so was our ability to encourage the child to participate and make the child feel at ease.

The lack of preparation was evident during the second phase in School 2. All of the children from who we had consent from both the parents and teachers were asked if they wanted to participate. During the second phase three of the children in School 2 and one child at School 3 declined to participate. One of the children at School 2 first said “Yes”, but as the interview would be conducted during the break the child declined. Further, before our observation with Child 5 the teacher prepared us that the child might be unwilling to participate as it was not “Diary writing time”. Therefore, when involving developmentally diverse children it is important to clearly underline when and how the children will be involved. It is then possible for the teachers to prepare the children in advance, explaining the purpose and what they will need to do.

9.2.3 Formulating interview questions

Before conducting the interview session, it is important to consider how to formulate the questions. Even though we did a literature search and formulated the questions with consideration of the guidelines on how to interview children, the questions in the questionnaire in the first phase were too difficult for the children.

During the first phase all of the children at School 1 and School 2 struggled with understanding the questions in the questionnaire. At School 1 the teacher rephrased the questions in order to make them more comprehensible to the child. The word *family* was replaced with *mom and dad* and *school day* was translated to what you have done at school. Besides, Teacher A argued that there was a too subtle difference between the two questions in the questionnaire. Likewise, the questions required the child to be aware of having a “self” which was not true for one of the children at School 1, why s/he felt that s/he and the parents could answer the questions accurately on behalf of the child. Consequently, it is important to reflect on the purpose of the interview and if the questions can be accurately answered by someone else.

For the second and third phase the questions were rephrased, which seem to have made it easier for the children to comprehend. This can be illustrated with a child in School 1. During the first phase the child struggled with understanding the questionnaire and the teacher had to help simplify each question. For the second phase we asked the child if s/he remembered the questionnaire to which we got the answer “I hate it”. The child still agreed to try it again and this time the child could finish it with much more ease. Although, since the child showed less difficulties performing the questionnaire also between phase two and three this decrease could also be because of the training in using the questionnaire that the child got between each iteration.

Although the questions were simpler in the second and third phase, several children gave conflicting answers or answered repetitively. Due to the high variability within the target group the interview questions had to be adopted during the interview. This often lead to the

use of leading questions in order to receive a response of some sort, as when open questions were used the child either did not answer or answered “*I don’t know*” or “*I forgot*”. However, in the second phase the leading questions were often answered with “*Yes*” as the questions were positively phrased. In the third phase we altered our approach to focus more on how different formulation of questions worked in the interview session. By phrasing both negative and positive formulations of the same questions it was possible to ensure whether or not the question was understood by the child. An example of this was Child 4 who said that s/he did not talk to its family about the school day. However, through the use of probing and leading questions we understood that the cause seemed to be that the child did not enjoy talking about it.

9.2.4 Conducting the interview session

No matter how much preparations and planning that is performed, everything has to be adopted in the field. All situations are unique and the mood of the child can largely influence the answers that are received. An example of this can be found in School 3 where one of the children during the second phase was in a “No thanks”- mood, which resulted in the child not wanting to listen to the questions in the questionnaire, but answered the questions without listening. In this case the interviewer helped the child and read them aloud, but the child said: “*I always press yes*”. If the child would not have been observed by the interviewer, it is possible that the results would be registered even though they are just random answers.

One of the most prominent discoveries between the different interview sessions was that it was easier to talk to the children when we had a concrete physical object to talk around. By using a mediating tool (the children’s analogue contact book in the first phase and the diary application in the two latter phases) it was easier to get more elaborate answers and maintain greater focus. For many of these children it is not enough to ask if they know about Dagboken. This was apparent at School 3 where the interviewer did not use the application as a mediating tool, but in three cases had to interrupt the interview and get the child’s tablet. Once the application was shown the children knew exactly what it was, and were able to talk about it. Further, by using a mediating tool (both the analogue contact book and Dagboken) it was easier to redirect the child's attention back to the interview when they drifted off. Thereby, with the children where a mediating tool was used it was possible to observe and converse around a certain topic of compared to the interview sessions where a mediating tool was not used. Nonetheless, providing the child with a tablet also caused them to lose focus occasionally as they wanted to talk about and show other things on it rather than the diary application.

The use of the questionnaire illustrates that by introducing a concrete object to converse around the children are more likely to stay focused. A majority of the children were more focused and interested during the use of the questionnaire compared to during the interview sessions. All of the children listened patiently to the voice as it read the questions. Even one

child who showed a lacking interest in the questionnaire looked and listened as the questions were read.

9.2.5 Technical aspects of the interactive questionnaire

While the interactive questionnaire has the potential of being used in evaluation sessions, it is important that all technical issues are rectified. In the first phase the questionnaire had some technical flaws. The questionnaire did not function as the voice in the introduction stated, which led to one of the children not being able to re-listen to a question. Further, the application crashed a few times at all of the schools.

Despite the fact that an updated version was used in the two later phases, some technical issues still remained. The children had trouble with pressing the alternatives with enough power for a result to be registered. Several of the children had to press the button multiple times, and in some cases we, an assistant or a teacher pressed the alternative on behalf of the child. One child altered its response after pressing one alternative multiple times. This may be explained by the child believing it to be wrong or not working. Additionally, several of the children at School 1 and School 2 had difficulties finding the appropriate response option. Although many of the children gave a response by either shaking their head, nodding or saying yes and no, they struggled with identifying which option was which. The alternatives were all read aloud, but it requires that the children can either read or remember which option is which. Another child exclaimed "*I picked the right one*" as a response to the option turning green when it was pressed.

Consequently, to ensure that the response the children want to answer the question with is registered it is important that the touch is responsive to light touch and that it is possible to re-listen to the response options separately.

10

REALIZATION OF TELLME

Bruce et al. (2009) proposes that in order to study the realization of the innovation both the idealization, the setting in which it appears and the usage of the innovation needs to be analyzed. This chapter aims to present the result of this analysis by answering the following questions about innovation and change:

- What do people do as they use the innovation?
- How do social practices change, in whatever direction?
- What are the various forms of use of the innovation in use?
- How should the innovation be changed and how can people interact differently with it in order to achieve educational goals?
- How does the community fit the innovation into ongoing history?

Through the study of the three settings in which TellMe has been used we have been able to examine three individual contexts of use, leading us to present three different realizations of TellMe; School 1, School 2 and School 3.

10.1 School 1

School 1 did not have a contact book in prior to the introduction of TellMe, but instead communicated through phone calls, text messages, email and direct conversation. During phase 1 Teacher A expressed hope that TellMe would increase the parent's involvement in the children's education, especially since the parents had shown a positive attitude towards using the application. The observations of the log content and the interviews performed with the teachers during the second and third phase showed that the parents involvement was continuously low. However, it also showed that they have experienced advantages by using TellMe. Especially Child 2, whose parents showed an increased interest in their child's education after the introduction of TellMe. During the interviews in the last phase Assistant C said that the parents have come closer to the school, and exemplified this by saying that sometimes when they take pictures of Child 2's school work, the parents asked questions about it.

Assistant D had a very limited communication with one parent of Child 3 in prior to the introduction of TellMe due to language difficulties. Assistant D described that although that parent did not use Kontaktboken on their phone the communication had improved since it

was possible to use the application to show the pictures in the application in connection to picking up the child. The pictures gave a better insight and support in communicating about the child's education, bridging the language barriers.

The parents to Child 2 was the only parents in School 1 who used *Kontaktboken* to communicate with the teacher and assistants. Two of the remaining parents only wrote an initial message confirming that they had installed the application, and the parents to Child 4 did not use the application at all. Most of the communication consisted of informal messages and greetings. The reasons to the low activity is somewhat unknown due to the low response rate from the interview questions asked to the parents. The collected data indicated that the cause could be linked to time constraint and the language barriers described above. Additionally, Assistant B wanted to write in Arabic, but chose to write in Swedish in order to make sure that we could analyze the data properly. This could be a reason to the low communication rate in *Kontaktboken*.

Although Teacher A was optimistic to the use of *Kontaktboken* throughout the study, the limited time of use affected the amount of time and effort spent on pursuing the parents to use the application. According to Assistant C the limited use of the application could be explained by the daily contact this school is able to have with the parents' as the number of adults per child is high, making the communication in the application superfluous.

The application was used at least once a day to document what had happened during the day. The log content showed that a large amount of the pictures was taken when they were outside or on a field trip. As *TellMe* requires internet connection to send the entries to the parents, the pictures were always taken with the camera and then added to the application retrospectively when they were back in school. It is possible that their previous practice of documenting all field trips and outdoor activities with a camera affected how *TellMe* was used. According to Teacher A the usage of *TellMe* created a quicker and smoother documentation process.

The goal of the usage of the application differed depending on the degree of the child's abilities. For Child 2 the application was used as a way to support the child's communication with its parents, enabling the child to reflect back to the school when at home and vice versa. Thereby combining the two worlds. The parents of Child 2 posted pictures from home using the child's tablet as well, both during weekdays and weekends. For Child 1 and Child 3 the goal of the application was to document and provide the parents' with an insight in the child's education, since these children have a limited ability to talk about their day. One parent to Child 1 and one parent to Child 3 expressed an appreciation of the increased insight provided by *TellMe*.

their own, as Child 1 and Child 3 who they were responsible for are less conscious of how and what the application is used for. Teacher A and Assistant C on the other hand always made sure to involve Child 4 and Child 2 in a discussion of what pictures to post and what text to write. During an interview Assistant C said *“I want [the child] to take part and understand what we are doing. Also [the child] doesn’t like it when I touch [hir] tablet”*. Thereby, lifting the importance of creating a dialogue between the teacher or assistant and the child regarding what to send to the parents. However, none of the children used the application independently. According to Assistant C with more time Child 2 may understand the purpose of the application, which in turn would encourage the child to take more initiatives in creating diary entries. Likewise, Teacher A believed that Child 4 would be capable of using the application more independently with more time and if it was incorporated as a permanent part of their routine. Already during the two weeks between the second and third phase Child 4 took a more prominent role in formulating the sentences.

10.2 School 2

School 2 consist of four classes, out of which three participated in the study. Each class has its individual head teacher, who has implemented the application in individual ways. Due to this each class will be presented respectively. All classes used a contact book previous to TellMe. How they used the analogue contact book and how regularly differed between the classes, as will be described below. All classes used phone calls and email in addition to the contact book.

Class A

Even though all the classes of School 3 used a contact book in prior to the introduction of TellMe the head teacher of Class A preferred to use email to communicate with the parents. This was due to the limited privacy of the contact book, as it was available for anyone to read. Therefore, in Class A the analogue contact book was mostly used to write information about what the child does in school. The use of TellMe allows for more private information to be exchanged between the parents and the teacher:

“At least one parent thinks it’s [Kontaktboken] good because it becomes much more private. It’s not this book that lies open in the bag that anyone can read, and s/he can write more things that s/he perhaps would not have written in the book [the analogue contact book]. It’s things that are more personal. And things that are important for me as the child’s teacher to know, which you might not write in the [analogue] contact book. I think that is really good”

During the usage of TellMe some parents decided to replace the analogue book with TellMe completely, while for the remaining parents Teacher F continued to use the analogue contact book in parallel. This was because they were less active in the use of TellMe, making it insufficient in providing information to and from the parents.

In Class A the application was used throughout the day. During an interview in phase two Teacher F said that s/he experienced an improvement with writing in Dagboken compared to writing in the analogue contact book: *“It is not sure that one remembers what has been done at half past ten in the morning, but now it’s possible to post immediately when doing something”*. Further Teacher F said that it is good that the entries can be posted from any tablet that has the application installed, making it sufficient to bring one tablet on field trips.

The entries for the diaries were mainly composed by the student in collaboration with the teacher or a student assistant. Sometimes the student created the diary entries by themselves and sometimes, due to limited time, the teacher or student assistants sent only pictures in the purpose of the parents discussing the picture with the child at home. With the children who cannot write on their own the teacher or student assistant asked the child what they were doing in the picture and wrote the text for them. During the interview with Child 14 we created a diary entry together with the child. The child chose a picture together with one of the interviewers, and then proceeded to write a text. To do so the child needed assistance by the means of the interviewer making the sound of the letter the child was going to write. Further, the child showed movie clips, and expressed disappointment over the fact that it is not possible to add movie clips in the diary entries.

The implementation of the application created a somewhat new process of creating diary entries, where the focus became on choosing or taking a picture and writing an appropriate text. The analogue contact book consisted mainly of words. Sometimes pictures were added by cutting and pasting them. During our observation with Child 11 we observed that s/he did not seem to like the application, which was explained by Assistant M to be due to that the child enjoyed the cutting and pasting.

Class B

In Class B an analogue contact book was used once at the end of every day to document both what the child does in school as well as information that the parents need. The information in the contact book was written by the teacher and in the best cases also read by the assistants to ensure that everyone was aware and informed about what information had been communicated to the parents. With the use of TellMe the communication between the teacher and the assistants improved due to the possibility of everyone involved to access the information at any time. This was explained by Teacher A who stated that:

“It is also good that all personnel can see it [Kontaktboken]. Because if I send home the contact book [the analogue contact book] it doesn’t mean that the other [teachers] has read it. Now I know that they can see it anytime. So that’s what’s new. If I send a reminder of swim training they can see it and the day after they can see that it has been done. So that’s nice, that you don’t have to call”

Contrary to Class A, Class B only used the diary application once a day. Not all of the children were a part of the study and not all of the parent's used the application which required the teacher to use the analogue contact book and TellMe in parallel. For some children both the analogue contact book and the application were used, depending on which parent the child was currently staying with. The parallel usage of the means of communication can be seen as an explanation to how TellMe is used. By directly replacing the analogue contact book where it was possible, the same social practice could be maintained which facilitated the different parallel communications.

An observation during the session when the class created diary entries illustrated how Dagboken was used. First, a picture was taken during the day by the teacher or assistants using Teacher E's tablet. Second, during the session of creating diary entries each child was presented with a picture from the day. Third, depending on the children's ability to write different levels of help was provided by the teacher or assistants. One of the children were able to write and spell simple words, but with more difficult words the teacher or assistant helped by sounding out which letter to press. The children who are not able to write were asked to explain what happened in the picture, and this was then written by the teacher. Lastly, the child was asked to press the arrow and the teacher or assistant explained that it would appear in their parent's phone.

The use of Kontaktboken replaced the previous email conversations between the teachers and the parent's. Teacher E provided the parents with an update of the daily mode of their child through Kontaktboken. Additionally, it was used to send reminders to the parent's. One parent claimed that the communication between the teacher and parent did not change that much by the introduction of TellMe. However, it did allow for a more direct communication rather than written messages read in retrospect. Additionally, in prior to TellMe Teacher E used a reception notice to ensure that the parents had received the information. Although TellMe does not provide a reception notice the parent's respond to the messages in the application more frequently which gives the teacher a confirmation that the information is read.

In prior to the use of TellMe Teacher E wrote a weekly letter with general information about what has happened in the school during the previous week. Although the email communication has decreased between the parent's and the teacher, the weekly letter was still sent by email even after the introduction of TellMe. This was done due to the limited possibilities of sending the same information to multiple receivers. Teacher E described that the limited writing space in TellMe enforced a copy-paste procedure which was time consuming and cumbersome.

Before the use of TellMe one of the parents used the analogue contact book to write entries about what the child has done during the weekend. During the use of TellMe the same parent explicitly asked for a functionality to allow parents to create entries in the diary. Thus,

the idealization of TellMe was not inline with the current practice of how this parent communicated with the teacher, causing a decreased opportunity of the teacher to get an insight in the student's life outside of school.

Another parent explained in the first phase that with more information about the child's school day it is easier to communicate, as this make it possible to use leading questions which supports the child in retelling what has happened in school. During the use of TellMe the parent's described that the pictures provided a support in their communication as it both gives the parent's a better understanding of what has happened in school as well as a concrete focal point of the conversation.

Class C

In Class C the analogue contact book was used frequently to share large amounts of information between the teachers and parents. More delicate information was communicated through email. Class C continued to use the analogue contact book throughout the study, in parallel with TellMe. The motivation behind why Class C chose to use both the analogue contact book and TellMe differed from the other two classes, where it mainly was referred to the parents' low usage of the application. The teacher and student assistant in Class C instead motivated it to be due to difficulties in writing messages and a low perception of security from the app.

The version of TellMe that they used did not support scrolling in the text bar while writing long messages, making it difficult to get an overview of the text. Assistant O explained that in order to send a message to multiple recipients they had to copy and paste the text, resulting in a larger time consumption when sending messages. This was considered by Assistant O as a reason behind why TellMe was not sufficient to use for communicating with the parents. During the interview with Teacher G in phase three she said that the application felt unsafe and too easy to access. Since all classes in School 2 had installed Kontaktboken on all children's tablets it adds a greater responsibility on the teachers and student assistants to sign out from the application, compared to when it is only installed on their personal mobile phones.

There was a change in how the application was used between the second and the third phase. Both Assistant O and Teacher G described that the process of creating diary entries together with the children was too time consuming which affected how frequently the application was used. Assistant O described that the goal was to involve the children in the creation of the diary entries, but since the children have limited writing skills all children needed help in creating the entries. The teacher or assistant sounded out the letters to help the students to write. As they only have one student assistant in Class C they did not have the possibility to spend time with each student to create multiple entries a day. In the second phase the application was sometimes used several times a day, but in the third phase the application was

only used occasionally. Teacher G described in the interview in the third phase that the application had evolved to being used as an application for documenting and communicating about “fun stuff” happening at the school, rather than about the education and learning.

The contact book was used to write short and concise messages, such as reminders or similar information that is needed fast. Assistant O said that “*I think that you get a lot more response here [in TellMe] than in the contact book [analogue]. It is a lot faster and more direct responses.*”. Although much of the old way of communicating with the parents was maintained the application changed the way they communicate as it provides more direct and faster responses to the information from the parents compared to the analogue contact book.

Several of the parents’ explained that they used the analogue contact book to communicate with their child about their school day in prior to TellMe. This was done as many of the children struggle with retelling the events of the day. Through the use of TellMe the communication between Child 9 and its parents’ was improved as the pictures supported the conversation making it easier for the child to retell events.

10.3 School 3

School 3 did not use a contact book regularly in prior to TellMe. Most of the communication was through email together with weekly letters with general information about what has happened during the past week. Phone calls were only used for more urgent or serious matters, like health concerns.

During the interviews in the second phase several of the parents said that they were disappointed that the diary application was not used to a larger degree. The same goes for the last phase where one parent said that s/he wanted the diary to become a more natural feature in the children's days: “*The problem is still regularity. I think, as I said, it would be good if this became a natural and recurring part of the school day, so it gets going.*”. Teacher Q said that they only used the application at the end of the day and only during the days where they had their final activity in the classroom. Similarly to the parents, the children commented on the low frequency of use during the interviews in the last phase. One child said that it was hard to know what should be changed with the application since they have not used it for long, while another child said that they wanted to use it more often. Since the children in this school are slightly older than the children in School 1 and School 2 they were able to create diary entries by themselves to a greater extent. The students who could not write entries on their own received help from the teachers.

Kontaktboken was used more frequent compared to Dagboken at this school. It was used to write short and fast questions, time for picking up and leaving children, questions about lost things and similar.

11

DISCUSSION

11.1 Discussion of the process

When this project was initiated the goal of the study was broad and the outcomes uncertain. Our initial plan was to put a larger emphasis on the use and results of the interactive questionnaire in order to do a comparative study on the use of situated evaluation versus the questionnaire. However, as the project evolved we came to focus more on the situated evaluation. Especially due to the low number of questions being possible to include in the questionnaire and the possible richness of the data collected through the two methods combined. The change of direction caused us to re-frame our research aim, leading to a more focused approach.

Considering that the first school we had contact with dropped out, the time frame of the study was affected. As the process only lasted for four weeks the participants did not have enough time to adapt to the new routine and the new tool. The limited time frame of the study might therefore have affected the results.

Another setback of our study was the limited access and engagement from the parents. Only a small number of the parents that used the application answered our questions. This was true for all three schools. In School 1 the attempts of getting replies directly from the parents was abandoned already after the first phase as several of them expressed that it was tedious. We offered all of the parents at all schools to answer the questions through telephone instead. However, at both School 1 and School 2 this did not have an effect. In School 3 two parents preferred a telephone interview generating a few more replies. Further, it is possible that our formulation of the questions to the parents should have differed more between the second and third phase, as two of the parents replied saying they had already answered the questions even though their replies were from the second phase. If more parents would have participated in the study the results may have been different.

Nonetheless, the involvement of three distinct schools and the use of several different data gathering methods resulted in a rich insight in the various adaptations of TellMe which in turn generated a thorough evaluation of the application in three very diverse settings.

11.2 Discussion of the results

11.2.1 Design recommendations of TellMe

Our proposed changes of TellMe increases the complexity of the application. Adding functionality to an application is not always beneficial. One of the major advantages of TellMe found through our study was the simplicity of the application and the limited functionality which lead to most of the participants being able to use it directly without support or manual. Thus, leading to a discussion of what the goal of the application is. We propose adding a calendar for a better overview of the diary entries as the current endless scrolling does not support using the application as documentation, which all of the schools did.

Consequently, Fotokalendern was used as inspiration as it was argued to be a good example of documenting photos. Yet, Fotokalendern is solely a calendar application which do support children in communicating, but it does not support nor facilitate the communication between parents and teachers. Additionally, TellMe is similar to the prototype MyCalendar but differs in the design (Abdullah & Brereton, 2015). As TellMe is composed of both a diary application for the children and a contact book application for the parents and teachers, also children whose parents are less engaged can benefit in using the application. Further, by combining Dagboken and Kontaktboken less demand is placed on requiring the children to bring the tablet between home and school. As our study showed that there was a high variability in if the tablet was brought back and forth or not, it is important that the application supports use from different units. By adding functionality for the parents to access Dagboken to create entries from home, the contribution of TellMe would be even more prominent.

The current functionality of TellMe was limiting to most of the children in the study. Our observations of the creation of diary entries in combination with the interviews with the teachers revealed that some of the children have the potential to use the application more independently but that the lack of support prevents them of fully using it. Thus, TellMe does not fulfill its potential. By adding increased support in line with the current way of working in special education schools, the possibility of the application being adapted by the target group is increased.

11.2.2 Including children in special education school in evaluation

The high variability within the target group made it difficult to find a suitable level of the questions along with figuring out how to best pose the questions to the children. Alper et al (2012) argues that developmentally diverse children that are the same age and gender, with equal disability and from the same socioeconomic background still could need opposite design solutions, making it complex to prepare the interview sessions. This was found true in our study as children in the same class had very varied abilities to comprehend and answer our

questions. Hence, it is important to be flexible in the use of methods, adapting to the particular circumstances of the situation. In our case this could have been improved by being more adaptive in our approach, using different methods for eliciting responses from the children. With more experience of interviewing children in general, and developmentally diverse children in particular it is possible that we would have obtained a better response rate.

We decided to use short and concise questions in line with the recommendation of Bell (2007). However, the questions we used for the questionnaire were polar which should be avoided according to both Lewis (2004b) as well as Read and MacFarlane (2006). Children have a strong acquiescence response bias, meaning that they tend to answer 'yes' to questions with yes and no as answering alternatives, no matter if that is what they think or not. This decision was made due to the format of the questionnaire and the limited responses when other question forms were used. In the interviews the children often answered the questions with yes, no matter what question was asked. On the topic of children answering yes Frauenberger et al. (2012a) argue that this tendency can be explained by the children's wish to please and trying to satisfy the adult. Additionally, both Bell (2007) and Lewis (2004b) claim that children often assume that adults know the answer to the questions they ask, thus wanting to please them by giving the right answer. Therefore, it is important to avoid suggestive questions as they can influence the child's desire to please, give in or impress. However, when more open questions were used the children either did not respond at all, answered "*I don't know*" or "*I forgot*" or with something out of context. Milne and Bull (2001) argue that these answers can be explained by the children's insecurity and lack of confidence. Bell (2007) further notes that the children may have learned that not answering or answering that one does not know is an easy way to avoid answering, instead of properly trying to understand the question by asking for a clarification. Thus, leading questions were used to explore the children's answers. As our goal was changed between the second and third phase we managed to rephrase most of the questions to involve both positive and negative phrasing to discover if the children understood the questions. However, it is possible that a different formulation of the questions would have yielded a different result.

11.3 Discussion of ethical aspects of the study

The inclusion of developmentally diverse children in the design process requires several ethical considerations and decisions to be made. One of the decisions is how much to encourage and persuade the children to take part in a study. Several of the children first said no to participating, but were then convinced by the teacher or assistant to take part. Markopoulos et al (2008) argue that the children should always have the last say in whether or not to participate. Yet, some children do need encouragement and persuasion to feel confident enough to take part. Consequently, it is important to weigh the risk of getting the child to do something to please the adults against the risk of leaving children out simply because they say no as a response to not fully understanding what is required from them.

Additionally, as stated by Frauenberger et al. (2011), the consideration of beneficence and non-maleficence is an important ethical aspect of this study. Several of the children were not able to participate in the study due to not being able to communicate verbally or understanding the questions in the questionnaire. Some of the children that did participate may have experienced the involvement as challenging, which can be exemplified by the one child who claimed to hate the questionnaire after having apparent struggles with it in the first phase. In one of the schools the teachers did not let us interview or involve some of the children. It is possible that a clearer description of the purpose and value on our behalf would have affected the teachers' judgment. Nonetheless, it is also possible that the teachers made a qualified assessment considering the value of inclusion versus the psychological risk of inclusion on behalf of the children. With observational methods it was possible to involve a larger number of children, which provided a rich understanding of the situation of use. From an evaluation perspective the use of observation methods was more rewarding both for us and the children compared to the use of the questionnaire or interviews, placing a lower demand on the children's ability to communicate.

Another ethical aspect is in line with Preece et al. (2011) argumentation that involving indirect observations as a method for data gathering can be problematic from an ethical standpoint. Although all communication was directed through secure servers application logs gathered through the participants use of TellMe was analyzed, allowing us to take part of all the communication between everyone in the study. Even though it was stated in the consent form that all of the communication was open for us to read it was not verified that everyone involved were aware of it. In School 1 the participants took for granted and even adopted their communication in order for us to take part of it but in School 2 this was less pronounced.

11.4 Discussion of the reliability and validity of the study

As a major part of the work was based on our subjective judgments, involving a vulnerable user group, this section provides a thorough discussion about validity and reliability both regarding the practical approach of involvement as well as our analysis of the findings.

11.4.1 Validity

Frauenberger et al. (2012b) argue that when performing evaluation in the field it is more difficult to establish the validity compared to a study performed in controlled settings. Further, our study aimed to find various social practices, by studying vast settings to obtain a rich and thorough understanding of individuals, rather than trying to aggregate the experience into a generative description of a population. Thus, as our process involved several iterations and multiple encounters with the informants it was possible to give them the opportunity of confirming or correcting our understanding of their responses. By grounding our findings in the performed field work it was possible to create a thorough understanding of the setting and a solid ground for our descriptions (Creswell, 2009). Consequently, conducting the study in a

natural setting, in the user's everyday life increases the ecological validity as the findings are applicable in a real world context (Markopoulos et al., 2008).

By analyzing the results from the interviews and comparing it with the logs from TellMe as well as the field notes from the observations, it was possible to triangulate the results and thereby verify if the application was used in the same way as it is described by the informants (Creswell, 2009).

As a situated evaluation is concerned with understanding various social settings and practices it is important to consider the relationship between us and the participants, as it may affect our understanding of the situation (Bruce et al., 2009). Thus, our goal has been to maintain a neutral, yet open, relationship and a reflexive attitude towards the findings to minimize the bias. However, it is possible that our values and our background has affected our interpretation and focus of the findings.

11.4.2 Reliability

Reliability is often defined as how possible it is to obtain a similar result if using the same methods. Nonetheless, qualitative approaches and design research is subjective and complex by nature. All individuals and the social context shape the findings, and as time elapses the possibility of retrieving a similar result decreases (Denscombe, 2009). In qualitative research reliability can instead be obtained by giving a thorough description of the procedures and decisions made throughout the study. Thereby making it possible for others to determine if these choices are reasonable (ibid.). Therefore, we have provided a detailed description of our methods used, the process as well as our analysis and results, to facilitate an examination of the research process (ibid.).

Several procedures for increasing the reliability of the study was performed according to the guidelines suggested by Gibbs 2007 (ref. in Creswell, 2009). A description of the different codes was written during the coding of data. The themes were provided with keywords and topics which should be presented in relation to each theme. Further, the codes were examined and read through by both of the authors and conflicting opinions were discussed as they arose.

Additionally, our formulation of the questions for the children affect the reliability of the answers given by the children. Language effects, satisficing, suggestibility and specific question formats were all evident in our study (Read & MacFarlane, 2006). As the response options of the questionnaire were yes, sometimes and no the risk of the children not answering reliably was increased. Vague and ambiguous words such as “sometimes” are argued to be problematic by Read and MacFarlane (2006), affecting the reliability. Borgers et al. (2000) argue that the ability of the child involved in answering a question affects the reliability as the issues of satisficing increases when children do not understand a question. Due to our questions in the first phase being too difficult for the children to comprehend, their answers

were not perceived to be reliable. However, Read and MacFarlane (2006) claim that the risk of satisficing is decreased by keeping the questionnaire short which we have applied through our study. Nonetheless, as the answers in itself were not the used to draw conclusions on the usage of TellMe or their communication with their parents the reliability of the responses is not considered to have any significant effect on the overall reliability of the study.

11.5 Generalizability

This study was conducted at three distinct Swedish special education schools in the Västra Götaland region. Our aim was to establish what socially situated design recommendations that are apparent for communication tools in the special education context in general, not only in these specific schools and only of TellMe. The proposed changes of TellMe in combination with the realization of TellMe present what functionality is necessary to include in an application which supports communication in special education, as well as what factors and social practices that need to be considered.

Additionally, the aim was to establish how children in special education can contribute to the evaluation. These results are valid in other situations where children are involved in the design process in general, and evaluation specifically. The findings are not depending on this particular situation, thus being generalizable between settings.

Moreover, our findings through the use of the questionnaire tool are generally valid for both performing questionnaire studies with children in special education as well as for what design considerations that are important to consider when creating this kind of application. Further, the findings are not solely adapted to the type of evaluation conducted in this study.

11.6 Future work

As our proposed changes affect the complexity of the application, we leave it to future research to evaluate these changes to discover how and if to implement them. The design recommendations presented in this thesis are merely recommendations, thus the focus of our study was not to produce flawless design solutions. Additionally, the technical aspects of our design recommendations are for future work. This involves deciding and figuring out how to implement these design recommendations.

Additionally, the interactive questionnaire used in this thesis need to be evaluated with a greater focus on the functionality specifically. Our study showed that the application has potential to be used in evaluation with children in special education. Yet, some technical issues need to be resolved. Thereafter, we see a possibility of using it for an evaluation study were the tool itself is evaluated. Thereby, it would be possible to establish requirements for how to configure and use the questionnaire and how and if it is possible to use it in various areas for children in special education.

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CONCLUSION

The objective of this thesis was to explore the socially situated design recommendations of a communication tool for the special education context. This was achieved through a situated evaluation of the application TellMe, performed in three distinct special education schools in the Västra Götaland region. Further, the thesis aimed to explore how children in special education school can contribute in such an evaluation.

Although the study only involved three schools, the variation between them was high. The variations were found not only in how the classes were composed, but also in their social practice, their resources and the challenges they faced. The evaluation of TellMe demonstrates that this high variability is important to acknowledge, both in terms of how schools, classes and the people are configured as well as in what units it is available for.

The evaluation shows that TellMe has the potential to enhance the communication between children-parents-teachers. Yet, several factors should be taken into considerations in order for the potential to be met. These factors include how to support information to be shared from home to school and the importance of valuing the varying abilities and preferences of this user group. Further, it is of importance that the diary entries are accessible to overview and that they are displayed in a way that is pedagogical to the child.

Further, the aim of this thesis was to explore how children in special education can contribute to evaluation. This involves both getting past the gatekeepers, in this case the teachers, as well as encouraging the children to participate in the study. Consequently, it is important not only to consider how the children can contribute to the evaluation, but also how the children can be involved and how to make the involvement meaningful for both the children themselves and the outcome of the study. Additionally, the high variability within the target group makes it increasingly important to be flexible and adapt to the situation at hand. This includes careful consideration of the formulation of questions as well as how to convey them to the children in a way that is comprehensible.

Consequently, the evaluation of TellMe shows that the setting of use is essential for understanding how technology is appropriated in real world contexts. By following the design recommendations proposed in this thesis, TellMe has the potential to bridge the gap between home and school by adapting to the circumstances that characterize special education schools.

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APPENDIX

Appendix 1: Consent form, parents.

Touch AT! – Test av applikationen TellMe

Till förälder till elev på XXX,

Göteborg 21 mars, 2016

Du får detta brev som en förfrågan om du och ditt barn önskar delta som testare av applikationen TellMe i forskningsprojektet Touch AT! (<http://touch-at.se/>) i samarbete med fyra forskare inom interaktionsdesign från institutionen för Tillämpad IT vid Chalmers tekniska högskola och Göteborgs Universitet. Som en del av sitt examensarbete på master-programmet Interaction Design & Technologies kommer studenterna Liza Arvidsson och Linda Persson utvärdera applikationen.

Vi ber nu om er hjälp med att testa projektets första applikation som heter TellMe, som består av Kontaktboken och Dagboken. Genom Kontaktboken kan ni föräldrar ha direktkontakt med barnets lärare via er telefon. Barnet kan inte se denna kommunikation, men barnet kommer via applikationen Dagboken på skolans surfplatta kunna ta bilder och skriva meddelanden så att ni kan följa med i barnets skoldag via Kontaktboken i er telefon.

För att delta i testet krävs det att applikationen installeras på din telefon, antingen iPhone4 (eller senare), eller Android 4.1 (eller senare). Om du inte har en tillgång till en sådan telefon kan du kontakta oss för att diskutera en lösning. Det krävs även att du godkänner att ditt barn skickar bilder och meddelanden till dig under dagen. All analys av data kommer att ske anonymiserat.

Den information som kommer att sparas och som kommer att ses av forskarna är:

- Kommunikation mellan lärare och förälder via Kontaktboken
- Kommunikation från elev i Dagboken till förälder i Kontaktboken.

All information sparas på en säker server och kommunikationen sker genom säkra anslutningar.

Under testperioden vårterminen 2016 kommer vi att kontakta er tre gånger på e-mail och ställa fem korta frågor omkring användandet av Kontaktboken. Vi kommer även att ställa liknande frågor till barnen vid tre tillfällen i skolan under testperiodens gång.

Lite om projektet:

Ämnet interaktionsdesign handlar om samspelet mellan människa och teknik och syftet med detta forskningsprojekt är att studera hur informationsteknologi kan användas för att stödja barn med kognitiva funktionshinder. Fokus kommer att ligga på social och emotionell träning snarare än inlärning av färdigheter, med hjälp av olika pekskrämsbaserade gränssnitt som t.ex. surfplattor. En viktig del i projektet är att vi vill undersöka hur barnen själva, och personer i deras närhet kan delta i, och bidra till designprocessen. Denna process innehåller flera iterationer av allt från kravspecifikation, idégenerering, design, implementation, testning och evaluering. Genom att ta med barnen och er i designprocessen, hoppas vi utveckla appar som det finns ett behov av, samt att dessa är bättre anpassade för att användas av både barnen och er.

Den information och de observationer som samlas in från barnen och er föräldrar kommer att vara anonym och förutom projektteamet så kommer ingen annan känna till skolans eller barnens namn, och denna information kommer aldrig att uppges i rapporter eller artiklar som skrivs om projektet, utan resultaten presenteras alltid anonymiserat.

För att kunna ta del av skolans och ditt barns aktiviteter behöver vi ert medgivande. Detta medgivande gäller under vårterminen 2016. Om det under tiden uppstår behov för att ändra på planerade aktiviteter, metoder eller dokumentationsformer kommer vi att kontakta er med en särskild medgivandeblankett för detta tillfälle.

Hantering av data och sekretess

Alla svar och alla resultat kommer att behandlas så att inte obehöriga kan ta del av dem. Endast personuppgifter som är relevanta för forskningsprocessen och forskningsfrågan samlas in. Ingen enskild medverkande kommer att kunna identifieras i de slutliga rapporterna. I aktiviteter med barnen där processen dokumenteras med foton, ljud eller video, kommer barnens ansikten inte att vara synliga. E-mail kommer endast att användas för att skicka lösenord och instruktioner till er, och att skicka ut enkät tre gånger under studiens gång.

Frivillighet

Att delta är helt frivilligt. Även om ni tackar ja till att delta nu, så kan du som förälder eller du som elev när som helst avbryta deltagandet utan motivering. Om ni tackar nej till att delta så kommer det inte att påverka elevens skolgång.

Kontakta ansvariga

Om ni har frågor eller funderingar kring projektet så kontakta gärna någon av oss:



Liza Arvidsson

0738-084743

lizaa@student.chalmers.se



Linda Persson

0706-670400

pelinda@student.chalmers.se

Handledare: Eva Eriksson, tel 0704-989909 email: eva.eriksson@ait.gu.se

Projektledare: Olof Torgersson, tel: 0730-795831, email: olof.torgersson@ait.gu.se

Medgivande

Jag ger härmed samtycke till att jag och mitt barn deltar i projektet Touch AT med applikationen TellMe

Underskrift

.....

Namnförtydligande

.....

Email:

.....

Datum

Mitt barns namn

.....

Appendix 2: Consent form, teachers.



Samtyckesblankett

Jag har blivit informerad om studiens syfte. Jag har även fått information om att mitt deltagande i studien är frivilligt och att jag när som helst kan avbryta min medverkan utan att uppge någon orsak eller att det leder till några negativa konsekvenser. Den information som framkommer under intervjun kommer att presenteras på ett sätt som förhindrar identifiering av min person. Intervjun kommer att transkriberas till text där mitt namn är ersatt med kodnamn. Jag är medveten om att de uppgifter jag lämnar endast kommer att användas till denna masteruppsats men att slutversionen av denna är offentlig.

Härmed samtycker jag till att bli intervjuad och att intervjun spelas in.

Underskrift informant

Underskrift student

Ort och datum

Ort och datum

Appendix 3: Questions

Fas 1.	Föräldrar	Lärare	Barn
	Kan du beskriva hur du vanligtvis kommunicerar med lärarna om saker som är viktiga att veta?	Kan du beskriva hur föräldrarna informerar dig om viktiga saker som rör barnet?	Pratar du med din familj om din skoldag?
	Är du nöjd med hur du kommunicerar med lärarna eller skulle du vilja ändra något?	Är du nöjd med hur du kommunicerar med föräldrarna eller skulle du vilja ändra någonting?	Tycker du om att prata med din familj om din skoldag? / Vad tycker du om att prata med din familj om din skoldag?
	Kan du beskriva hur eller om du pratar med ditt barn om skolan?	Kan du beskriva hur du informerar föräldrarna om vad som händer i skolan?	Tittar din familj i din kontaktbok?
	Är du nöjd med hur du pratar med ditt barn om skolan? Vad skulle kunna bli bättre?	Är du nöjd med hur du informerar föräldrarna om vad som händer i skolan? Vad skulle kunna bli bättre?	Tittar du i din kontaktbok tillsammans med din familj?

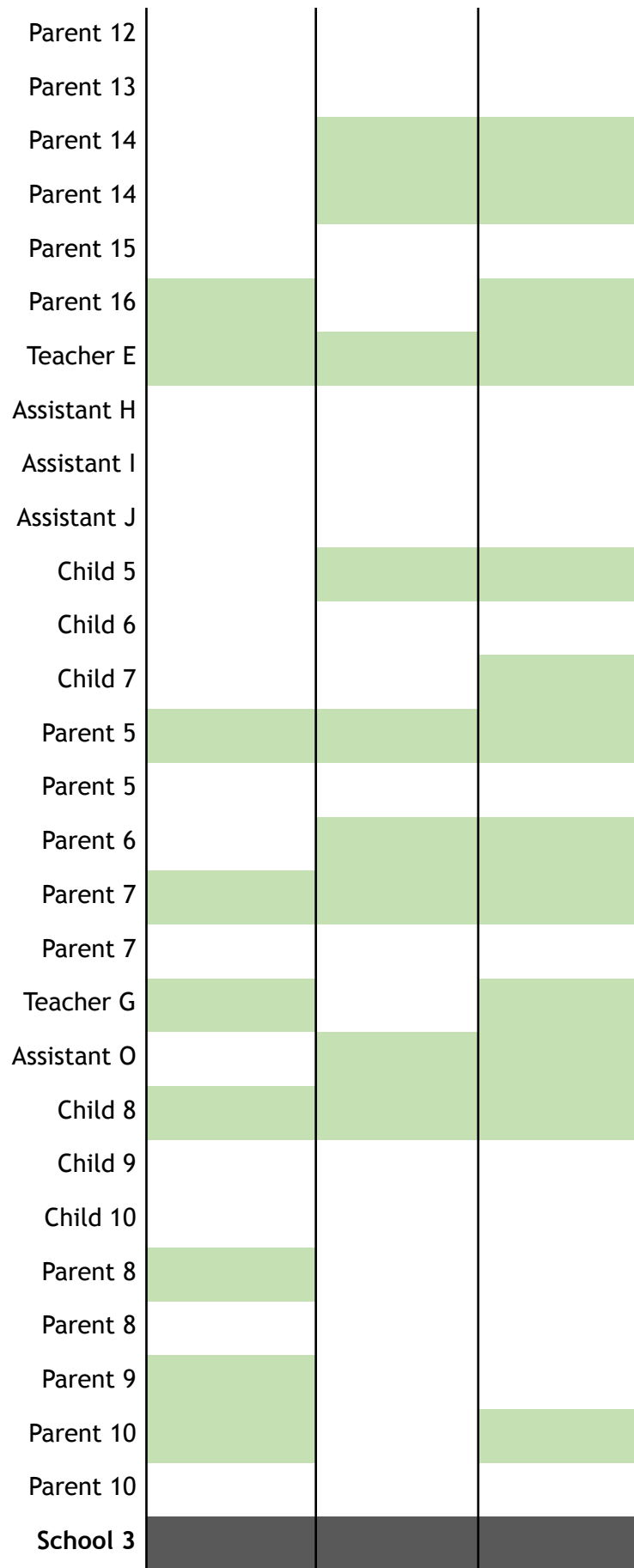
Fas 2.	Kan du beskriva hur du använder kontaktboken till att kommunicera med ditt barns lärare?	Kan du beskriva hur du använder kontaktboken för att kommunicera med elevernas föräldrar?	Kan du berätta hur du har använt dagboken?
	Är det något du skulle vilja göra annorlunda med kontaktboken när du kommunicerar med lärarna?	Är det något du skulle vilja göra annorlunda med kontaktboken när du kommunicerar med föräldrarna?	Skulle du vilja kunna göra något annat med appen?
	Kan du beskriva hur du använder dagboksappen tillsammans med ditt barn?	Kan du beskriva hur du använder dagboksappen tillsammans med eleverna?	

	Är det något du skulle vilja göra annorlunda med dagboksappen när du pratar med ditt barn om deras skoldag?	Är det något du skulle vilja göra annorlunda med dagboksappen när du använder den tillsammans med eleverna?	
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Fas 3.	Kan du beskriva hur du har använt Kontaktboken för att kommunicera med ditt barns lärare? Är det något du skulle vilja göra annorlunda med kontaktboken när du kommunicerar med lärarna?	Kan du beskriva hur du använt kontaktboken för att kommunicera med elevernas föräldrar? Är det något du skulle vilja göra annorlunda med kontaktboken när du kommunicerar med föräldrarna?	Kan du berätta hur du har använt dagboken?
	Har något förändrats i din kommunikation med lärarna under den senaste månaden?	Har något förändrats i din kommunikation med föräldrarna under den senaste månaden?	Skulle du vilja kunna göra något annat med appen?
	Kan du beskriva hur du använder dagboksappen tillsammans med ditt barn?	Kan du beskriva hur du använder dagboksappen tillsammans med eleverna?	
	Är det något du skulle vilja göra annorlunda med dagboksappen när du pratar med ditt barn om deras skoldag?	Är det något du skulle vilja göra annorlunda med dagboksappen när du använder den tillsammans med eleverna?	

Appendix 4: Table of informants

	Phase 1	Phase 2	Phase 3
School 1			
Teacher A	Green	Green	Green
Assistant B	Green	Green	Green
Assistant C	Green	Green	Green
Assistant D	Green	Green	Green
Child 1	White	Green	White
Child 2	Green	Green	Green
Child 3	Green	Green	White
Child 4	Green	Green	Green
Parent 1	White	White	White
Parent 2	White	White	White
Parent 2	White	White	White
Parent 3	White	White	White
Parent 4	White	White	White
School 2			
Teacher F	Green	Green	Green
Assistant K	White	White	White
Assistant L	White	White	White
Assistant M	White	White	White
Assistant N	White	White	White
Child 11	White	Green	White
Child 12	Green	Green	Green
Child 14	Green	Green	Green
Child 15	White	White	White
Child 16	White	White	White
Parent 11	White	White	White



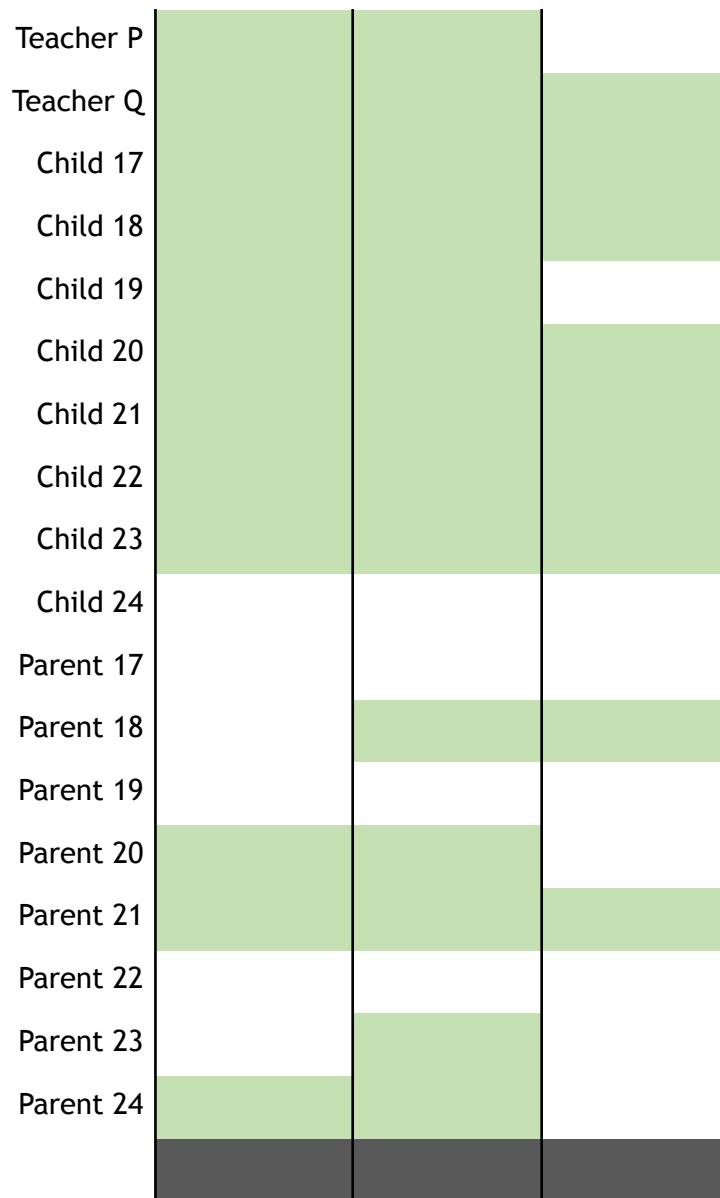


Table of the informants in the study. The areas marked with green indicate that the person was involved as an informant in that particular phase. This table does not show who used TellMe.