



Children's Interaction with Augmented Reality Storybooks

- A human-computer interaction study

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Abstract

Augmented reality (AR) is a technology that enhances user perception and experience, and allows users to see and experience the real world with virtual content embedded into it. The majority of research related to AR books has been focusing on improving underlying technology rather than exploring areas within the research field of human-computer interaction (HCI). This thesis reports an HCI study where the main focus is on different aspects of children's interaction with an AR storybook. A prototype of an AR book was developed through an iterative design process and consists of a physical storybook and virtual 3D models. An empirical evaluation of the prototype was conducted, where children were observed interacting with the prototype. Findings suggest that children were able to interact with the prototype of the AR storybook quite easily and most children understood how to interact with the prototype in order to solve the various tasks. Findings also indicate that the children benefitted from having a partner and most children expressed positive emotions while interacting with the prototype of the AR storybook.

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1. Introduction

This chapter gives an introduction to the study, describes the problem area and establishes the research questions, and outlines the intended contributions of the study.

Augmented reality (AR) enhances user perception and experience, and allows users to see and experience the real world with virtual content embedded into it. In addition, AR allows interaction in real time. For these reasons researchers as well as educators have been eager to explore enhancing material for educational purposes with the help of AR technology.

Books have been augmented with various visualisations, such as 3D graphics and animations, and sound. Adding these elements to books is believed to stimulate a broader set of input channels for the user, thus motivating the reader and enhancing the user experience. It has also been suggested that the use of augmented books may support collaboration among users.

This thesis reports a study of a prototype of an AR storybook developed for the target group of eight- to ten-year-old Norwegian children. The thesis provides a detailed account of the design process, as well as an empirical evaluation of the prototype. Findings from the evaluation are presented and thoroughly analysed. The main focus of the study is on children's interaction with the AR storybook, as well as usability issues with the prototype. It should be noted that the study is conducted in the research field of human-computer interaction (HCI), rather than educational research. It means, in particular, that analysis of potential effects of AR storybooks on children's learning is outside the scope of the study.

1.1 Problem Area and Research Questions

The majority of research related to AR books has been focusing on improving underlying technology, instead of exploring areas within the field of HCI. This focus certainly ensures technological development; however, it leaves other important areas out. While there has been some research dealing with how children use AR books, these studies vary a great deal in regard of technological implementation, choice of user interface, design of interactive parts and degree of integration of AR into the children's activities.

In order to be able to design AR books that are intuitive, easy to use and suitable for children, it is necessary to study children's interaction with AR books, and in this way gain knowledge about how to design better systems.

As the main objective of this study is to gain insight as to how children interact with AR storybooks, the following overarching research question will be explored:

- How do children interact with AR books?

In order to provide a thorough answer to the overarching research question, some areas of children's interaction need to be explored at more depth. Therefore the following more specific research questions will be explored:

- How do children interact with the physical elements of AR books?
- Do children understand how to interact with AR books?
- How do children experience interaction with AR books?
- Does the use of AR books stimulate cooperation between users?

1.2 Contribution

One outcome of this study is the prototype of the AR storybook, which can be considered a valuable contribution in itself. In addition, the thesis provides a detailed account of the design process, as well as an empirical evaluation of the prototype, which may be of interest. As this study's main focus is on children's interaction with AR storybooks, the empirical data from the study may contribute to understanding physical, cognitive, social and emotional aspects of children's interaction with AR technology, and as such contribute to the knowledge base within the field of HCI and AR research. Therefore, this study may be of interest for practitioners as well as researchers within the field of HCI and AR research, especially those who develop AR systems where children are end-users. Additionally, this study demonstrates the use of Design Research as research method within HCI.

2. History and Context

This chapter presents the definition and history of augmented reality, with a special focus on augmented reality books.

2.1 Definition of Augmented Reality

In *A survey of Augmented Reality* Ronald T. Azuma (1997) defines the main distinctive characteristics of AR. He defines AR as a technology that:

- “1) Combines real and virtual
- 2) Interactive in real time
- 3) Registered in 3-D” (1997: 2).

Where virtual environment technologies (VR) completely immerse the user in a virtual world, AR technologies allow the user to see the real world, but supplement it with virtual 3D objects. For users the virtual objects appear to coexist with the real world. Azuma wrote this definition in 1997 and his description and explanation of AR is still valid today, although the definition can be expanded by combining it with analysis conducted by other researchers. In *A Taxonomy of Mixed Reality Visual Displays* Milgram et al. (1994) present “The concept of a ‘virtuality continuum’” (1994: 3). The authors suggest that both VR and AR are part of this *virtuality continuum*, where real objects are placed at one side and virtual objects at the other, cf. Figure 1. The term “Mixed Reality” is the term used for environments that combine virtual and real objects, such as AR.

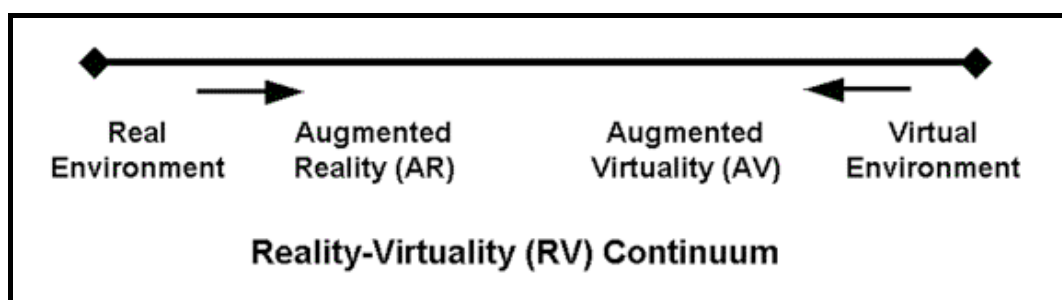


Figure 1: Virtuality continuum.

Steven Heim (2007) points out that: “[...] the goal of AR is to create a seamless integration between real and virtual objects in a way that augments the user’s perception and

experience” (2007: 36). In addition, Heim notes that an implicit criterion for AR environments is that the virtual information is relevant to and in sync with the real-world environment, which increases the importance of an accurate connection between virtual and real-world objects. It is in other words essential that the virtual information is precisely registered, otherwise the user might become confused and disoriented.

2.2 History of Augmented Reality

In the article *A head-mounted three dimensional display* Ivan E. Sutherland (1968) describes a project where the objective was to “(...) surround the user with displayed three-dimensional information (1968: 757). Through this project Sutherland realised in 1968 what is considered to be the very first AR system using a head-mounted display (HMD). The prototype was limited when it came to user interface and realism, and the HMD was so heavy it had to be suspended from the ceiling. Sutherland continued to work on better models of his prototype, but in the following decades interest in AR was entirely academic. The term “*augmented reality*” was actually not introduced until the 1990s as a result of more research on AR technology.

Because of a greater focus on AR technology research in recent years, AR is now gaining popularity and commercial interest. The use of AR applications has been explored in several areas, among them the educational field. Although most current AR applications are still academic, there are several commercial products on the market. There has, for instance, been a rapid growth in location-based AR applications for mobile devices during the past years, which is closely connected to the availability and functionality of the “smart-phone”.

2.3 Augmented Books

During the past decade or so, there have been several approaches to enhance books using virtual content. Researchers have explored various technological implementations, different interfaces and design of interactive parts, as well as using different degrees of integration of VR and AR, cf. Milgram’s virtuality continuum. The AR books that will be looked more closely at in this study are the books that are augmented by showing complementary visual

information on a computer screen, next to or in the actual book, or provide a new type of virtual popup book, in addition to using sound.

One of the first virtual popup books and the book that established the term “*augmented book*” was the MagicBook, which was developed by the Human Interface Technology Laboratory New Zealand (HIT lab NZ)¹. In the article *The Mixed Reality Book: A New Multimedia Reading Book* Billinghamurst et al. (2007) introduce the MagicBook as “(...) an interface with a seamless integration of different modalities, while keeping the intrinsic value of the physical values of the book” (2007: 2). The prototype consisted of a children’s story, which was developed in collaboration with a local children’s book author, standard desktop computer hardware, a multimodal handheld device, tangible interaction devices, and an additional green screen. The approach is based on visual and auditory augmentation and they experimented with both static and dynamic images. With the hand-held device the user can easily get absorbed into the mixed-reality book, as this device provides visual feedback in form of live video feed, as well as auditory feedback through headphones. The user can change detail depending on the angle of the hand-held device and the sound changes according to position and content on the page. In addition the user can interact directly with the digital objects, which changes their view from AR to VR. Billinghamurst et al. (2007) point out that the MagicBook may be a good tool for educational purposes, because the book provides a broad set of input channels and thus stimulates students with different learning styles. With their prototype, the mixed reality book, they provide a digital extension to physical books, which augments an existing interaction paradigm.

In the article *Little Red: Storytelling in Mixed Reality* Saso et al. (2003) explain that the story “Little Red” is “(...) an exploration in new methods of storytelling” (2003: 1). The authors have explored using the book as the interface for interacting with the story, and by using an HMD for augmentation the user gets totally immersed in the story. Dialogue and narrative is delivered aurally and illustrations and virtual 3D graphics are combined on each page of the story. The user can influence both the storyline and the ending of the story based on their actions.

¹ A human-computer research centre connected to the University of Canterbury (20.02.11)
< <http://www.hitlabnz.org/> >

The "BBC-Jam" was an AR storytelling trial run by the BBC in 2006² and the trial provided an online learning service for five- to sixteen-year-olds. There were several stories made available and all stories were to be used with a standard PC and a webcam. Users were able to see the 3D content and themselves on the PC screen and they could interact with 3D content while reading the story. The trial only lasted for three months, and the project was frozen for a while before it finally was suspended, apparently after complaints from commercial rivals.

The AR books mentioned above are books where children are target users, however, the AR books vary in both technical implementation and user interface. In addition they vary in content, where some books follow a linear storyline others allow users to create their own story based on various paths chosen.

²BBC.co.uk. (20.08.2011)

<http://www.bbc.co.uk/pressoffice/pressreleases/stories/2006/04_april/06/bbcjam.shtml>

3. Theoretical Framework

This chapter describes theory in regard to human-computer interaction, augmented reality studies and children's development.

3.1 Human-Computer Interaction

In the web-article *Human Computer Interaction (HCI)* John M. Carrol (2011) points out that: "Human-computer interaction (HCI) is an area of research and practice that emerged in the early 1980s, initially as a specialty area in computer science" (2011). HCI is today an interdisciplinary field that has in recent decade expanded rapidly, incorporating varied concepts and approaches. Though, the original focus of HCI was on personal productivity applications, such as text editing and spreadsheets, the field has constantly expanded and include today visualisation, information systems, collaborative systems, the system development process as well as many areas of design. Carrol (2011) also notes that user experience design and interaction design were among two of the first exports from HCI to the design world. The scope of this study is within the area of interaction design, where a key concern is designing interactive systems that meet user experience and usability goals.

3.1.1 Usability

The term "usability" is defined by the ISO standard 9241-11 as: "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use"³. Furthermore, the term "usability" assesses how easy a user interface is to use, it refers to methods for improving ease-of-use during the design process, and is also often associated with the functionality of a product. In the web-article *Usability 101: Introduction to Usability* Jakob Nielsen⁴ (1995-2011) points out that usability consists of five quality components: "*Learnability*: How easy is it for users to accomplish basic tasks the first time they encounter the design? *Efficiency*: Once users have learned the design, how quickly can they perform tasks? *Memorability*: When users return

³ Wikipedia.org (01.11.2011) <<http://en.wikipedia.org/wiki/Usability>>

⁴"Jakob Nielsen (1957) is a leading web usability consultant and holds a Ph.D. in human-computer interaction. Nielsen founded the "discount usability engineering" movement for fast and cheap improvements of user interfaces and has invented several usability methods". (01.11.2011)

<http://en.wikipedia.org/wiki/Jakob_Nielsen_%28usability_consultant%29>

to the design after a period of not using it, how easily can they re-establish proficiency? *Errors*: How many errors do users make, how severe are these errors, and how easily can they recover from the errors? *Satisfaction*: How pleasant is it to use the design?” (1995-2011). Nielsen also points out that there are other important quality attributes, for instance *utility*, which refers to the extent that the system provides the right functionality. Furthermore he claims that usability and utility of a system are equally important. Sharp, Rogers & Preece (2007) propose that usability “(...) involves optimizing the interactions people have with interactive products to enable them to carry out their activities at work, school, and in their everyday life” (2007: 20). In addition to the usability components mentioned above the authors also mention *safety*, which refers to protecting the user from dangerous conditions and undesired situations.

3.1.2 Design Principles

Sharp, Rogers & Preece (2007) explain that: “Design principles are derived from a mix of theory-based knowledge, experience and common sense” (2007: 29). A number of design principles have been promoted, but the most well known are concerned with how to determine what users should see and do when carrying out tasks using an interactive product. The most common design principles are: *Visibility*, *feedback*, *constraints*, *consistency* and *affordances*. Dünser et al. (2007) discuss how design principles can be applied to AR systems, cf. section 3.2. “Applying HCI Principles to AR Systems”.

3.1.3 User Experience

According to Sharp, Rogers & Preece (2007) *user experience* is central to interaction design and is concerned with “(...) how people feel about a product and their pleasure and satisfaction when using it, looking at it, opening it or closing it” (2007: 15). User experience is subjective and is concerned with how users interact with the product from their perspective, and since experiences are individual they vary from person to person and can as such be both positive and negative. Sharp, Rogers & Preece (2007) emphasise that one can only design *for* a user experience not design *a* user experience, as the user experience is subjective.

Marc Hassenzahl (2011) explains that from a psychological perspective “(...) an experience emerges from the integration of perception, action, motivation and cognition into inseparable, meaningful whole” (2011). In addition, the author believes that emotions and fulfilment of physiological needs to have an important role. Emotions provide an intrinsic evaluation, namely pleasure or pain, which yet again will provide the user either a positive or a negative user experience. Furthermore, Hassenzahl (2011) sees user experience as a sub-category of experiences, where the focus is on interactive products.

3.2 Applying HCI Principles to AR Systems

In the article *Applying HCI principles to AR systems designs* Dünser et al. (2007) state: “Clearly there is a need for more HCI and usability research in the field of Augmented Reality” (2007: 1). In present AR research, the authors note, there seems to be a strong technological focus among researchers. This focus indeed drives technological advancement, however, the drawback is that the end user is often forgotten or left out entirely of the design process; in addition, the technology is developed without having a specific problem in mind that the technology should solve. If the AR technology is going to make the step from research laboratories into everyday life, the technology must become easier to use. Dünser et al. (2007) suggest that knowledge found in basic HCI literature could be relevant to human interaction with different kind of interfaces, as well as knowledge derived from VR research. In AR systems interfaces are realised with a large variety of interaction techniques and devices, depending on specific hardware, and can include visual, audio and haptic interfaces. Therefore guidelines must perhaps always be specifically developed to solve individual problems. Nevertheless, Dünser et al. (2007) claim that general guidelines, based on general design principles identified in AR systems so far, can be a useful tool during prototyping or at an early stage in interface development. The authors attempt to provide examples of HCI design principles which can be applied to an AR system, and explore “affordance”, “learnability”, “user satisfaction”, “flexibility in use”, “feedback” and “error tolerance” among others. Although it is difficult to develop specific guidelines that will accommodate all AR system designers, the future success of AR systems depends on well-designed user experiences. The use of HCI design principles in this study is described in Chapter 5. “Development of the prototype”.

3.3 An Augmented Book Study

In the article *An observational study of augmented books* Dünser and Hornecker (2007) report on a user study conducted with young children, aged 6-7 years, where their objectives are: "(...) to explore how children interact with and handle augmented books, how the interaction of interactive story elements may enhance the reading and learning experience, and how the books support collaborative learning" (2007: 2). The authors used two augmented books, developed by BBC-Jam trial (cf. section 2.3 "Augmented Books), where markers were glued onto paddles and a webcam was mounted on top of the computer screen. This setup allowed users to see real and virtual content in a combined view, as well as themselves interacting with the story. The authors found that interaction styles with the story and the interactive sequences varied a lot, from playful and explorative interaction on one side to problem solving and strategic interaction on the other. In addition, most children were able to interact with the system after having support for the first sequences, although the authors point out that this observation is based on pupils from the upper end of the class. Dünser and Hornecker (2007) also found that classic elements of a story, such as main characters, setting and plot were important for readers' satisfaction, as well as the contribution of the interactive sequences to the story itself. When looking at collaboration the authors found that single children got stuck more often than children working together and that collaborative interaction seemed to help children cope with problems more easily, as well as being more likely to try alternative interactions.

In the article *Of pages and paddles: Children's expectations and mistaken interactions with physical-digital tools* Hornecker and Dünser (2009) re-analyse data from the user study mentioned above. The authors "(...) examine in detail how children perceive and then choose to interact with augmented physical objects" (2009: 96). The authors initial findings revealed that children often attempted interactions that the system did not detect or respond to, and they wanted to study more thoroughly how children would make use of objects' affordance and what kind of knowledge from the physical world the children would make use of. Hornecker and Dünser's (2009) findings showed that children expected the augmented objects to behave similarly to physical objects and that the objects would comply with the laws of the physical world. Both children's visible behaviour and their conversations supported these findings. Two factors contribute to these expectations; firstly

the paddle, which has physical affordance and encourages interaction, and secondly the augmented view on the computer screen supports the impression that interaction in 3D space is possible. The authors suggest that there is an obvious difficulty with the notion of “real-time interaction”, where the challenge is to match the physical affordance and the actions these invite to, with the actual capabilities of the digital systems.

3.4 Interaction Devices in AR

In the article *Augmented Instructions – A Fusion of Augmented Reality and Printed Learning Material* Asai, Kobayashi & Kundo (2005) note: “Multimedia learning environments have offered new ways for learners to interact with various educational resources” (2005: 1). In *Augmented Instructions*, a concept the authors describe as closely related to *The MagicBook*, printed learning material is mixed with AR. With *Augmented Instructions* Asai, Kobayashi & Kundo (2005) conducted an experiment in order to investigate the appropriate way of human-computer interaction, where a hand-held PC was compared to an HMD. The results of this experiment suggested that the hand-held PC was more suitable than an HMD as an interaction device for *Augmented Instructions*, in particular if used for a long time.

3.5 Augmented Reality and Learning Potential

In the article *Trend: Augmented Reality Check* Kaplan-Leiserson (2004) explores AR and its applicability to learning and notes that much less attention has been paid to the learning potential in AR than that of VR. The reason for this, Kaplan-Leiserson suggests, is that the AR technology is more complicated and has matured at a slower pace. Due to research and hardware advances in the past years, AR has developed more rapidly and may now be making an entry in the learning arena. As researchers have developed additional technologies, the definition of augmented reality has expanded and now includes visual, auditory and touch, or haptic augmentation. Visual AR technology is the furthest along when it comes to practical application since it has been under development the longest. AR systems within online learning and collaboration are making progress, and Kaplan-Leiserson (2004) suggests that AR would be much better than VR when it comes to learning and training in terms of cost and realism, as well as human factors.

3.6 Children's Development

Children are increasingly using and being exposed to computer technologies, both in schools and at home. In the article *Interaction Design and Children* Juan P. Hourcade (2008) notes: "Given the greater exposure of children to these technologies, it is imperative that they be designed taking into account children's abilities, interests, and development needs" (2008: 277). In order to understand children's abilities and development needs, it is necessary to be aware of factors that affect children's intellectual and cognitive development.

Jean Piaget⁵ was one of the most influential theoreticians on child development during the 20th century, and his views have influenced both psychological and educational research, as well as research within the field of interaction design and children. Piaget believed that children construct knowledge through a process he called *adaption*. He saw adaption as an active process, where children construct their own knowledge through experiences with the world. The idea that children actively construct their own knowledge through experiences and that children's construction of knowledge is individual is referred to as *constructivism*. Seymour Papert⁶ is a central researcher within the field of interaction design and children. In *Mindstorms: Children, Computers and Powerful Ideas* Papert (1980) explores the issue of "(...) how computers may affect the way people think and learn" (1980: 3). Papert expands on Piaget's idea of *constructivism* with the influential theory on learning called *constructionism*. He suggests that learning, or construction of knowledge, is the most effective when children are engaged in constructing a meaningful entity, for instance while using a computer. Papert's views have been very influential within the field of interaction design and particularly so when it comes to having children participate in designing or creating the technologies they use.

In the *The Psychology of a Child* Piaget and Inhelder (1969) describe four factors, which they believe affect children's development. The first factor is *maturation*, which is considered a precondition for learning and can as such limit what children are able to learn. The second

⁵ "Jean Piaget (1896- 1980) was a developmental psychologist and philosopher known for his epistemological studies with children" (16.11.2011). < http://en.wikipedia.org/wiki/Jean_Piaget>

⁶ "Seymour Papert (1928) is an MIT mathematician, computer scientist and educator. He is the one of the pioneers of artificial intelligence, as well as the inventor of the Logo programming language" (16.11.2011). < http://en.wikipedia.org/wiki/Seymour_Papert>

factor is *experience*, which Piaget found to be the key element in adaptation. Thus, experiences are necessary for building knowledge. The third factor is *social interaction*, which they regard necessary and essential, but insufficient by itself. The fourth factor Piaget and Inhelder identify as affecting children's development is *emotions*, such as motivation and self-regulation.

Piaget and Inhelder (1969) propose that all children go through stages in their cognitive development, where they attain logical, analytical and scientific thinking. At each stage children will present a behaviour which is particular for that stage. All children will follow the stages in the same order, although at different speed. All stages will not be explored here, but the stage that is within the target group of this study will be looked at briefly. Seven to eleven year old children are according to Piaget in the *concrete operations stage*. Children at this stage are more likely to appreciate someone else's opinion than younger children, and this makes it possible for them to work better in teams. Children at this stage also understand the use of hierarchies and are able to reverse actions in their head, which makes them able to use a variety of technologies. However, more abstract concepts, such as logically analysing options or the use of reasoning does not, according to Piaget, appear until the next stage. Though Piaget's idea that children follow these stages of development is criticised, the stages may help identify why children have difficulties with particular types of interaction at a given age.

The role of social interaction in children's development has been elaborated by several theoreticians, among them Lev S. Vygotsky⁷. Vygotsky was one of the first to emphasise the importance of social aspects in children's education. In *Mind In the Society - The Development of Higher Psychological Processes* Vygotsky (1978) proposes *The zone of proximal development* in order to explain the relation between learning and development. *The zone of proximal development* is "(...) the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (1978: 86). *The zone of proximal development* represents as such the range

⁷ "Lev Semyonovich Vygotsky (1896-1934) was a Russian psychologist and the founder of cultural-historical psychology (16.11.2011)< http://en.wikipedia.org/wiki/Lev_Vygotsky>

of tasks that a child can solve under adult guidance or while cooperating with peers, but not alone. Furthermore, once children internalise the processes that helps them solve tasks, they will be able to complete them individually. Thus, appropriate social support can be essential for children's learning and knowledge development.

3.7 Children as Design Partners

As children emerge as frequent and experienced users of technology it is important to involve the user group in the design process to ensure a suitable product. In the article *Cooperative Inquiry: Developing New Technologies for Children with Children* Allison Druin (1999) describes the methodology of "cooperative inquiry". Cooperative inquiry is an approach where new technology for children is created with children as design partners during the design process. Druin believes that "(...) children can and should be design partners throughout a team research experience" (1999: 592) and points out that children are most commonly asked to be technology testers, for instance by using traditional "user-centred" approaches, but researchers have begun to see limitations of what children can contribute to in these situations. In the article *Designing For or Designing With? Informant Design For Interactive Learning Environments* Scaife et al. (1997) point out that it has become common to involve users more as design partners, for instance in methods such as "participatory design", and such approaches have proven to be very successful for adult users. However, the authors question the use of children during the design process as equal co-designer, as children do not have time, knowledge or expertise to be involved in a participatory design process. Scaife et al. (1997) recognise that children should be involved more in the design process, however, they point out that it is unclear what role children should have. The authors therefore propose the method of "informant design", which is a framework for involving various participants throughout the design process. In this approach children are not regarded as neither users nor participants, but rather as "native informants". Children are involved in various stages of the design process, as are other informants, but children are not treated as equal design partners.

4. Methodology

This chapter describes the methodological foundations of this study. The three different views on design science is introduced, after which it is explained how design research is applied in this study. In addition, evaluation methods are described as well as reasons for the choice of method.

4.1 Design Research

In the article *Design Science in Information Systems Research* Hevner et al. (2004) explain that there are two main paradigms within the research field of Information systems, namely *behavioural science* and *design science*. While *behavioural science* is focused on explaining and predicting human or organisational behaviour, *design science* is focused on creating and evaluating IT artefacts. Hevner et al.' main objective is to describe "(...) the performance of design-science research in Information Systems via a concise conceptual framework and clear guidelines for understanding, executing, and evaluating the research" (2004: 75). Through a set of guidelines for conducting and evaluating design science research Hevner et al. seek to inform the community of information science of how to conduct, evaluate and present design research, cf. Table 1.

Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form a construct, a model, a method, or an instantiation.
Guideline 2: Problem relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions on the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigour	Design-science research relies upon the application of rigours methods in both the construction and evaluation of the design artifact.

Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication and Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

Table 1: Design-Science Research Guidelines proposed by Hevner et al. (2004: 83).

In the article *A Three Cycle view of Design Science Research* Alan R. Hevner (2007): “(...) briefly analyze design science research as an embodiment of three closely related cycles of activities” (2007: 87). The *Relevance Cycle* initiates design research with context, an opportunity or problem that should be addressed, and provides requirements for the research, as well as introducing criteria for evaluation of the research result. The *Rigour Cycle* provides past knowledge to ensure research innovation, and the researcher must select appropriate theories and methods for construction and evaluation and make sure results from the research are added to the knowledge base. The *Design Cycle* describes the design and evaluation of an artefact against the requirements until a satisfactory design is reached. The recognition of these three cycles in a research project identifies and differentiates design research from other research paradigms, and Hevner notes that it is essential that both design and evaluation are convincingly founded in relevance and rigour.

In the article *Design-oriented Human-Computer Interaction* Daniel Fällman (2003) introduces three different accounts as to what design ‘is’ and how design is related to HCI. *The conservative account of design* sees design as being a problem-solving activity and borrows methodology and terminology from the natural sciences and draws upon a philosophical base in rationalism. In this account, the design process goes from the abstract to the concrete and is developed by following well-described and structured steps. *The romantic account of design* sees the designer as a mastermind and nourishes the idea of creative geniuses. In this account the design process involves a certain mystical element and is guided by the designer’s values and taste; it is neither rational nor explainable. *The pragmatic account of design* holds that design is about being engaged directly in a specific design situation. In this account, the design process takes the form of a hermeneutic process of interpretation and creation of meaning, where designers iteratively interpret the effects

of their design related to a specific situation. The three accounts have different ways of trying to explain the nature of design. Fällman (2003) suggests that instead of thinking of design in terms of being on a continuum between science and art, design must be considered as a tradition guiding action and thought, where HCI is only one of the many disciplines. The author stresses that the field should distinguish between the conduct of Design-oriented Research, where the main contribution is knowledge or truth, and the conduct of Research-oriented Design, where the main contribution is an artefact, as these two orientations have different purposes and thus different criteria for interpretation and evaluation.

In the article *Research Through Design as a Method for Interaction Design Research in HCI* Zimmerman, Forlizzi & Evenson (2007) propose: “(i) a model of interaction design research designed to benefit the HCI research and practice communities, and (ii) a set of criteria for evaluating the quality of an interaction design research contribution”(2007: 493). First, design researchers must identify opportunities for either new technology or advances within existing technology that will have a significant impact on the world. They must also frame problems, as well as evaluate performance and effect of the artefact in the world, which will identify gaps in theory and models and help bridge aspects of theory to a given problem, context and target users. Secondly, interaction designer researchers must create artefacts, which provide concrete examples of theory and technical opportunities. Through the artefact the value of different theories, models and technology can be observed. Thirdly, the use of this model will result in a holistic research contribution that establishes the frame of the problem, as well as reveals the balance researchers have made between overlapping perspectives. As there is no agreed upon standard for evaluation of interaction design research within HCI, Zimmerman, Forlizzi & Evenson (2007) suggest a set of criteria for evaluating interaction design research through four different lenses. The *process* is the most critical element for judging the quality of an interaction design research contribution. Rigour applied to methods and selection of methods must be thoroughly evaluated. Even though interaction design researchers must provide enough detail so that research can be reproduced, there is no expectation that reproducing the design process will come up with the same results. Whether the contribution of the research represents a significant *invention* must also be evaluated. The work must be placed into context through a thorough literature

review, and how this particular contribution advances the current state must also be documented. Where scientific research has a focus on validity, the point of reference for interaction design research should be *relevance*. Interaction design researchers must therefore explain their motivation behind the research, as well as placing their work into the real world and give detail on the preferred condition. The last lens for evaluation suggested by Zimmerman, Forlizzi & Evenson is *extensibility*, which means that the design research has been documented so thoroughly that knowledge can be derived from the work and is possible to continue building on.

By presenting three different views of Design Research, I have sought to illustrate that there is no agreement on either the definition of design or Design Research in HCI. Hevner's paper is probably the most influential and provides a thorough description of Design Research as a research method; however, it has not made such a great impact within the HCI community as the guidelines were developed for an entirely different research field than HCI. In this study Zimmerman, Forlizzi & Evenson's (2007) account and description of Design Research within the field of HCI will be applied as research method.

4.2 Use of Design Research in This Study

Zimmerman, Forlizzi & Evenson's (2007) model of interaction design research as a research method is applied to this study following three steps. The first thing an interaction designer must do is identifying opportunities for either new technology or advances within existing technology and frame problem area. This aspect of the research method is described in section 1.1 "Problem area and research questions". Secondly interaction designers must design artefacts that provide concrete examples of theory and technical opportunities. This aspect of the research method is described in chapter 5. "Development of the prototype". Thirdly, a combination of the first and the second step will result in a holistic research contribution, as described in section 1.2 "Contribution".

Furthermore, Zimmerman, Forlizzi & Evenson (2007) also suggest evaluating interaction design research within HCI through four lenses, in order to ensure the quality of the design research. The first element that must be evaluated is *the design process*. The choice of

methods used for this study is described in chapter 4. “Methodology” and the evaluation have been described in detail in chapter 6. “Evaluation”. The second element that must be evaluated is *invention*. AR and AR books are described in described in chapter 2. “History and context” as well as relevant theory regarding the scope of the study is described in chapter 3. “Theoretical framework”. The third element that must be evaluated is *relevance*. This study explains motivation behind the study in section 1.1 “Problem area and research questions”. The fourth element that must be evaluated is *extensibility*. This thesis describes and documents the design process, evaluation and analysis of the findings so thoroughly, that it should be possible for the HCI community to derive knowledge from.

4.3. Evaluation Methods

In the paper *Survey of User-Based Experimentation in Augmented Reality* Swan and Gabbard (2005) find that “(...) user-based experimentation in AR dates back to as early as 1995” (2005: 1). Furthermore, the authors classify three categories of efforts which experiments have been conducted in line with: *Human perception and cognition in AR*, *User task performance and interaction techniques within specific AR applications* and *User interaction and communication between collaborative users*. In the paper *A Survey of Evaluation Techniques Used in Augmented Reality Studies*. Dünser, Grasset and Billingham (2008) “(...) report on an initial survey of user evaluation techniques used in (...) AR research” (2008: 1). They classified all articles according to Swan and Gabbard’s categories, as referred to above, but identified another category: *Interface or system usability studies*. They looked at all articles in the major publications of computer science literature from 1992 to 2007, and found that an estimated 10 % of all AR articles included some user evaluation, if informal evaluation was included. Dünser, Grasset and Billingham (2008) conclude that although the percentage of AR user evaluations seems to somewhat increase over time, the overall percentage of user evaluation in AR research is low and there clearly is more potential for evaluation of AR systems.

4.4 Usability Testing

Steven Heim (2007) points out that: “A usability test is a structured process used to explore the interaction between an objective participant and a proposed design” (2007: 277). The usability test can evaluate a design based on specific usability problems or it can explore a design and uncover new problems. However, the main objective is to identify areas of improvement. A usability test has three basic components: *the participant* – should be representatives of the target user group; *the design* - may be a fully functioning prototype or a more limited prototype; *the tester* - there may be only one tester or a whole team which observes how the participant interacts with the product. Furthermore, Heim (2007) propose to divide usability testing into four phases. In the first phase the test will be designed and the purpose must be established, with goals and concerns as well as a task list. It is also essential to determine how to measure the results, and results can be divided into qualitative and quantitative measures. The location of the usability test must be established, as well as who is going to be involved, such as participants and evaluators. In the second phase one makes further preparations for the usability test. A date time for the test must be established and a detailed time schedule must be outlined. One should also prepare introductions and consent forms during this phase, as well as running a pilot test if possible. In the third phase the actual usability test will be conducted. In the fourth and final phase the focus is on the data, which was gathered during the usability test. Data must be summarised, categorised and finally analysed and documented. How usability testing was applied as an evaluation method in this study, is described in detail in chapter 6. “Evaluation”.

In interaction design evaluation it is important to utilise evaluation methods both during the design process, as well as after. As Dünser, Grasset and Billingham (2008) mentioned, reports of AR user evaluation are under represented in present AR research, and one reason for that can be that there are no specific methods for evaluation of AR interfaces. Since there are no specific methods to use for evaluation of AR systems for children, I am free to apply evaluation methods that I find suitable for this study. I have decided to evaluate the prototype during the design process by the help of a focus group, which is documented in chapter 5. “Development of the Prototype” and for the evaluation of the prototype I have decided to conduct a usability test, which is documented in chapter 6. “Evaluation”.

5. Development of the Prototype

This chapter describes and documents the iterative design process, where the prototype of the AR book was developed. The use of end-users during the design process is also documented.

Zimmerman, Forlizzi & Evenson (2007) point out that after interaction designers have identified opportunities for either new technology or advances within existing technology and framed the problems, they must create artefacts, which will provide specific examples of theory and technical opportunities. The artefact in this study is a prototype of an AR storybook and the target group is eight- to ten-year-old Norwegian children. The AR book will be augmented using virtual 3D models, sound and interactive tasks. The development of the prototype of the AR book has more or less followed Sharp, Rogers & Preece's (2007) framework of an interaction design process, which consists of four basic activities:

- "Identifying needs and establishing requirements for the user experience.
- Developing alternative designs that meet those requirements
- Building interactive versions of the design.
- Evaluating what is being built throughout the process and the user experience it offers" (2007: 428).

In interaction design approaches it has become common to involve end-users in the design process, in order to ensure that users' needs are met. However, when children are end-users there are different views as to how much children can and should be involved in the design process. Druin (1999), for instance, believes that children should be involved in the design process as equal design partners, whereas Scaife et al. (1997) question how much children should be involved and propose children to be looked at as informants who participate during specific stages during the design process. For this study the latter approach has been applied, and a focus group, consisting of two children from the target group, will participate in the design process at three stages. The children's parents were present at all meetings. The first meeting with the focus group was held prior to establishing system requirements, as described in section 5.1 "Requirements". In the second meeting, the focus group evaluated the first version of the prototype, as described in section 5.5.1

“Evaluation by focus group”. In the third meeting, the focus group evaluated the second version of the prototype, as described in section 5.6.1 “Evaluation by focus group”.

5.1 Requirements

Sharp, Rogers & Preece (2007) point out: “A requirement is a statement about an intended product that specifies what it should do or how it should perform” (2007: 476). Requirements should be established from data gathering, analysis and interpretation for activities in order to meet users’ needs. Requirements must explain what the product should do and must be specific and to the point. In the process of determining and defining requirements for the prototype of the AR book knowledge about similar AR books were considered, the problem area regarding AR books was taken into account as well as input from the first meeting with the focus group. In addition, a use case diagram was sketched up.

Sketching up a use case diagram, cf. Figure 2, where user activities as well as system responses are the main focus, is a good way to go through tasks and activities of the system, thus ensuring that the requirements you set are sufficient.

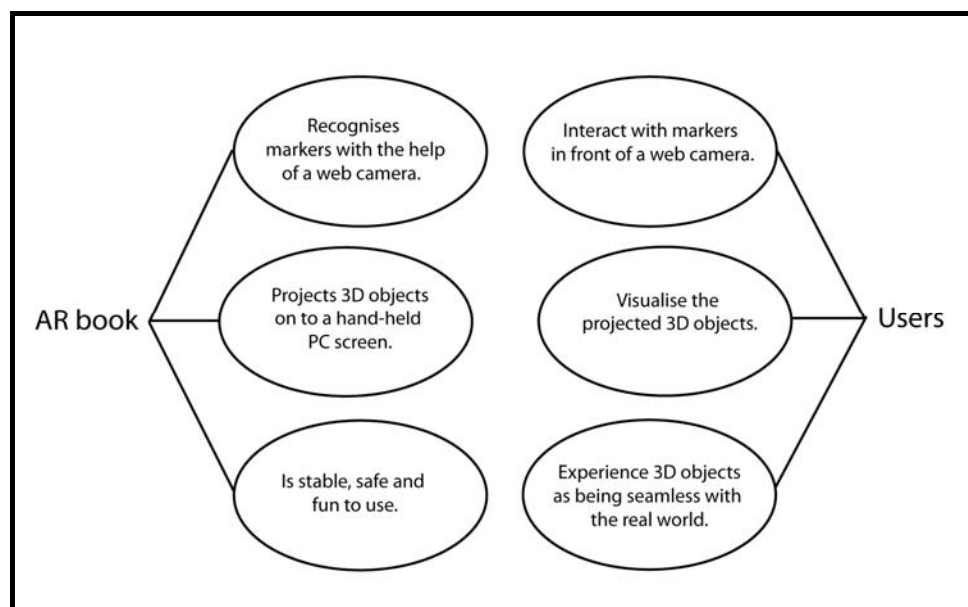


Figure 2: Use case diagram.

An important factor in the process of setting requirements was consideration of the user group. Through a meeting with the focus group, prior to establishing requirements for the prototype of the AR book, the concept of AR were introduced to the children. The main objective of this meeting was to introduce AR technology as well as motivate the children to participate in the design process. In order to support the children's understanding of AR and to illustrate different usages of AR they viewed a selection of films on Youtube. After watching the films I asked the children a few questions. To the question: "What do you think AR can be used for?" they answered games, cardboard figures and books. The films we had just watched inspired their answers, and no new areas of usage came up. To the next question: "What is important when designing AR that children will like?" they answered the use of pictures, not too much text and that AR should be simple and not too technical. Though this first meeting with the focus group was brief, it gave important insight into children's ability to understand the concept of AR, as well as input in regard of what children will consider as important elements of an AR artefact.

5.1.1 Functional Requirements

The functional requirements describe what the system is supposed to do, with focus on the functionality, which is available for the user. The prototype of the AR book has the following functional requirements:

- Allows tangible and flexible interaction.
- Makes use of a webcam and a hand-held PC-screen.
- Recognises markers and projects corresponding 3D models and sounds.
- Projects the 3D objects as being seamless and in sync with the real world.

5.1.2 Non-functional Requirements

The non-functional requirements describe what the system should be like, with constraints and qualities, such as requirements related to usability and user experience. The prototype of the AR book has the following non-functional requirements:

- Is intuitive and easy to use.
- Is easy to learn.

- Is stable and safe to use.
- Is fun and exciting to use.
- Stimulates cooperation between users.

5.2 Choice of AR Software

Part of the design process was finding a suitable AR software application, which could be used when modelling the prototype. When searching for a suitable AR software application I had the system requirements, applicability with system components, as well as my personal limitation in regards of programming skills in mind. After a search process, where several applications were assessed, the choice fell on the software application BuildAR Pro⁸ (version 1.1.4), which is developed by HIT lab NZ.

Among the software applications I considered was ARToolKit⁹, which is a computer program developed by Hirokazu Kato that can be downloaded for free for non-commercial use. This application was for instance used to realise the MagicBook. The website provides good documentation and support, and the application seems to be user-friendly. However, the graphical user interface suggests that some programming knowledge would be necessary in order to use this software. Another software I looked at was ARTag¹⁰, which was developed by Mark Fiala and can be downloaded for free for academic purposes. The website provide good documentation and the application seems easy to use. However, the software was not available for downloading at that given time. I also considered using location-based AR software applications, which would for instance allow the use of mobile devices as part of the user interface of the prototype. However, the applications I looked at, such as Layar Vision¹¹ and Buildar¹², use GPS to find points of interest and visualise AR objects connected to those locations. Since the prototype of the AR book relies on marker-based augmentation, these location-based applications were discarded.

⁸ BuildAR: <http://www.buildar.co.nz/>

⁹ ARToolkit: <http://www.hitl.washington.edu/artoolkit/>

¹⁰ ARTag: <<http://www.artag.net/>>

¹¹ Layar Vision: <<http://www.layar.com/>>

¹² BuildAR: <<http://buildar.com/>>

There are several good reasons for using BuildAR Pro. For one, it has a user-friendly graphical user interface, which ensures AR scenes to be built without much programming knowledge. BuildAR Pro shows a live view of an AR scene when connected to a web camera and has features for creating markers and adding, scaling and positioning 3D objects. BuildAR Pro supports showing several 3D objects simultaneously, and elements such as video, text and sound can also be added to the AR scenes. The HIT lab NZ's website provides good documentation and video tutorials of how to use BuildAR. Although it took some time to learn how to use the software, the software proved to be quite easy to use once one got the hang of it.

5.3 Choice of Interaction Device

When choosing an interaction device for the prototype, using an HMD and a hand-held screen was considered. The use of an HMD was considered being too heavy for a child to use, therefore using a small hand-held PC screen as interaction device seemed more like a suitable choice for this prototype. Since this study also explores whether AR books will support cooperation, using an HMD would also limit children's ability to interact and cooperate with each other. The choice of using a hand-held PC screen is in line with Asai, Kobayashi & Kundo's (2005) research, who concluded that the use of a hand-held screen was the preferable interaction device for printed learning materials, particularly if used for a long time.

The interaction device for this prototype was provisionally made of a small PC screen, attaching a web camera to the back of the PC screen using rubber bands, and wires from the PC screen and the web camera were attached together, cf. Figure 3.



Figure 3: Interaction device used for the prototype.

5.4 Prototype Elements

During the design process I made use of the technique of prototyping when creating the artefact. According to Sharp, Rogers & Preece (2007) “ (...) a prototype can be anything from a paper-based storyboard through to a complex piece of software (...)” (2007: 530). A prototype will support the designer in clarifying requirements of the design, help test out ideas and help choosing between alternative designs. In addition, a prototype is suitable for user testing and evaluation. Thus, prototyping is a very useful tool when developing and designing an artefact. I chose to develop a high-fidelity prototype, which resembled the final artefact. A high-fidelity prototype is time consuming to develop, but will give users a feel of the final artefact and is suitable for testing out technical issues.

Based on the established system requirements I started developing the prototype of the AR book. In the following, the development of the prototype elements, such as the story, the markers, the 3D models and the tasks and interactive sequences will be described.

5.4.1 The Storybook

The story used for the prototype of the AR storybook was written in collaboration with two friends. It was established that the story should be suitable for children aged eight- to ten-year-old Norwegian children, and the story should therefore be catchy and humorous. Additionally, a plot that was suitable for augmentation would have to be chosen. After a brief brainstorming session, it was decided that the plot would be a mystery story involving

animals, where the animals would be the augmentation of the prototype. Dünser and Hornecker (2007) found that classic elements of a story, such as main characters, setting and plot were important for the reader's satisfaction in AR books, and this was taken into consideration when writing this story. Shortly summarised, the plot involves executive director of Zaza Zoo Sheila Giraffe waking up one morning only to find out that four animals had disappeared during the night. The main character and pet detective S. Nute arrives at the zoo, and during the story S. Nute is introduced to information about the four missing animals and the different crime scenes. The layout of the storybook was edited and designed using Adobe InDesign.

5.4.2 The Markers

The marker is a very important physical element in a marker-based AR system. BuildAR Pro tracks and identifies markers in order to overlay the real world with virtual content. While writing the story, it had been decided that animals would be used for augmentation. Therefore, it was only natural that the pattern on the markers would also be animals, and markers were designed using more or less the same degree of detail. One limitation that was set at this stage was that the prototype would not contain more than six markers. In addition to the considerations that I have just mentioned, BuildAR Pro had some guidelines for design of markers in the BuildAR Pro tutorials, which were important to follow:

- The markers must have a thick black border with a white space around to ensure contrast.
- No marker must be the same and design should not be rotationally symmetric.
- Use black and white to ensure contrast.

The markers were designed using Adobe Illustrator. For an overview of all six markers, see Appendix 1. "The Markers".

5.4.3 The 3D Models

Rather than designing the virtual 3D models for the prototype of the AR book, since that would involve learning another new software, I decided to download 3D models from the

Internet in order to save time. This would also ensure that the quality of the models would be quite good. After searching a few websites for suitable 3D models of animals, assessing design, quality and available formats, the choice fell on the artist x3mer's 3D animals, which were available from Turboquid¹³. X3mer could provide all the animals I needed for the prototype, his design was very good, and all animals were provided in several formats that was possible to use in BuildAR Pro, such as 3ds, obj, mtl, lwo, iva and fbx. For an overview of all six 3D models used for the prototype, see Appendix 2. "The 3D models".

5.4.4 Tasks and Interactive Sequences

Tasks and interactive sequences were supposed to provide the children with a natural reason to interact and explore the virtual content of the prototype. Tasks and the interactive sequences must therefore be closely related to the content of the story and users must experience tasks as a meaningful activity related to the use of the AR book. The intention was also that the tasks and interactive sequences would eventually make up the task list, which would be used during evaluation in order to give users specific tasks related different aspects of interaction with the prototype.

5.5 First Version of the Prototype

In the first version of the prototype the storybook was designed in A4-format and divided into six paragraphs over two pages, cf. Appendix 3. "First Version of the Prototype – Story and Tasks". Each paragraph would introduce a new animal and was framed by an individual colour. The same colour would also be found on the marker. The reason for this choice was the design principle of *visibility*. The intention was that the colour would provide users with a visual clue of which marker to use for interaction. In addition, the illustration on the markers was added to the corresponding paragraph, so that the story would resemble a children's story, cf. Figure 4. The story was followed by four tasks; all tasks were so-called open questions, with no right or wrong answer. The intention was that these questions would stimulate cooperation and discussion between users.

¹³ Turbosquid.com (18.04.2011) <<http://www.turbosquid.com/Search/Artists/x3mer>>

Det er en mørk, men langt fra stille, aften i Zaza Zoo. Mens direktøren Sheila Sjiraff snorker høylytt fra direktørboligen, beveger noen seg i skyggene. Det rasler i løvet, det knirker i porten - det er fare på ferde.

Morgenen etter på andre siden av byen.

Privatdyredetektiven S. Nute tørker som vanlig sokkene sine i mikrobølgeovnen da det ringer på døren. Utenfor står assistenten hans, Polly, og sier: "Det er krise i Zaza Zoo! Fire dyr har forsvunnet i løpet av natten og Sheila Sjiraff holder på å slå knute på halsen, hun trenger hjelp straks!"



Figure 4: Excerpt from the story.

The colours that was used in the storybook was also applied to the markers. Although the guidelines recommended not using colour for markers, I found that BuildAR Pro did not have difficulties tracking markers with a little colour. The principle of *consistency* was the reason for this choice, as corresponding colour in paragraphs and markers would provide users with a visible and logical layout and structure. Markers were cut out and glued onto cardboard cubes, and a total of four cubes were prepared, cf. Figure 5. The reason for using a cube for the markers was the design principle of *affordance*, as a cube would encourage being picked up and interacted with.



Figure 5: Cubes of markers.

Once the markers were tracked and uploaded into BuildAR Pro, the 3D models in fbx-format

were added, cf. Figure 6. Once uploaded, the 3D models had to be rotated and scaled, in order to get the right size to suit the hand-held PC screen.

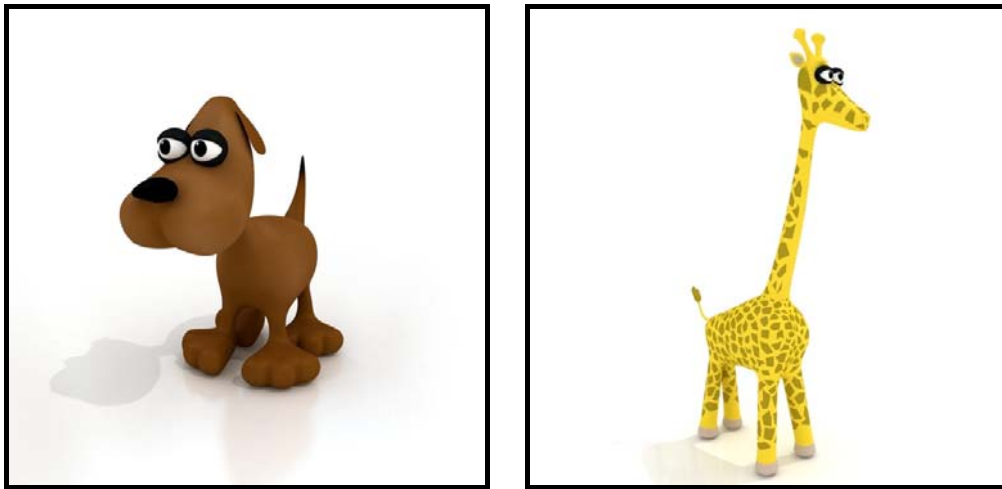


Figure 6: 3D models of S. Nute and Sheila Giraffe.

5.5.1 Evaluation by Focus Group

The main purpose of the evaluation of the first version of the prototype was to see how users would interact with the prototype. It was necessary at this point to explore if the system set-up would work sufficiently, as well as whether the prototype would provide data in order to address the research questions of this study. Prior to the evaluation the focus group received some information about how to use the equipment. They were also told to alternate between reading the story aloud and holding the hand-held PC-screen and cooperate solving the four tasks following the story, using the cube of markers.

The evaluation uncovered that some prototype elements worked sufficiently, whereas others needed alterations. One thing that seemed to work sufficiently was the interaction device. Users were able to track markers with the web camera and visualise the 3D objects on the PC screen, as intended. However, users commented that the PC-screen was a little heavy. Although this can be considered a usability issue that should be improved, it was not possible to replace this PC screen for this study. I also observed that the wires from the PC screen limited movement of the screen. Instead of passing the hand-held PC screen to each other, users actually changed places when they alternated holding the PC screen. A prototype element that users appeared to be content with was the story, as they confirmed

finding it both interesting and funny. A prototype element that needed further alternation was the cube of markers, as the cube of markers generated a usability issue that users found confusing. Depending on how users held the PC-screen in relation to the cube, several markers were identified at the same time and therefore several 3D models were visible on the PC screen. Users commented that this was confusing. Another prototype element that did not function as intended was the tasks and interactive sequences. The tasks did not provide users with a specific need for interaction with the 3D models, and users managed to solve all tasks using the markers. Tasks and interactive sequences will therefore be altered in the next version of the prototype.

5.6 Second Version of the Prototype

The evaluation by the focus group showed that some prototype elements functioned well, but most importantly it gave input to necessary changes to the prototype. Since the story received good feedback from the focus group, the layout and structure was not altered in the second version of the prototype. As the evaluation revealed, the tasks and interactive sequences had to be altered, as they did not provide users with a need to interact with the 3D models. That users interact with the 3D models during the tasks and interactive sequences is essential in order to be able to address the research questions of this study. In order to provide users with a clear need for interaction with the 3D models during the interactive sequences, information, in form of text such as the animal's hobby and age, was added to the 3D models. In addition, relating tasks to the text on the 3D models, tasks would also require users to explore the virtual 3D models, cf. Appendix 4. "Second Version of the Prototype – Story and Tasks".

One important area for improvement was the cube of markers, as the cube generated a usability issue with projected several 3D models at the same time on to the hand-held PC screen. In order to improve this, the markers were glued onto six different paddles, cf. Figure 7. Dünser et al. (2009) found that paddles' physical affordance encouraged interaction, and although users in their study interacted in front of the computer screen, it seemed like a reasonable design improvement for the prototype.



Figure 7: Paddle with marker.

5.6.1 Evaluation by Focus Group

The main purpose of the evaluation of the second version of the prototype was to see if the alterations made to the prototype would provide users with a need to interact with the 3D models, and as such provide data in order to address the research question of this study. Additionally, it was necessary to see whether the markers glued onto paddles would generate new usability issues.

Since the focus group already were familiar with the user interface of the prototype, it was not necessary to provide them with additional information. Observing the focus group's interaction it seemed as changes made to the tasks and interactive sequences made users interact with the user interface of the prototype in a natural way. I also observed that tasks that specifically asked for an exploration of a 3D model or for some kind for action to be performed, were the ones that amused users the most. These tasks will also provided data, which would be interesting when addressing the research questions of this study. I also observed that all tasks should be as short and clear as possible to avoid confusion and distraction; therefore all unnecessary text should be removed. Users found the paddles much easier to use; however, some usability issues were identified. For instance when users were asked to rotate a marker, they accidentally held onto the black frame of the marker, which made the 3D model disappear. Users seemed to understand quite quickly why the 3D

model disappeared and adjusted their grip and were then able to solve the task. Although being an improvement from the cube of markers, this indicates that the paddle is perhaps not ideal for this prototype.

5.7 Third Version of the Prototype

The third and final version of the prototype was the result of an iterative design process and evaluations by the focus group gave important input to design alterations of the prototype of the AR storybook. If I had let the focus group evaluate the prototype yet again, I am sure it would have resulted in further alterations. However, due to time limitations I had to settle with this version of the prototype for the evaluation.

In the third version of the prototype, the content of the story was still the same. However, the layout and structure of the storybook was altered. The format was smaller, towards A5, and each paragraph was presented on a separate page followed by a task and interactive sequence that were relevant to the content of that paragraph, cf. Figure 8. Colour still linked each paragraph in the story with the corresponding marker; this idea has been kept throughout the design process.

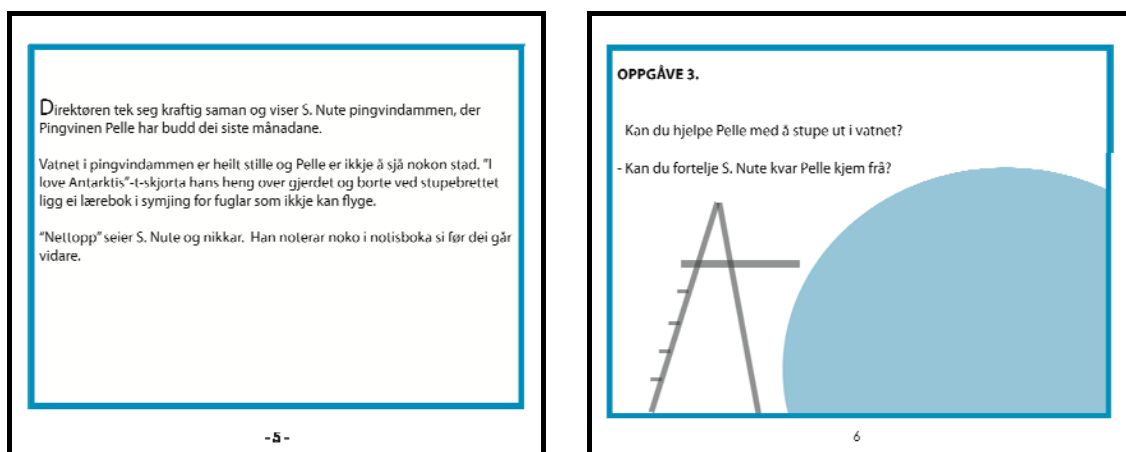


Figure 8: Paragraph with corresponding tasks and interactive sequence.

Tasks and interactive sequences had also been altered throughout the design process. The focus group's evaluation established that tasks that worked the best were tasks involving the added information on 3D models or tasks that required some action to be performed. This

knowledge was taken into consideration when designing tasks for the final prototype. In the final prototype tasks and interactive sequences were integrated into the storybook after each paragraph, and were designed in such a way that they required physical interaction with the user interface. A total of seven tasks and interactive sequences were designed and they were closely linked to the content of the paragraph and the new character that was introduced. The various tasks in the interactive sequences had ascending levels of difficulty, in order to naturally make users aware of the possibilities with the user interface. The reason for this choice was the design principle of *learnability*. Task one and two would allow participants to become familiar with the user interface of the prototype, and as such enable them to solve the following tasks, which also required them to perform some kind of action with the marker. Additionally, tasks three and six required including an illustration in the book, which would combine the physical element of the book with the virtual object. In addition some tasks required that information placed on the virtual 3D model were used. Task seven was intended to be the most difficult tasks, and sought to reveal what users had learned about interaction with the user interface of the prototype. For the story and tasks and interactive sequences see Appendix 5. "Third Version of the Prototype – Story and Tasks".

The shape of the markers was altered during the design phase, from a cube to a paddle. The design of the paddles was not suitable for this prototype, and its affordance were probably more suitable for interaction in front of a computer screen. I therefore decided to redesign the marker in the final version of the prototype. This time markers were glued across square bits of cardboard, and were shaped like a star, cf. Figure 9. This way there were edges available to grab hold of on all sides of the marker. The intention was that the affordance of the star shaped marker would enable users to have a natural and flexible interaction, without holding on to the black frame of the marker.



Figure 9: Star shaped marker.

The 3D models attached to the markers had been kept the same throughout the design phase. However, evaluation by the focus group revealed that adding text to the 3D models made interaction with them more amusing. Therefore, in the final prototype information in the form of text, such as the animal's name, nationality and age, was added to the 3D models, cf. Figure 10. And this information was something that users would have to use in order to be able to solve tasks. In addition, in order to make the 3D models even more interesting and amusing for users, a suitable sound effect was added to all 3D models. The children in the focus group provided the voice for the pet detective S. Nute and the giraffe Sheila: all other sound effects were downloaded from the Internet. Apart from the sound effects for the pet detective S. Nute and the sheep Bertil, the sound effects were related to the tasks users will be asked to solve.



Figure 10: 3D model of Pelle with added text.

6. Evaluation

This chapter outlines and describes how the evaluation of the prototype was conducted.

As mentioned previously, an essential element of interaction design is to evaluate the artefact in order to ensure that the product or artefact meets the user's needs, as well as identifying areas for improvement. The evaluation of the prototype of the AR book will be based on the method of usability testing, as outlined by Heim (2007) in section 4.4 "Usability Testing", but with some necessary adaptation. The main objective of the evaluation is to gather data which will make it possible to address the research questions of this study, namely explore various aspects of children's interaction with the AR book.

6.1 Preparations

The following section describes the various elements that were considered and prepared prior to the evaluation.

6.1.1 Participants

It was important that the participants in the evaluation represented the target group of the prototype, namely nine- to ten-year-old children. Through a friend who is a teacher I got in touch with a 4th grade at a local primary school that would like to participate in the evaluation. The class consisted of a total of 21 children, aged eight and nine. It was therefore suitable to divide the class into two groups: a test group consisting of ten pupils and a reference group consisting of eleven pupils.

It was also considered important that all children would be able to try using the AR technology, so that they would not experience being treated differently. It was therefore decided that participants in the reference group were to interact with the prototype of the AR book after the test group, and that these results would not be documented or included as part of the evaluation.

6.1.2 Consent Form

Since the participants of this evaluation were children, ethical consideration prior to the evaluation was necessary. One crucial thing was informing parents about the project and ensuring them that it would be entirely safe for their children to participate in the evaluation. It was emphasised that all data that was gathered during the evaluation would be handled confidentially and would under no circumstances identify the children. The teacher informed parents about the project at a class conference and through the class' week plan. Parents had to sign a consent form, which documented that their child was allowed to participate in the evaluation, cf. Appendix 6. "Consent Form". It was decided that children whose parents did not sign the consent form would be placed in the reference group.

6.1.3 Location

Usability tests are usually conducted in laboratories, however, regarding that the participants of this usability study were children it was considered important to provide participants with a natural environment. Alternative locations available at the school was carefully discussed and considered with the teacher. In order to make the children feel as safe and comfortable as possible during the evaluation, it was decided to conduct the evaluation in the children's classroom with their teacher present.

6.1.4 Task List

The task list for the test group corresponds with the tasks and interactive sequences in the storybook:

1. Can you describe S. Nute?
2. Can you explain to S. Nute what Sheila Giraffe is saying?
3. Can you help Pelle dive into the water?
Can you tell S. Nute where Pelle is from?
4. Can you help Leo dance to the music?
Can you tell S. Nute where Leo is from?
5. Can you help Elena do a pirouette?
Can you tell S. Nute where Elena is from?

6. Can you help Bertil jump over the fence?
Can you tell S. Nute where Bertil is from?
7. Can you find out how old Pelle, Leo, Elena and Bertil are and sort them from the youngest to the oldest?
Can you see all animals on the screen at the same time?

The task list for the reference group corresponds to the tasks in the adapted version of the storybook, cf. Appendix 7. “Adapted Version of the Prototype – Story and Tasks”.

1. What is the pet detective called and what do you get to know about him?
2. Who shows the pet detective around in Zaza Zoo?
3. What are the four missing animals called?
4. Does the pet detective find any clues at the different crime scenes?
5. Where does the pet detective think the missing animals are?

Observations of participant’s interactions will be videotaped and the evaluator will make notes during the usability study. Afterwards all participants will be asked to answer a questionnaire, and the test group will be asked to participate in a short group conversation.

6.1.5 Time Schedule

A time schedule was drafted for both the test group and the reference group, in order to get a detailed overview of the time aspect of the usability study.

Time schedule for the test group:

- 08:30-09:00: Preparations
- 09:00-09:20: Participant 1 and 2
- 09:20-09:40: Participant 3 and 4
- 09:40-10:00: Participant 5 and 6
- 10:00-10:40: Participant 7 and 8
- 10:40-11:00: Participant 9 and 10
- 11:05-11:15: Answer questionnaire and group conversation with all participants
- 11:15-13:00: Regular class

Time schedule for the reference group:

- 08:30-09:00: Read adapted version of the storybook + answer questionnaire.
- 09:00-10:40: Regular class
- 11:15-13:00: Test of prototype (results of this will not be included in the evaluation)

6.2 Conducting the Evaluation

The first half hour of the day was spent preparing the children for the day and the evaluation, cf. time schedule. The children were given an individual number and divided into two groups. The children also received some information about the evaluation, for instance that they were going to take part in a reading project, where they were going to read a storybook and solve tasks making use of a special computer program. The children were shown a marker and told that they would be able to find information on the marker that they would need for solving tasks. In addition, the children were told that they could choose either to read the story aloud themselves or have the story read for them, as well as if there were words in the storybook that they did not understand, they could ask what they meant.

6.2.1 The Set Up

The equipment was set up as during the evaluation with the focus group, as that had proved to work satisfactorily. In addition, markers were placed on a piece of paper so that it would be easy to get an overview of the different markers. As mentioned previously, it was decided to conduct the usability test in the classroom and screens were set up in order to prevent the other children in the test group from watching the evaluation, cf. Figure 11.



Figure 11: Set up for usability test

6.2.2 Video Recording

In order to support the evaluator's observations and capture dialogue between participants during the evaluation, the test group's sessions was videotaped using a simple video camera. The video was transcribed using the software Inqscribe¹⁴, which lets one view the video while inserting time codes and relate them to the video. Dialogue between participants and evaluator as well as sound made by the virtual objects is transcribed to detail, however, all personally identifiable information and dialogue is removed. Participant's number refers to the different participants. The video will not be made available due to privacy concerns of participants. Transcription is available in Norwegian, cf. Appendix 9. "Transcription of dialogue".

6.2.3 Group Conversation

In order to see how the children would explain their experience with the prototype of the AR book, a short group conversation was held with the test group right after the usability test. The children were having their lunch break at this time and were therefore sitting at their original places in the classroom, while I was asking them three questions which had been prepared in advance. Their teacher was, as during the usability test, present during this conversation. The conversation was about ten minutes long.

¹⁴ InqScribe: <<http://www.inqscribe.com/>>

The questions the participants were asked:

1. What did you like best about the story/tasks?
2. Was there anything that was difficult?
3. How would you explain to your parents or best friend what you have done today?

6.2.4 Questionnaire

In order to get the participant's subjective opinion about the prototype of the AR book a questionnaire, which was prepared in advance, was handed out. Both the test group and the reference group answered the same questionnaire, in order to see whether participants' answers would result in any significant difference in replies between these two groups. The questionnaire asked only a few questions, made use of simple language and used scales in form of smiley faces, cf. Appendix 8. "Questionnaire".

7. Findings

In this chapter the most important findings regarding the research question of this study is presented.

The overarching research question of this study is “How do children interact with AR books?” and in order to provide answers to that question, different aspects of children’s interaction needs to be explored separately. Findings are therefore presented according different aspects of children’s interaction, where each section corresponds to a specific research question, as outlined in section 1.1 “Problem Area and Research Questions”. In addition qualitative data from the questionnaire will be presented.

Findings are based on the evaluator’s observations of the participants’ interaction with the prototype of the AR book during the evaluation. Observations are supported by transcripts of the video, which document dialogue between participants during the evaluation. Quotes that are presented are related to participants and time codes. For the entire dialogue in context see Appendix 9. “Transcription of Dialogue”.

7.1 Physical Aspects of Interaction

In this section findings related to the research question “How do children interact with the physical elements of AR books?” are presented. There are three elements in the user interface of this prototype that require physical interaction, namely the hand-held PC screen, the storybook and the markers.

7.1.1 The Hand-held PC Screen

As the focus group already had pointed out, the hand-held PC screen was a little bit heavy, particularly if held for a long time. None of the participants in the usability test made any comments or remarks about this. However, observations of participants’ interaction with the user interface suggest that it is likely that the weight of the PC screen in addition to the wire from the PC screen limited a more flexible interaction.

The participants differed as to how much they actually interacted with the hand-held PC screen and it varied how much they moved it. Some movement of the hand-held PC screen was necessary in order to create a wide enough range for the web camera to identify the marker. Most of the participants were able to widen the range by lifting up the hand-held PC screen during the interactive sequences and solved most tasks sitting by the table. However, some of the participants would sometimes stand up in order to create distance to the marker. Participants one and two solved all tasks sitting by the table. Participant three frequently stood up throughout the session and for task seven both participants three and four were standing on their feet. Participants five and six, participants seven and eight, and participants nine and ten sat by the table during the entire session, apart from task seven, when they got up on their feet in order to view several markers on the hand-held PC screen at the same time.

Due to the web camera attached to the front of the hand-held PC screen, the PC screen had to be placed in upright position between the interactive sequences. This caused BuildAR Pro to identify markers in between the interactive sequences as well. Additionally, during the interactive sequences the web camera would quite frequently pick up markers that were not in use at that specific time, because the marker was within the range of the web camera. This projected the corresponding 3D models onto the PC screen and made the sound attached to the 3D models audible. Understandably, this distracted the participants, and some of them made comments about their observations (cf. quote 1 and 2).

Quote 1: [00:14:27] Participant 5: It looked like a tiny one who jumped around...
[00:14:31] Evaluator: Mmm.
[00:14:32] Participant 5: It did, hihi.
[00:14:32] Bertil: Baaaaaa.
[00:14:36] Participant 5: He jumped over the fence, and then there was a tiny one as well.

Quote 2: [00:06:11] Participant 10: There is a sheep.
[00:06:15] Participant 10: I can see a sheep.
[00:06:24] Bertil: Baaaaaa.
[00:06:25] Participant 10: The sheep makes a sound.

During the group conversation when the participants were asked if there was anything that they found to be difficult using the prototype, two replies were related to physical interaction with the hand-held PC screen. Participants answered:

- To get everything into the picture, sometimes.
- Holding the PC screen still.

7.1.2 The Storybook

Reading the story also required physical interaction, but as the story was presented in the form of a storybook, a traditional medium which children are familiar with, interaction with this element was unproblematic. When it came to using illustrations in the storybook in order to solve tasks, thus combining the physical book and the virtual object, for instance using the pond in task three and the fence in task six, the participants did this at a varying degree. This issue will be covered in section 7.2 “Cognitive Aspects of Interaction”.

7.1.3 The Markers

The third element of the prototype, which requires physical interaction were the markers. Interaction with the actual markers was not difficult for the participants; however, a weakness with marker-based AR is the actual marker. In order to get a visual, one cannot obscure the black border around the marker while holding it. Most of the participants understood this relatively quickly and made use of the white edges around the marker when interacting with it.

Even when the participants would hold on to the white edges of the marker, they sometimes accidentally placed their hands in front of the range of the web camera, thus hindering tracking of the marker, causing participants to lose the visual of the virtual objects (cf. quote 3).

Quote 3: [00:11:13] Elena: Drum roll.

[00:11:17] Participant 6: The hand gets in the way.

[00:11:19] Evaluator: Does it.

[00:11:20] Participant 6: I can see it. Can you take it?

Another issue with the marker being of paper glued onto cardboard, is that it is quite vulnerable for damage. One incident, which fortunately did not occur until the very end of participant nine and ten's session, was that one marker got slightly folded, which made the marker impossible to track; therefore the participants were unable to visualise the 3D model and thus unable to solve the task (cf. quote 4).

Quote 4: [00:15:05] Evaluator: Elena has been folded a little.
[00:15:09] Participant 10: It has been folded.
[00:15:19] Participant 10: Do you think so?
[00:15:23] Evaluator: It doesn't show because it has been folded.
[00:15:25] Participant 10: Oh, yes.
[00:15:27] Evaluator: You managed to do it, apart from the elephant.

Light from the ceiling and from the window also caused a reflection on the marker, making it difficult to get a visual of the virtual content on the marker. This was particularly an issue with participants one and two (cf. quote 5). During their session curtains were drawn in front of the windows and the light in the ceiling was turned off, so it became less of a problem for the following participants. However, the issue reoccurred a few times, for instance with participants five and six (cf. quote 6).

Quote 5: [00:11:03] Participant 2: Nothing happens.
[00:11:08] Evaluator: It's probably because of the light (draws the curtains).
[00:11:23] Participant 2: Does it come?
[00:11:24] Elena: Drum roll.
[00:11:26] Participant 2: Yes.

Quote 6: [00:13:52] Participant 5: No, we can't get him in.
[00:13:56] Evaluator: No, it's because of the light... (moves the curtain).
[00:14:03] Participant 6: Like that, now it's ok.
[00:14:14] Participant 5: I can't do it.
[00:14:17] Bertil: Baaaaaa.

7.2 Cognitive Aspects of Interaction

In this section findings related to the research question “Do children understand how to interact with AR books?” are presented. All of the participants were given some explanation about usage of the element of the user interface of the AR book prior to task one. The ascending level of difficulty in the interactive sequences, were also meant to help enable the participants with interaction possibilities within the user interface. Findings showed that most of the participants would understand rather quickly how to interact with the user interface. Two kinds of tasks in the interactive sequences will be looked at in regard of cognitive aspects of users’ interaction; firstly the tasks that required a particular action with the marker and secondly tasks that required that participants identified and used information placed on 3D models.

7.2.1 Performing Actions with the Marker

In task three the participants were asked to help the penguin Pelle dive into the water. The intended action was to drop or place the marker of Pelle into the pond on page six in the book and in this way combine the illustration in the book with the virtual object, or perform an action with the marker that would resemble a dive. Participants chose to solve this task in three different ways. The most common interaction was to place the marker in the pond, which participants one and two, participants three and four, and participants seven and eight did (cf. quote 7). Some of the participants repeated this action several times before they were content with the way they solved the task. Participants five and six chose to place the marker on the table and commented that they could not see Pelle diving, but could only hear it (cf. quote 8). Participants nine and ten kept the marker in the air, but heard the splashing sound and were content that they had solved the task.

Quote 7: [00:05:55] Participant 3: It is supposed to be that (points to the book).
[00:05:55] Participant 4: There.
[00:06:01] Participant 4: I know where we can put him.
[00:06:03] Pelle: Splash.
[00:06:05] Participant 3: Like that, haha.
[00:06:06] Participant 3: Wait, can we do like this?
[00:06:14] Participant 4: I don’t think that is possible.

[00:06:15] Participant 3: Yes, wait.
[00:06:16] Pelle: Splash.
[00:06:17] Participant 3: Oh yes.
[00:06:18] Participant 4: Hahah!
[00:06:19] Evaluator: Great!
[00:06:20] Pelle: Splash.
[00:06:21] Participant 3 and 4: Hahahaha.

Quote 8: [00:05:31] Pelle: Splash.
[00:05:43] Pelle: Splash.
[00:05:46] Evaluator: Can you see in the screen that he dives into the water?
[00:05:51] Pelle: Splash.
[00:05:52] Participant 5: No, we can only hear it.

In task four the participants were asked to help the lion Leo dance to the music. The intended action was to move the marker to the rhythm of the song from The Lion King, which was added to the marker. Everyone managed to get a visual of the 3D object quickly and was amused by the music, however, no one attempted any action straight away. Since of the participants seemed to be content with watching the 3D model and listening to the music, I asked a follow-up question to all of the participants about whether they thought Leo was dancing or how they could get him to dance. After this question the participants attempted three different ways of interaction in order to get Leo to dance. For instance, participants one and two and participant nine and ten decided to move the marker and were content with solving the task. Participants three and four first tried ordering Leo to dance, then tried to move the table before they decided to move the marker. Participants five and six solved the task by moving the hand-held PC screen and were content with how they solved the task. Participants seven and eight first attempted moving the PC screen, but said that this didn't make Leo dance, and thereafter made Leo dance by moving the marker (cf. quote 9.).

Quote 9: [00:06:45] Participant 8: Um, hehe.
[00:06:51] Evaluator: Does he move?
[00:06:51] Participant 8: No.

[00:06:53] Evaluator: No, what can you do to get him to move?
[00:06:53] Leo: Music from The Lion King.
[00:07:00] Participant 8: Um, I don't know.
[00:07:04] Participant 7: Um....
[00:07:09] Leo: Music from The Lion King.
[00:07:10] Participant 7: Yes.
[00:07:12] Participant 8: Hehe.
[00:07:14] Evaluator: We did it.
[00:07:17] Participant 8: Yes.

In task five the participants were asked to help the elephant Elena do a pirouette. The intended action with the marker was to rotate it carefully around, while holding on to the white edges on the marker, without losing the visual of the virtual 3D object. The participants actually tried three different ways of interaction attempting to solve this task. Participants one and two rotated the marker carefully, but managed only to get it halfway around before the visual of the 3D model was lost, and they concluded that this was a difficult task. Participants three and four, and participants seven and eight managed to move the marker carefully all the way around, as intended, and they did in fact manage to rotate the marker several times. Participants five and six first tried to move the PC screen, but realised it was not possible to solve the task that way. Participant six attempts solving the tasks, before participant five solves the task successfully. Participants nine and ten did not move the marker at first, but instead of rotating the marker they do a forward flip. The visual of the 3D model was lost and the participants reckoned they had not solved the task (cf. quote 10).

Quote 10: [00:08:13] Participant 9: I'm just going to turn him.
[00:08:14] Participant 10: Further away.
[00:08:18] Participant 9: Turn him, like this.
[00:08:21] Elena: Drum roll.
[00:08:34] Participant 10: He disappeared.
[00:08:35] Evaluator: Yes.
[00:08:38] Elena: Drum roll.
[00:08:39] Participant 9: No, I can't...

[00:08:47] Participant 9: He disappeared.

[00:08:47] Participant 10: Hehe.

[00:08:48] Participant 10: It's not possible.

[00:08:50] Participant 9: Hihi.

In task six the participants were asked to help the sheep Bertil jump over a fence. The intended action was to use the illustration of the fence in the storybook and move or jump the marker across, and in this way combine the illustration in the storybook with the virtual 3D model. All participants solved this task as intended using the illustration in the book, but some of the participants were unsure if they had solved the task correctly. Participants one and two used the fence in the book and solved the task as intended, but continued to move the marker back and forth across the fence and commented that the sheep did not want to jump (cf. quote 11). Participants three and four solved the task using the fence in the book, and even though participant four was unsure that they had solved the task, participant three quickly confirmed that they had. Participants six and seven experienced some difficulties with the marker; due to reflection from the light they did not get a visual of the 3D model at first, but they did not give up and completed the task after some time. Participants seven and eight flipped the marker over the fence so it really looked like he did jump. This action was repeated several times and both participants were happy about the way they solved the task. Participants nine and ten wondered how they were going to solve the task because there was no fence, so the evaluator suggested they use the fence in the storybook, and after that they solved the task.

Quote 11: [00:13:05] Bertil: Baaaaaa.

[00:13:10] Participant 2: Lift him carefully.

[00:13:15] Participant 1: No.

[00:13:18] Participant 2: No, he disappears.

[00:13:22] Bertil: Baaaaaa.

[00:13:24] Participant 2: Maybe you could push him over the fence. Just straight over.

[00:13:31] Bertil: Baaaaaa.

[00:13:35] Bertil: Baaaaaa.

[00:13:41] Participant 2: Hahaha.

[00:13:47] Participant 2: Come on!

[00:13:49] Participant 2: He doesn't want to jump over the fence.

[00:13:55] Bertil: Baaaaaa

During the group conversation when asked the participants were asked if there was anything that they found to be difficult, two answers were related to performing an action with the marker. The participants answered:

- Getting the sheep to jump.
- Getting the elephant to do a pirouette.

7.2.2 Using Information on 3D Models

As part of task three, four, five and six, the participants were asked to tell the main character S. Nute where the different animals came from. Information about the animal's nationality was placed on the 3D models as text and was not to be found in the storybook. In order to solve these tasks, it required that the participants would use the information on the virtual 3D models. When it came to discovering and using this information for solving these tasks, some of the participants understood this instantly, whereas others used more time before they realised where to find the this information.

Both participants one and two discovered the information on the marker already in task three and when asked where the animals were from in the following repetitive tasks, they knew instantly where to look and simply read the answer aloud from the 3D model.

Participants three and four did not realise where to find this information at first. In task three they simply guessed the correct answer. In task four they also tried to guess the correct answer, but without luck. The evaluator asked a follow-up question, which made the participants look at the marker again. When they discovered the text on the virtual 3D model they were able to give the correct answer. For task five participants four were able to give the correct answer instantly, but participant three just looked puzzled. For task six participant three continued to guess the answer, but participant four knew how to solve the task (cf. quote 12).

Quote 12: [00:14:02] Participant 3: From Norway.
[00:14:02] Participant 4: Where Bertil is from?
[00:14:05] Participant 3: Could come from Norway.
[00:14:07] Participant 4: Do it again.
[00:14:09] Participant 3: What? No, I will. Okay.
[00:14:13] Bertil: Baaaaaa.
[00:14:14] Participant 4: Sauda.
[00:14:16] Participant 3: Sauda.
[00:14:17] Evaluator: Correct. Yes, great.

Participants five and six did not realise where to find this information at first. In task three they gave the correct answer, but it was difficult to assess whether they just guessed the correct answer or if they picked up this information while interacting with the marker. For task four they were unable to give the correct answer and did not know how to solve it. After a follow-up question from the evaluator they picked up the marker again and were able to give the correct answer. In task five participant five gave the correct answer instantly and explained where this information was to be found (cf. quote 13), and in task six both participants showed that they had understood how to solve the task.

Quote 13: [00:11:47] Participant 5: India.
[00:11:50] Evaluator: India, yes.
[00:11:50] Participant 5: I read it there.

Participants seven and eight did not discover the added information on the virtual 3D models straight away. They gave the correct answer to task three, however, it was difficult to assess whether they just guessed the answer or if they had actually read the information on the virtual 3D model. In task four they tried to guess the correct answer, and confirmed that they had not seen the added information while interacting with the marker. After a follow-up question from the evaluator they looked at the marker again and were able to give the correct answer. In task five participant seven was aware of the added information and gave the correct answer before the question was even asked and while participant eight was occupied with performing a pirouette with the marker. For task six both participants illustrated knowledge about how where to find this information (cf. quote 13).

Quote 14: [00:10:39] Participant 8: Then we have to look at it again.
[00:10:43] Bertil: Baaaaaa.
[00:10:44] Participant 7: Bertil. Um, Sauda.
[00:10:46] Participant 8: Sauda.
[00:10:47] Evaluator: Sauda, yes.

Participant nine gave the correct answer to task three immediately, but it was difficult to assess whether this was simply a good guess or the information on the virtual 3D model had been discovered. However, participant nine's quick response with the correct answer was repeated in task four and it was obvious that the participant's information was obtained from the virtual 3D model. Participant ten seemed unaffected. For task five participant nine yet again gave the correct answer; however, this time participant ten also saw the information. For task six participant nine gave the correct answer yet again, and even though participant ten saw the information in the previous task, the participant was unsure how participant nine was able to give the correct answer (cf. quote 15).

Quote 15: [00:10:48] Evaluator: Next task. Can you tell S. Nute where Bertil comes from?
[00:10:50] Participant 10: Em.
[00:10:50] Participant 9: Sauda.
[00:10:52] Evaluator: Sauda, yes.
[00:10:53] Participant 10: How do you know?
[00:10:54] Participant 9: Because I see it there.
[00:10:54] Bertil: Baaaaaa.
[00:10:55] Participant 10: Oh yes, Sauda.

In task seven, which was the last task, the participants would have to demonstrate what they had learned about interaction with the user interface of the prototype during the session. They were asked to find out how old Pelle, Leo, Elena and Bertil were and then sort them according to age from the youngest to the oldest. The participants had to identify the correct characters, find how old they were and then sort them. Following this tasks the participants were asked to see whether they would be able to see all the animals in the PC screen at the same time. This would require that the markers were placed close together,

but not so as close that they would overlap. All pairs were able to solve these two tasks, although different interaction approaches were used.

Participants one and two first checked all markers in order to identify the correct animals, then checked their age and finally sorted the markers correctly. When asked to look at all animals in the PC screen at the same time, they chose to look at the four markers they had just sorted. They placed them close together, and participant two demonstrated knowledge about not covering the black border around the markers (cf. quote 16).

Quote 16: [00:18:13] Participant 2: Put them together.

[00:18:15] Participant 1: Like this.

[00:18:18] Participant 2: Um, we need to see all the lines.

Participants three and four checked all markers in order to find the correct animals, found the animal's age and then sorted them correctly. They picked up all six markers when asked if they could see all animals on the PC screen at the same time. They did not manage this at first attempt, but after some rearranging of the markers they got a visual of all animals on the PC screen.

Participants five and six picked up the correct markers instantly, checked their age, and sorted them correctly. When asked to look at all markers at the same time on the PC screen they used the four markers that they had already sorted. At first they only got a visual of two of the markers, but after some rearranging of the markers they managed to see all the animals on the PC screen.

Participant eight was unsure of how to find the animal's age, but participant seven knew where to find this information (cf. quote 17). They picked up the correct markers right away, found the information they needed on the markers and sorted them correctly. When asked to look at all markers on the PC screen at the same time they picked up all six markers. They did not get a visual of all animals right away, but they kept rearranging the markers until they got a visual of all the animals on the PC screen.

Quote 17: [00:11:56] Participant 8: How can we see who is the oldest?

[00:11:59] Participant 7: We can see it there.

[00:12:01] Participant 7: There's a number there.

Participants nine and ten picked up the correct markers right away, but participant ten was unsure of how they would find out how old the animals were. They sorted them correctly while keeping the visual of the four animals on the PC screen. When asked to look at all animals on the PC screen at the same time, participant nine quickly placed the two remaining markers next to the others on the table. They managed to get a visual of all animals but one, so they rearranged the markers. While rearranging the markers, one marker probably got slightly folded and was for this reason impossible to get a visual of (cf. quote 4).

7.2.3 Explaining Interaction

Some of the participants tried to explain their interaction with the user interface of the prototype and related this to technology that they were already familiar with or which they found the equipment to resemble (cf. quote 18, 19 and 20).

Quote 18: [00:07:55] Participant 3: It's TV.
[00:07:57] Participant 3: TV.
[00:07:59] Evaluator: Are you ready for task four?
[00:08:00] Participant 4: Yes.
[00:08:02] Participant 3: We are watching TV now.

Quote 19: [00:01:13] Participant 7: Are we going to film that one?
[00:01:14] Evaluator: Mmmm.
[00:01:25] Participant 8: Like this?
[00:01:26] Evaluator: The whole marker must show on the screen.
[00:01:29] Participant 8: Like this!

Quote 20: [00:01:07] Participant 9: Are we supposed to film?
[00:01:11] Evaluator: Yes, the marker.
[00:01:18] Participant 10: Yes.

During the group conversation the participants were asked how they would explain what they had taken part of today to either their parents or their best friend. This question was asked in order to see how the participants would explain their experience with the prototype of the AR book and to see what they associated the experience with. The participants replied:

- I have been in a top-secret project.
- It was a computer program and cards with animals, and the animals came out of the cards.
- It was really fun.
- It was about animals.
- A reading project.
- 3D fairy tale, where we read and solve tasks.

7.3 Emotional Aspects of Interaction

In this section findings related to the research question “How do children experience interaction with AR books?” are presented. Observations established that most the common emotions were joy, excitement and satisfaction, although emotions such as curiosity and frustration were also identified.

All of the participants showed joy and excitement at some point while interacting with the prototype. Although the participants expressed these emotions mostly during the interactive sequences and while interacting with the user interface, they also smiled and laughed while reading the story. Whereas most of the participants showed joy and excitement through facial expressions and laughter, some of the participants also expressed themselves verbally. For instance, participant ten smiled throughout the entire session and expressed joy and excitement several times (cf. quote 21).

Quote 21: [00:01:50] Participant 10: Hahaha.
[00:01:50] Participant 10: Cool.
[00:03:08] Participant 10: I liked it.
[00:04:36] Participant 10: Again!
[00:04:39] Participant 10: Hahaha.

[00:05:48] Participant 10: Yes, I'm ready.

[00:12:43] Participant 10: Cool.

Most of the participants showed satisfaction when they had, or believed they had, solved a task during the interactive sequences (cf. quote 22).

Quote 22: [00:06:33] Pelle: Splash.

[00:06:33] Evaluator: Have you helped Pelle dive into the water now?

[00:06:33] Participant 1 og 2: Mmmm, yes (and nodding).

Participant three showed a particular curiosity when it came to exploring interaction possibilities with the user interface of the prototype. This resulted in much more experimenting and playful interaction than the other participants. Most of participant three's experiments took place just before or after tasks (cf. quote 23).

Quote 23: [00:06:35] Participant 3: Can I try something?

[00:06:37] Participant 3: See if he can fly.

[00:06:42] Participant 3: He doesn't want to fly.

[00:06:43] Pelle: Splash.

[00:06:44] Participant 4: He flies!!

[00:06:46] Participant 3: He fliieees!

[00:06:48] Pelle: Splash.

[00:06:49] Participant 3: Hahahaha.

[00:06:51] Participant 4: And you who said he couldn't fly.

[00:06:52] Participant 3: Haha.

However, participant three's curiosity caused his partner some frustration, as participant four was more interested in solving tasks correctly than his partner (cf. quote 24).

Quote 24: [00:01:25] Participant 4: Don't do it like that.

[00:01:27] Participant 3: Why. I'm going to crush him. Da, da, dush, dush.

[00:01:30] Participant 4: Stop it!

The very first question the participants were asked during the group conversation was what they liked best about the story and the tasks. This question was asked in order to get information about what the participants thought about the prototype immediately after interacting with it. The participants replied:

- Pelle and Leo (mentioned by all 10 participants).
- Finding out fun things.
- Reading and solving tasks.
- Seeing how the animals came out from the cards.
- That the story was about animals and not humans and problems.

7.4 Social Aspects of Interaction

In this section findings related to the research question “Does the use of AR books stimulate cooperation between users?” are presented. Interaction with the user interface of the prototype of the AR book required collaboration between users. In order to solve tasks during the interactive sequences the participants had to cooperate, where one participant would have to hold the PC screen and the other would have to hold and interact with the marker. All of the participants held and interacted with the hand-held PC screen at some point, although, some participants found a pattern where one participant would hold the PC screen and the other would interact with the markers. It also varied how much the participants would communicate and well they would cooperate.

Participants one and two communicated and cooperated well throughout the session. They alternated holding the PC screen and interacted with the marker nicely, and sometimes they even alternated holding the PC-screen without talking about it. They also helped and guided each other while solving tasks (cf. quote 11).

Participants three and four struggled a bit more cooperating. One reason for this was that they often had different approaches as to how they believed things should be solved, and as mentioned previously participant three’s curiosity about the prototype caused participant four some frustration. Therefore they would often discuss how they should solve things and who was going to do what, and the evaluator often had to remind them that they would

have to share (cf. quote 25). However, it must be mentioned that cooperation between the two participants got better at the end of the session.

Quote 25: [00:09:25] Participant 4: I can do it.
[00:09:26] Participant 3: No I, please.
[00:09:31] Participant 3: Look how cool he is!
[00:09:34] Evaluator: You have to share, right.
[00:09:36] Participant 3: You can hold it.

Participants five and six cooperated well, but did not communicate much during the interactive sequences. However, they ended up in a pattern where participant five mainly held the PC screen and participant six interacted with the marker. Although they did alternate as well, for instance when participant six was unable to solve a given task and participant five wanted to try.

Participants seven and eight communicated and cooperated well. Although, participant seven mainly held the PC screen and participant eight interacted with the marker throughout the session, they alternated as well. Although they did not communicate a lot, they did provide each other with explanations a few times (cf. quote 17).

Participant nine and ten cooperated well, but had some difficulties with communication. Whereas participant nine mainly held the PC screen participant ten interacted with the markers; however, they alternated when participant ten was unable to solve tasks. Participant nine often guided participant ten, explaining what needed to be done in order to solve tasks (cf. quote 26.). However, when participant ten was able to solve tasks alone, this was done without participant ten's participation (cf. quote 15).

Quote 26: [00:10:28] Participant 9: You have to kind of take it over.
[00:10:30] Participant 10: That is what I am doing.
[00:10:32] Participant 9: Em, not like that.
[00:10:33] Participant 9: Take it over.
[00:10:41] Participant 10: Like this?
[00:10:44] Bertil: Baaaaaa.

[00:10:47] Participant 10: Hah, a jump.

7.5 The Questionnaire

Both the participants in the test group and in the reference group were asked to answer a short questionnaire, consisting of the same questions. The intention of giving the two groups the same questionnaire was to see whether there would be any significant difference in their replies, considering that the test group had interacted with AR technology whereas the reference group had not. The questionnaire consisted of only a few questions and in the following section the result will be presented. Also note that the test group consisted of ten participants and the reference group of eleven participants.

The participants were first asked to provide their participant number and their age, so that it was possible to trace a particular participant and compare the age composition of the test group and the reference group. The results show, cf. Diagram 1, that the groups were more or less even regarding participants' age, although the participants in the reference group had a higher average age than the test group.

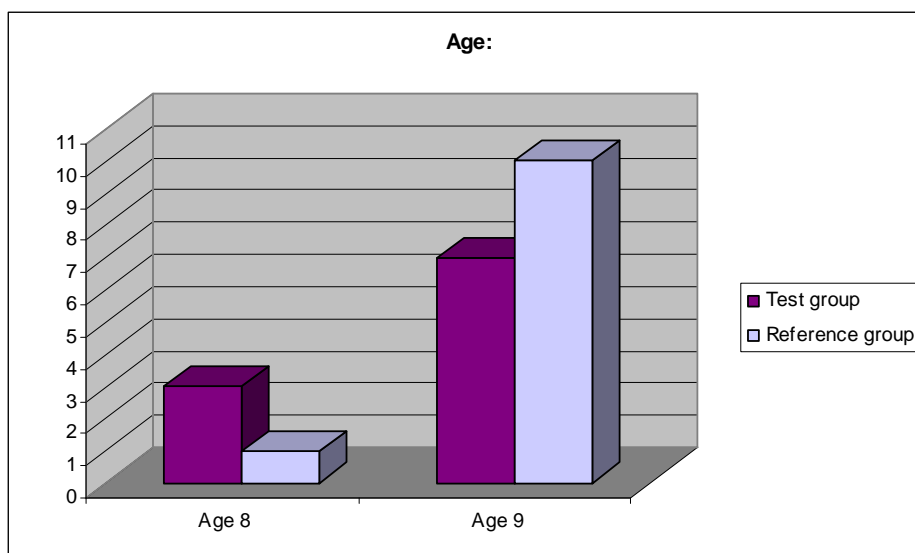


Diagram 1.

To the question "How well did you like the story?" the participants' answers show, cf. Diagram 2, that the participants in the test group and in the reference group liked the story

well. Altogether seven participants in the test group answered 6, which were the highest score possible, whereas the replies from the reference group seemed to be more evenly divided between the 5 and 6, the two highest scores possible.

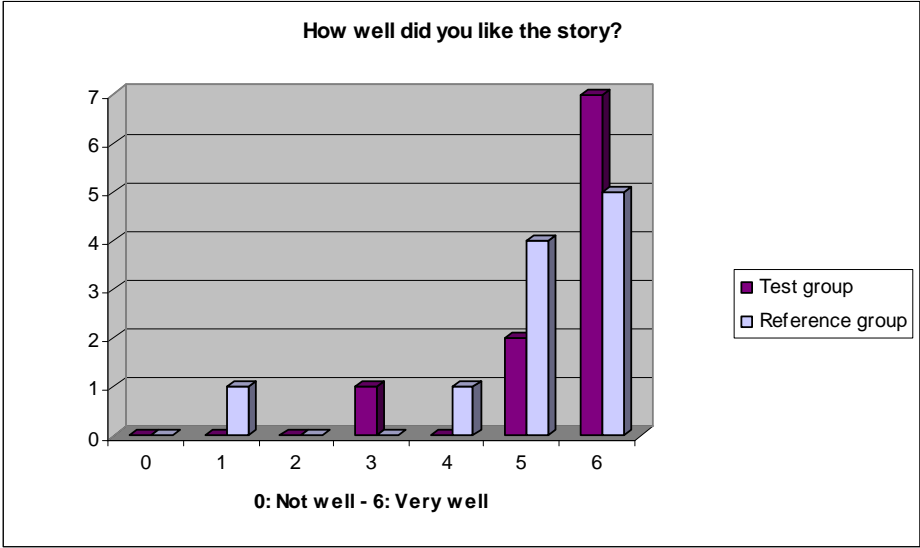


Diagram 2.

To the question “How easy did you find solving tasks?” the participants’ answers show, cf. Diagram 3, that the participants in the test group and in the reference group are more evenly divided on the scale, as answers range from 2 to 6.

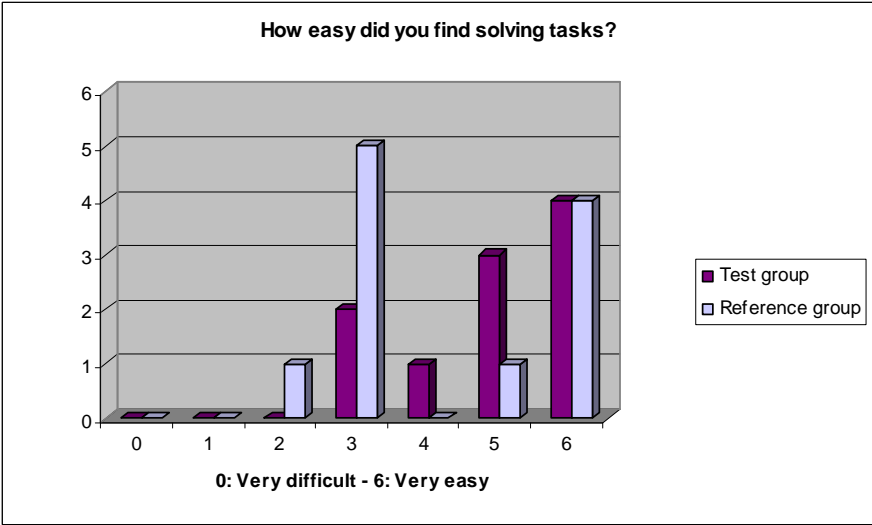


Diagram 3.

To the question “What was your favourite animal in the story?” the participants’ answers show, cf. Diagram 4, that the participants in the test group and in the reference group differ. The participants in the test group have only two favourite characters, the penguin Pelle and the lion Leo. The participants in the reference group also seems to have two favourite characters, the pet detective S. Nute and the lion Leo, but here participants also answered the giraffe Sheila, the penguin Pelle and the elephant Elena.

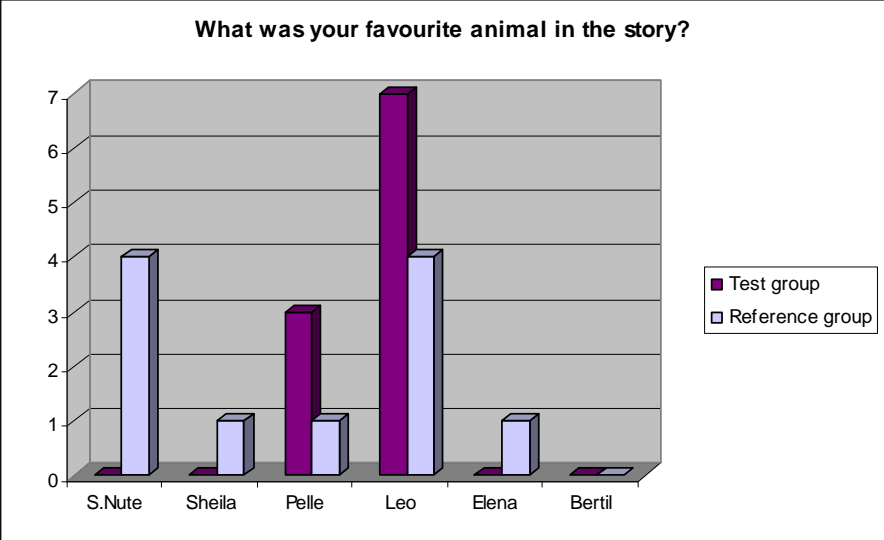


Diagram 4.

To the question “Do you like playing computer games?” the participants’ answers show, cf. Diagram 5, that with the exception of one participant in the reference group, all participants gave a positive answer to this question.

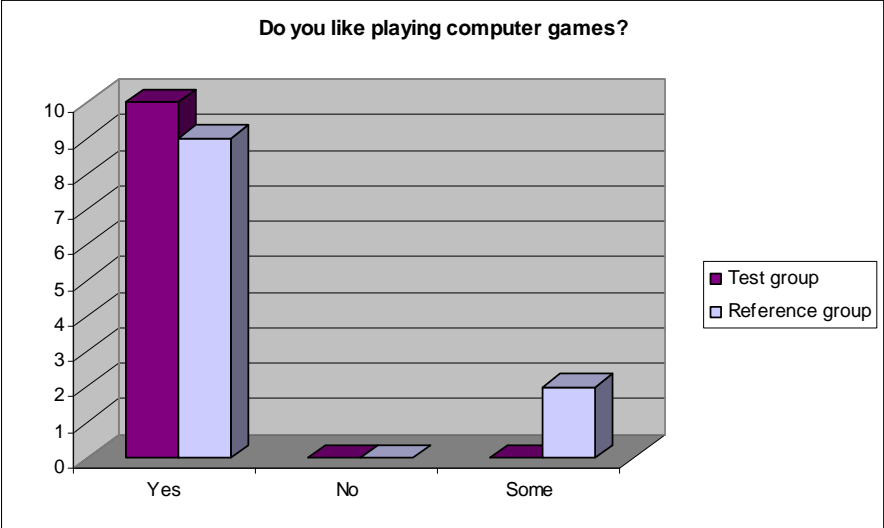


Diagram 5.

8. Analysis

This chapter presents a detailed discussion of the findings in regard of this study's research questions and in light of relevant theory. In addition, usability issues with the prototype of the AR storybook will be discussed.

In the discussion below the research questions presented in section 1.1 "Problem Area and Research Questions" will be explored in regard of findings presented in chapter 7 "Findings" and in light of relevant theory presented in chapter 3. "Theoretical Framework". Topics include different aspects of children's interaction with the prototype of the AR storybook, usability issues with the prototype, as well as a note of reflection of the evaluator's role in the usability test.

8.1 Physical Aspects of Interaction

The research question "How do children interact with the physical elements of AR books?" was proposed in order to explore how children would interact with the physical elements of an AR book, such as the hand-held PC screen, the storybook and the markers.

The interactive sequences were designed with ascending level of difficulty and in such a way that they required physical interaction with the user interface of the prototype, where usage of the hand-held PC screen, the storybook and the markers would have to be combined. Findings suggest (cf. 7.1 Physical Aspects of Interaction) that all of the participants were able to interact quite easily with the physical elements of the user interface of the prototype after some instruction. These findings are in line with Dünser and Hornecker (2007) who also found that most children in their study were able to interact with the AR book after some instruction.

However, it varied how much the participants would move the hand-held PC screen. Some movement of the hand-held screen was necessary in order to create a wide enough range for the web camera to identify the markers. Findings show that most of the participants were able to create a wide enough range by lifting up the hand-held PC screen during the interactive sequences, and solved tasks while seated. However, some of the participants would at times get up on their feet in order to create a wider range for the web camera. This

occurred for instance with task seven, where the participants were asked to view all markers on the hand-held PC screen at the same time. All of the participants but two got up on their feet in order to create a wide enough range for the web camera to identify all markers in the same frame.

Although most of the participants were able to interact quite easily with the physical elements of the prototype of the AR book, some usability issues with the prototype were identified and these issues will be discussed in section 8.5 “Usability Issues”.

8.2 Cognitive Aspects of Interaction

The research question “Do children understand how to interact with AR books?” was proposed in order to explore whether children would understand how to interact with the prototype of the AR book. It must be mentioned that the participants were faced with a quite large cognitive load while interacting with this prototype. Firstly, several new characters were introduced in a completely new story. Secondly, the participants were asked to solve tasks using technology they were unfamiliar with.

Findings show (cf. 7.2 Cognitive Aspects of interaction) that the information given prior to task one and the ascending level of difficulty of the interactive sequences enabled the participants to interact with the user interface of the prototype. Although follow-up questions were at times asked by the evaluator, in order to help participants who seemed to get stuck and did not know what to do next, it seems that the design principle of *learnability* was sufficiently integrated into the system.

Two kinds of tasks during the interactive sequences were looked at in regard of cognitive aspects of children’s interaction, where the first was performing actions with the markers in order to solve tasks and the second was to use information on the virtual 3D models in order to solve tasks. When it came to understanding how to perform actions with the marker, something which was required by tasks three to six, findings show that the participants chose different interaction approaches in order to solve these tasks and did not always solve the task using the intended interaction. Tasks three and six also required combining the

physical element of the storybook with the virtual 3D model. Not all of the participants realised that using the illustration in the book was an option; nevertheless, using the illustration in the book, thus combining a physical and virtual element, was the most common interaction approach for both of these tasks (cf. quote 7 and 11). Task four required the evaluator to ask a follow-up question to all of the participants, after which the participants tried out various interaction approaches in order to solve the task (cf. quote 9). Although moving the marker was the most common interaction approach, moving the table and the hand-held PC screen were also attempted. Task five, where the participants were asked to help an animal perform a pirouette, was perhaps the most challenging task as it required careful and specific movement with the marker. Findings show that the most common interaction approach was the intended interaction, and although some were successful in solving the task, not everyone managed to perform the intended interaction without losing visual of the virtual 3D model. Two participants also tried performing a forward flip with the marker, but reckoned they did not solve the task as they lost the visual of the virtual 3D model (cf. quote 10).

As part of tasks three, four, five and six the participants were asked to answer a question, which relied on using information that was added to the virtual 3D models. Findings show that all of the participants eventually found this information, but some of the participants picked up this added information much faster than others. Where some of the participants would be very determined and check the virtual 3D model for information, others would just make a guess. As this was a repetitive task, it was expected that the participants after the first of these tasks would understand where to look for this information. However, it turned out that the participants were able to determine the correct answer to task three by guesswork, probably due to a clue in the story. Most of the participants, though, did understand where to find this information after task four, and participant five also expressed where this information was found (cf. quote 13). Participants nine and ten had, according to my observations, the largest “cognitive gap” between all of the participants. Participant nine gave correct answers to these tasks every time, but participant ten did not understand where to find this information until task six when participant nine explained where the answer was to be found (cf. quote 9).

Task seven was designed to explore what the participants had learned about interaction with the user interface of the AR book throughout the session. First of all they had to identify the correct markers, then they had to check their age, which was added as text on the virtual 3D models, and then they had to place the markers close together, but not so close that they would lose visual of the virtual 3D models. All of the participants managed to solve this task, although different interaction approaches were chosen. One participant expressed knowledge about the black border of the marker having to be visible when putting them together (cf. quote 16), whereas another participant expressed knowledge about where to find information about the animals' age (cf. quote 17).

When trying to explain their interaction with the user interface of the AR book, findings suggest that some of the participants made use of vocabulary related to familiar technology. While trying to understand how to interact with the user interface, participants seven and nine related this to filming (cf. quote 19 and 20). Additionally, while interacting with the user interface participants three and four reckoned that this experience reminded them of watching television (cf. quote 18). During the group conversations it became evident how differently the participants would explain their experience with the prototype of the AR book. Answers ranged from "it was really fun" and "it was about animals" to more relevant descriptions, such as "it was a computer program and cards with animals, and the animals came out from of the cards" and "3D fairy tale, where we read and solve tasks". Though explanations varied, the most relevant explanations were somewhat related to technology familiar to the participants.

Knowledge of Piaget's stages of cognitive development was very useful. However, these stages cannot be applied for this study as the level of tasks did not separate successful interaction from non-successful interaction with the prototype of the AR book. It should also be pointed out that the ability of abstract thinking and logical reasoning will not be developed, according to Piaget, until the next development stage. As findings suggest that most of the participants did understand how to interact with the prototype and were able to solve most tasks, it is likely that having a partner to rely on during the evaluation levelled the cognitive differences between the participants.

8.3 Emotional Aspects of Interaction

The research question “How do children experience interaction with AR books?” was proposed in order to explore how children would experience interaction with the prototype of the AR book. Findings show (cf. 7.3 Emotional Aspects of Interaction) that all of the participants expressed emotions, such as joy, excitement and satisfaction while interacting with the prototype of the AR book. Though some of the participants were more expressive and verbal about their emotions than others, such as participant 10 (cf. quote 21), others only smiled and giggled. Emotions were mostly expressed during the interactive sequences while interacting with the user interface of the prototype of the AR book. In addition, most of the participants also expressed satisfaction when they were able to solve a task, mostly through body language and facial expressions (cf. quote 22), but also with some verbal language. Participant three showed a particular curiosity towards the prototype and was eager to experiment with interaction possibilities of the user interface (cf. quote 23); however, this did cause participant four some frustration (cf. quote 24).

As Sharp, Rogers & Preece (2007) point out, user experiences are individual and can as such be both positive and negative. Interacting with the prototype of the AR book was an entirely new experience for all of the participants and it was expected that they would express negative emotions such as disappointment or frustration if they were unable to solve tasks, and that usability issues could influence the participants’ user experience negatively. Findings suggest, however, that when the participants were unable to solve tasks they were often content with watching the virtual 3D models and listening to the corresponding sounds, and usability issues did not seem to affect the participants’ user experience considerably. The participants’ amusement by the 3D models was also established during the group conversation, when the participants were asked what they liked best about the story and tasks and all of the participants immediately responded by naming their favourite 3D model, which for the test group was either the lion Leo or the penguin Pelle. As mentioned previously, interacting with the prototype of the AR book was cognitively challenging, but findings do not indicate that interaction related to cognitive aspects had much of an impact on the participants’ user experience, and one can assume that the participants felt satisfaction just being able to visualise the 3D models. The overall

impression of the participants' user experience is that the children found the prototype of the AR book fun and enjoyable to interact with.

8.4 Social Aspects of Interaction

The research question "Does the use of AR books stimulate cooperation between users?" was proposed in order to explore how children would cooperate while interacting with the prototype of the AR book. Cooperation between the participants was a very important aspect of the interaction with this prototype, as the interactive sequences relied on the two participants working well together. It is worth noting that the participants were only told that they should share, and not that they should make use of the hand-held PC-screen and markers equally while interacting with the user interface. Some of the participants did share equally though, such as participants one and two, whereas other participants found a pattern where one participant would mainly interact with the hand-held PC screen and the other participant with the marker, such as participants nine and ten. It also varied how much the participants would communicate and support each other throughout the session. Findings suggest that although most of the participants did not communicate a lot they cooperated well and often provided each other with guidance while trying to solve tasks, such as participants one and two (cf. quote 11), participants seven and eight (quote 17), and participants nine and ten (quote 26). Two participants in particular struggled a bit more with cooperation than the others, i.e. participants three and four, and the evaluator repeatedly had to remind them to share (cf. quote 25).

Vygotsky (1978) emphasised the importance of social interaction in children's development and suggested that providing children with the appropriate social support can be crucial for children's knowledge development. Vygotsky also believed that once children internalise the processes that help them solve tasks, they will be able to solve them alone. The prototype of the AR book required the participants to cooperate when interacting with the user interface of the prototype and in order to solve tasks. Findings suggest that most of the participants benefitted from having a partner to cooperate with, as they could ask questions and help and guide each other. Though most of participants shared the equipment, some participants maintained particular roles throughout the session, where one participant interacted with

the hand-held PC screen and the other would interact with the markers. It is possible that the participants who had a clear division of roles throughout their sessions were not able to internalise the understanding of the whole AR technology structure but only parts of it, though this issue was not explored further with the participants after the usability test.

8.5 Usability Issues

Most usability issues that were identified by the participants' interaction suggest that most issues were related to the physical elements of the user interface of the prototype. In the following, issues related to the hand-held PC screen, markers, light and feedback are discussed.

8.5.1 The Hand-held PC Screen

Observing the participants interacting with the prototype of the AR book revealed a few issues with the hand-held PC screen (cf. 7.1.1 The Hand-held PC Screen). As the focus group already had pointed out during the design phase, the hand-held PC screen was a little heavy, so that was an issue I was aware of. Even though none of the participants made any comments about the weight, it is likely that it limited a more flexible interaction. In addition, the wires attached to the hand-held PC screen could have contributed to less movement with the screen, since it was easier for the participant sitting on the left to hold the PC screen.

Since the web camera was attached to the back of the hand-held PC screen, it would sometimes inadvertently identify markers that were not in use, both in between and during the interactive sequences. Due to this, the participants often saw 3D models on the PC screen and heard the corresponding sounds when they were not supposed to, and were naturally enough disrupted (cf. quote 1).

The use of a wireless reading tablet, such as an iPad or a Galaxy Note, could solve some of the issues that the participants experienced with the hand-held PC screen. Firstly, it would have been possible to put the tablet on the table with the web camera facing downward

when not in use, hindering the web camera to track markers in between interactive sequences. Secondly, being wireless it would be easier for the participants to pass back and forth. And thirdly, being lighter it would possibly contribute to a more flexible interaction.

8.5.2 The Markers

As findings suggest (cf. 7.1.3 The Markers) there are some usability issues related to the marker of the prototype. During the design phase the marker was altered several times, and the star shaped marker was reckoned to be the best solution for the prototype at the time of the evaluation. Although the star shaped marker did not have a recognised affordance for the participants, they quickly realised that they would have to hold the white edges and not the black frame in order to maintain a visual of the 3D model while interacting with it. However, the participants would at times accidentally place their hands in front of the web camera while trying to solve tasks, causing the visual of the 3D model to disappear (cf. quote 3).

Another usability issue with the marker is that it is quite vulnerable for damage being of paper and glued onto cardboard. During the last session one marker was actually folded and thus damaged so much that it was impossible for BuildAR to identify the marker (cf. quote 4).

The usability issues with the marker are not issues that can be easily resolved in marker-based AR systems, as the web camera needs to track the markers in order to project 3D models. However, the advantage with paper-based markers is that they are cheap and it is easy to make new ones. An improvement for this prototype could have been to glue the markers onto a more robust material than cardboard.

8.5.3 Light

Light from the window and the ceiling reflected the markers and obstructed identification of the markers, which made it difficult and sometimes even impossible to get a visual of the virtual 3D models. This was an issue which participants one and two experienced (cf. quote 5). Curtains were therefore closed during their session and the light in the ceiling was turned

off. These adjustments improved the conditions; nevertheless this issue did occur a few times during the usability test, such as with participants five and six (cf. quote 6).

8.5.4 Feedback

Another usability issue that was identified through the participants' interaction with the prototype is the lack of feedback. Apart from some instruction prior to task one, the participants were given no guidance by the system during the usability test, nor were they provided with feedback if they did something wrong. Due to the lack of feedback, some of the participants would ask the evaluator questions when they got stuck or were unsure of what to do next. In addition, the sound effect that was attached to the virtual 3D models was by some of the participants interpreted as feedback, such as participant five who interpreted the sound effect as feedback that they had solved a task correctly (cf. quote 8).

The lack of feedback and the use of sound effects are of course related to the actual design of the prototype and is something that must be considered an important issue to address. One solution could have been to provide the participants with a help option, which they could have made use of if they were unsure of what to do or if they had solved a task correctly. This information could for instance have been provided in form of a video attached to a marker, which illustrated how to solve at task correctly.

8.6 The Questionnaire

The main objective with the questionnaire was to see whether there would be a significant difference in answers between the participants in the test group, who had interacted with AR technology, and the participants in the reference group, who read the same story but solved adapted tasks without using AR technology. The questionnaire was for that reason designed so that both groups would answer the same questions. The questionnaire must be regarded as a qualitative analysis, considering the number of participants of the study.

Findings (cf. 7.5 The Questionnaire) show that there is no significant difference in the answers between the participants in the test group and in the reference group. The

participants in the test group and in the reference group liked the story very well, and rated the story between 5 and 6, which were the two highest scores possible. When answering the question related to solving tasks, both the participants in the test group and in the reference group are evenly divided, ranging from 2 to 6. For the participants in the test group answers to this question are related to solving tasks using AR technology and for the reference group answers are related mainly to the contents of the story, and are as such difficult to compare as there is no significant difference between the two groups' answers. When answering the question related to the participant's favourite character in the story, answers differed for the participants in the test group and in the reference group. The participants in the test group had only two favourite characters, the penguin Pelle and the lion Leo. The majority of the participants in the reference group also had two favourite characters, the pet detective S. Nute and the lion Leo, but some also chose other characters such as the giraffe Sheila, the penguin Pelle and the elephant Elena. One could argue that this difference between the test group and the reference group is related to the use of AR technology, as it was the animals that were the augmented element of the prototype. And for the question regarding computer games there is no significant difference, as all of the participants responded positively.

This questionnaire contained very few questions and did not identify many differences between the participants who interacted with the AR technology and those who did not. The questions could also have been more carefully designed in order to specifically find differences between the participants who used AR technology and those who did not. However, considering the participants' young age it was important to give them a few simple questions that they would be able to answer. Nevertheless, the results from the questionnaire suggest that the influence of the augmented elements of the prototype on the participants would be interesting to study further.

8.7 Children's Interaction with AR Storybooks

The overarching research question of this study "How do children interact with AR books?" has been divided into four more specific research questions in order to explore different aspects of children's interaction with the prototype of the AR storybook. This division made

it possible to explore the different aspects of interaction separately and at more depth, thus providing a thorough foundation for answering the overarching research question. Exploring physical, cognitive, emotional and social aspects of children's interaction also revealed that these different aspects are closely linked to each other.

Findings suggest that the children were able to interact with the physical elements of the prototype of the AR storybook quite easily after some instruction, and in spite of some usability issues. The children did also more or less understand how to interact with the prototype, although some of the children did use more time grasping the concept of what was needed in order to solve tasks correctly. One could assume that when the children were unable to solve tasks it would affect their user experience negatively, but findings from the evaluation were unable to establish such a connection. On the contrary, the children often seemed content with just being able to visualise the virtual 3D models and listen to the added sounds. Analysis of the social aspect of interaction showed that it was very individual how well the children cooperated; however, findings indicate that the children benefitted from having a partner.

The use of a tablet as interaction device for the prototype of the AR storybook could alter and improve the physical elements for interaction, but it would have little effect on the cognitive load. However, the use of a tablet could influence children's user experience and their social interaction with the prototype positively.

8.8 The Evaluator's Role

It was very valuable to be a part of the evaluation, as I was able to observe the participants interact with the prototype closely. Additionally, I was able ask the participants some follow-up questions in order to gain an insight to their thoughts. Being present during the evaluation and sitting across the table from the participants made the participants talk to me and direct questions to me, and although I tried to acknowledge the participants' answers with nods and facial expressions it was at times difficult not providing the participants with a proper reply. This is of course unfortunate, as it could have influenced the results of the usability study. However, considering how closely it enabled me to observe

the participants' interaction with the prototype of the AR storybook, I believe the advantages outweigh the disadvantages.

9. Summary

This section will summarise the main points of this study.

This study has illustrated how children interact with one type of implementation of an AR book. A challenge in AR research today is that there is little research in regard of HCI and children and this study has sought to generate knowledge to address this issue.

The prototype of the AR storybook was developed through an iterative design process, in which two children contributed by evaluating the prototype. An empirical evaluation of the prototype was conducted, where children from the target group were observed interacting with the prototype of the AR book.

Findings from the evaluation suggest that the children were able to interact with the physical elements of the prototype of the AR storybook quite easily and were able to solve most tasks. However, it varied how quickly the children understood how to use information added to the virtual 3D models when solving tasks. Most of the children expressed positive emotions while interacting with the prototype of the AR storybook, even though they were unable to solve tasks correctly or experienced usability issues with the prototype. In addition, how well the children cooperated varied; however, findings indicate that all of the children benefitted from having a partner.

In addition, this study has demonstrated one approach of Design Research as a research method within the field of HCI.

9.1 Further Research

Analysing the findings from the empirical evaluation and addressing this study's research questions identified some areas that would be interesting for future research, for instance:

- To explore whether using a tablet as interaction device for the AR storybook would support a more flexible interaction with the user interface of the prototype and whether it would add to the children's user experience. As BuildAR Pro is now

available for Mac and Hit lab NZ have plans for a release of an App, it would be quite easy to make use of an iPad for this prototype.

- To explore whether the use of AR technology would have an educational effect on children's learning, and, particularly, whether using AR would support children with visual, practical and tactile learning preferences.
- To explore whether the use of AR technology would stimulate children's motivation for a particular subject, such as learning a second language.
- To explore if and how the augmented elements, the virtual 3D models, will influence children.

10. References

Azuma, Ronald T. (1997): A survey of Augmented Reality. In *Presence: Teleoperators and Virtual Environments* vol. 6 (4), pp. 355-385.

Asai, Kikuo, Kobayashi, Hideaki, Kundo, Tomotsugu (2005): *Augmented Instructions – A Fusion of Augmented Reality and Printed Learning Materials*. In Proceedings of the Fifth IEEE International Conference on Advanced Learning Technologies (ICALT '05).

Carrol, John M. (2011): *Human Computer Interaction (HCI)*. In: *Soegaard, Mads and Dam, Rikke Friis (eds.). "Encyclopedia of Human-Computer Interaction"*. (20.11.2011) <http://www.interaction-design.org/encyclopedia/human_computer_interaction_hci.html>

Dünser, Andreas, Grasset, Raphael, Seichter, Hartmut, Billinghamurst, Mark (2007): *Applying HCI principles to AR systems design*. In Proceedings of 2nd International Workshop on Mixed Reality User Interfaces: Specification, Authoring, Adaptation (MRUI '07).

Dünser, Andreas and Hornecker, Eva (2007): *An observational study of children interacting with an augmented storybook*. Edutainment 2007. In Proceedings of Second International Conference on Technologies for E-Learning and Digital Entertainment (Edutainment 2007).

Dünser, Andreas, Grasset, Raphael, Billinghamurst, Mark (2008): *A Survey of Evaluation Techniques Used in Augmented Reality Studies*. In Proceedings of International Conference on Computer Graphics and Interactive Techniques (SIGGRAPH '08).

Druin, Allison (1999): *Cooperative Inquiry: Developing New Technology for Children with Children*. In Proceeding of the SIGCHI conference on Human factors in computing systems (CHI '99), pp. 592-599.

Fallman, Daniel (2003): *Design-oriented Human-Computer Interaction*. In Proceedings of the SIGCHI conference on Human factors in computing systems (CHI '03), pp. 225-232.

Grasset, Raphael, Dünser, Andreas, Seichter, Hartmut, Billinghamurst, Mark (2007): *The Mixed Reality Book: A New Multimedia Reading Book*. In Proceedings of the SIGCHI conference on Human factors in computing systems (CHI '07).

Hassenzahl, Marc (2011): *User Experience and Experience Design*. In: Soegaard, Mads and Dam, Rikke Friis (eds.). "Encyclopedia of Human-Computer Interaction". (30.11.2011) <http://www.interaction-design.org/encyclopedia/user_experience_and_experience_design.html>

Hevner, Alan R, March, Salvatore T, Park, Jinsoo and Ram, Sudha (2004): *Design Science in Information Systems Research*. MIS Quarterly (28:1), March 2004, pp. 75-105.

Hevner, Alan R (2007): *A Three Cycle View of Design Science Research*. Scandinavian Journal of Information Systems, 2007, 19 (2), pp. 87-92.

Heim, Steven (2007): *The Resonant Interface: HCI Foundations for Interaction Design*. Addison Wesley.

Hornecker, Eva, Dünser, Andreas (2009): *Of pages and paddles: Children's expectations and mistaken interactions with physical-digital tools*. Interacting with Computers, Vol. 21 (2009), pp. 95-107.

Hourcade, Juan Pablo (2008): *Interaction Design and Children*. Foundations and Trends in Human-Computer Interaction, Vol. 1, Issue 4, April 2008, pp. 277-392.

Nielsen, Jakob (1995-2011): *useit.com: Jakob Nielsen's Website, Usability 101: Introduction to Usability*. (01.12.2011) < <http://www.useit.com/>>

Kaplan-Leiserson, Eva (2004) *Trend: Augmented Reality Check*. Learning Circuits. (19.10.11) <http://www.astd.org/LC/2004/1204_kaplan.htm>

Milgram, Paul, Kishino, Fumio (1994): *A Taxonomy of Mixed Reality Visual Displays*. IEICE Transactions on Information Systems, Vol. E77-D, No. 12. (01.11.11)

http://etclab.mie.utoronto.ca/people/paul_dir/IEICE94/ieice.html >

Papert, Seymour (1980) *Mindstorms: Children, Computers, and Powerful Ideas*. New York: Basic Books, Inc.

Piaget, Jean, Inhelder, Bärbel (1969): *The Psychology of the Child* (H. Weaver, Trans.). USA: Basic Books, Inc.

Saso, Tomoki "Issac", Iguchi, Kenji, Inakage, Masa (2003): *Little Red: Storytelling in Mixed Reality*. In Proceedings of the 30th International conference on computer graphics and interactive techniques (SIGGRAPH '03).

Scaife, Michael, Rogers Yvonne, Aldrich, Frances, Davies, Matt (1997): *Designing For or Designing With? Informant Design For Interactive Learning Environments*. In Proceedings of the SIGCHI conference on Human factors in computing systems (CHI '97), pp. 343-350.

Sharp, Helen, Rogers, Yvonne, Preece, Jenny. (2007): *Interaction Design: Beyond Human Computer Interaction* (2. edition). Chichester, England: John Wiley & Sons, Ltd.

Sutherland, Ivan E. (1968): *A head-mounted three dimensional display*. In Proceedings of the AFIPS Fall Joint Computer Conference, 1968, Vol. 33, pp. 757-764.

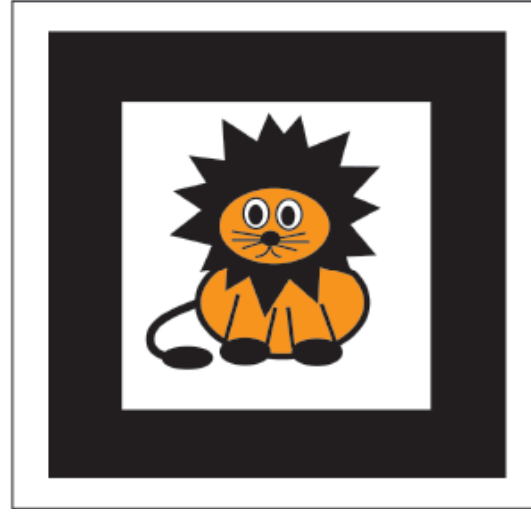
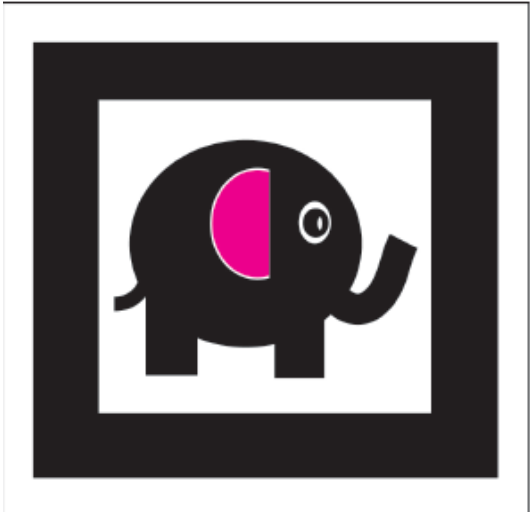
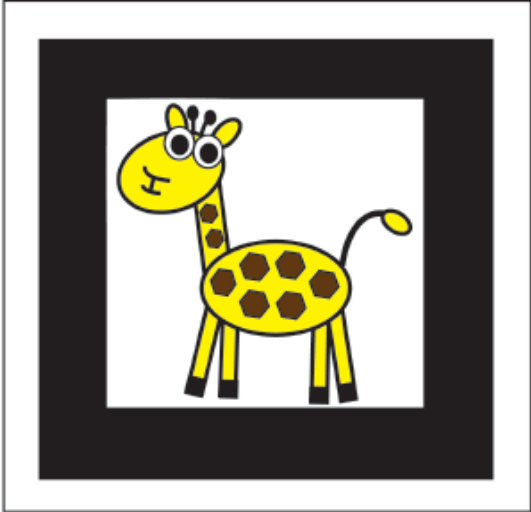
Swan, J. Edward, Gabbard, Joseph L. (2005): *Survey of User-Based Experimentation in Augmented Reality*. In Proceedings of the 1st International Conference of Virtual Reality, 2005.

Yygotsky, Lev S. (1978): *Mind In the Society – The Development of Higher Psychological Processes*. Cambridge MA: Harvard University Press.

Zimmerman, John, Forlizzi, Jodi, Evenson, Shelley (2007): *Research Through Design as a Method for Interaction Design Research in HCI*. In Proceedings of the SIGCHI conference on Human factors in computing systems (CHI '07), pp. 493-502.

Appendix

1. The Markers



2. The 3D models



3. First Version of the Prototype – Story and Tasks

Dyredetektiv S. Nute og mysteriet i Zaza Zoo



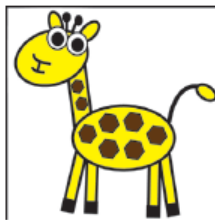
Elisabeth Vik
Camilla van Veen
Olaug Eiksund

Dyredetektiv S. Nute og mysteriet i Zaza Zoo

Det er en mørk, men langt fra stille, aften i Zaza Zoo. Mens direktøren Sheila Sjraff snorker høyløst fra direktørboligen, beveger noen seg i skyggene. Det rasler i løvet, det knirker i porten - det er fare på ferde.

Morgenen etter på andre siden av byen.

Privatdyredetektiven S. Nute tørker som vanlig sokkene sine i mikrobølgeovnen da det ringer på døren. Utenfor står assistenten hans, Polly, og sier: "Det er krise i Zaza Zoo! Fire dyr har forsvunnet i løpet av natten og Sheila Sjraff holder på å slå knute på halsen, hun trenger hjelp straks!"



Innen det har gått ti minutter er S. Nute på plass i Zaza Zoo. Han blir møtt av en fortvilet Sheila Sjraff som snakker usammenhengende om forsvunne dyr, mulig kidnapping og tyveri.

"Ta det helt med ro," sier den alltid avbalanserte S. Nute. "Vis meg åstedet for forbrytelsen - gjerningsmannen har garantert lagt igjen spor etter seg."

Den oppskjortede direktøren tar seg kraftig sammen og viser S. Nute første åsted, hvor Pingvinen Pelle har bodd de siste månedene. Pingvindammen er blikkstill. "I love Antarktis"-t-skjorten hans henger over gjerdet og borte ved stupebrettet ligger en kvittering fra Ishakkespesialisten AS.

S. Nute nikker rolig og noterer noe i blokken sin før de går videre til neste åsted.



Lyden av hit-låten "Hakuna matata" gjaller i veggene i det de nærmer seg buret til Løven Leo. Også her er det tomt. Kjøttrester etter gårsdagens middag ligger i matskålen; det var visst bøffelburger med deilig antilopedressing som stod på menyen. "Hvordan smaker egentlig antilopedressing?" lurer S. Nute, og tar en liten smakebit. "Pføy!" utbryter han og spytter ut dressingen. "Det er jo SOLKREM!"



"Det var da underlig", mumler han. Han skribler litt i notisblokken sin og løfter blikket ut mot den overskyete høsthimmelen.



Ettertenksom følger S. Nute etter Sheila Sjr Raff som er på vei til elefantområdet, hvor den karismatiske Elefanten Elena har holdt til. S. Nute studerer Elenas oppslagstavle grundig. Blant annet er det hengt opp siste nummer av Elefantnytt, et signert bilde av Dumbo, en løpeseddel som informerer om at et sirkus er på vei til byen, og en annonse hvor det står: "Har du sjarm og talent, publikumstekke og stil, kan du være dyret vi søker!"

"Som du ser er alt som vanlig her," sier Sheila Sjr Raff en smule fortvilet idet de rusler mot siste åsted.

I motsetning til de andre åstedene er båsen til Bertil mer moderne utrustet. I følge Sheila Sjr Raff er Bertil en kløpper på data og dyrehagens dataspesialist. Datamaskinen til Bertil står på og passordet finner S. Nute raskt: Bæ123. Bertil kunne kanskje ha funnet på noe bedre, tenker S. Nute... På maskinen finner de bloggen til Bertil, og siste innlegget har overskriften "En villsau på villspor". Han skriver om hjemstedet Bærum, om de grønne markene, de flotte knausene og den lykkelige oppveksten med tvilling-søsteren Berit. "Bærum ja, interessant," sier S. Nute og noterer noe i blokken sin. Sheila Sjr Raff og S. Nute går sammen ut på gårdsplassen.



Dyrehagens Direktør Sheila Sjr Raff er fortsatt bekymret, og er usikker på hva hun skal meddele avisene om forsvinningen. "Vi har jo ingen spor," sier hun fortvilet. S. Nute, derimot, har et lurt smil om munnen.

"Der du tar feil, Sheila," sier S. Nute, "jeg tror nemlig jeg vet hva som har skjedd. La meg sammenfatte notatene mine og rådføre meg med assistenten min, så skal jeg straks fortelle deg hvor dyrene er."

Mens Sheila Sjiraff viste S. Nute de fire forskjellige åstedene, noterte han flittig i notisblokken sin. S. Nute må sortere de rotete notatene sine slik at han så raskt som mulig kan fortelle Sheila Sjiraff hvor dyrene er!

OPPGAVE 1.

Hjelp S. Nute å plassere påstandene nedenfor sammen med riktig dyr:

Dette dyret tar av seg klærne før det stuper i vannet.

Dette dyret er nok veldig glad i solkrem!!



Dette dyret har tydeligvis
Dumbo som idol.



Dette dyret
ser ut til å være svært
opptatt av blogging!



S. Nute mener også det kan være nyttig for etterforskningen å sortere de forsvunne dyrene etter hvilke som liker sol og varme og hvilke som liker is og kulde.

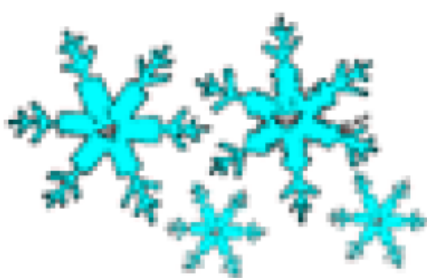
OPPGAVE 2.

Hjelp S. Nute å plassere dyrene i riktig boks:

Dyr som liker sol og varme:

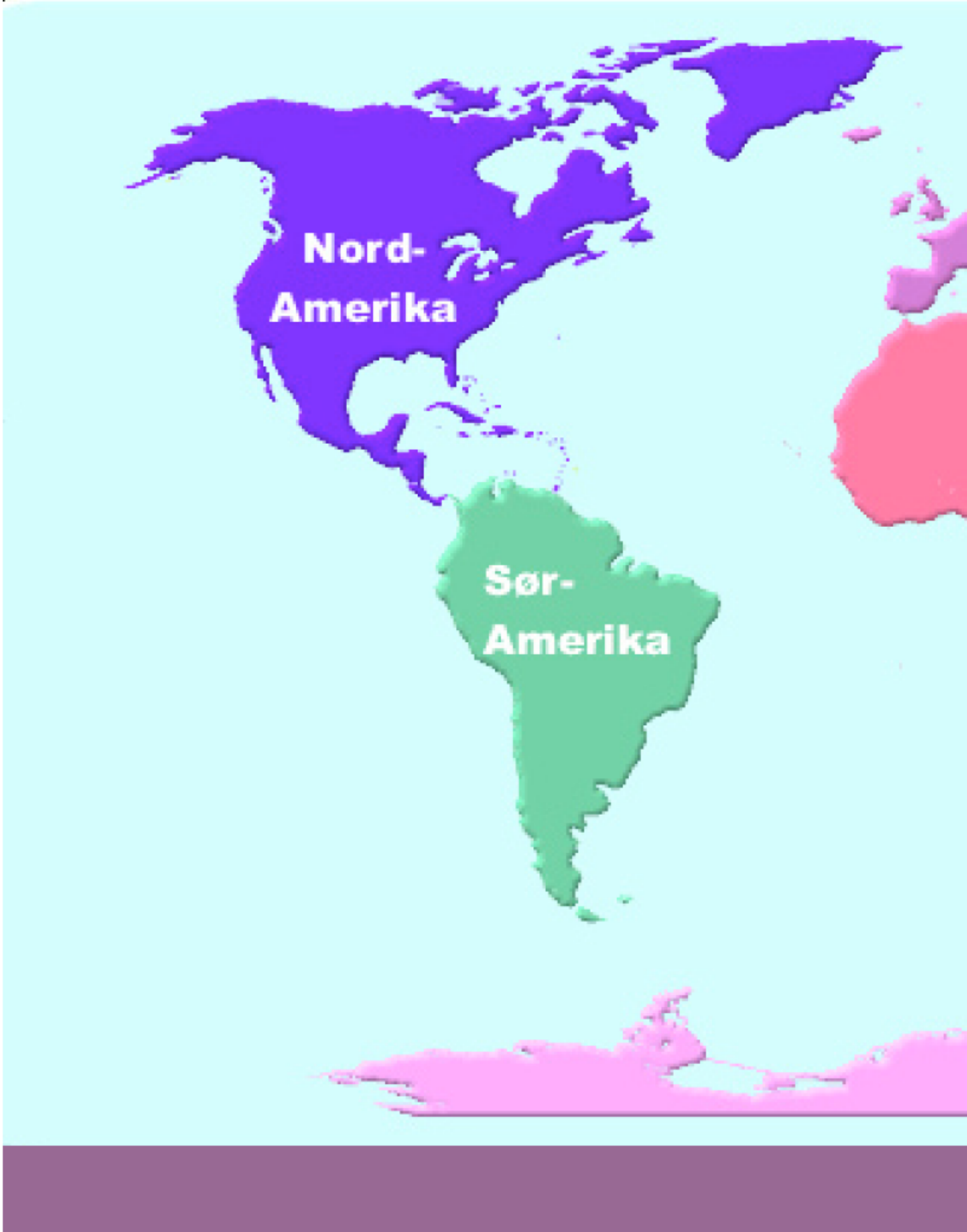


Dyr som liker is og kulde:



OPPGAVE 3.

S. Nute mener å kunne forklare hvor dyrene her. Hjelp S. Nute å plassere dyrene på kartet nedenfor:





S. Nute har nå fått god hjelp av dere og assistenten sin til å sortere notatene og er klar til å løse mysteriet.

OPPGAVE 4.

Fullfør S. Nute sine setninger slik at Sheila Sjiraff endelig får vite hvor dyrene er:

Pingvinen Pelle forsvant fordi...

Løven Leo forsvant fordi...



Elefanten Elena
forsvant fordi...

Sauen Bertil
forsvant fordi...

4. Second Version of the Prototype – Story and Tasks

Dyredetektiv S. Nute og mysteriet i Zaza Zoo



Elisabeth Vik
Camilla van Veen
Olaug Eiksund

Dyredetektiv S. Nute og mysteriet i Zaza Zoo

Det er en mørk, men langt fra stille, aften i Zaza Zoo. Mens direktøren Sheila Sjr Raff snorker høyløst fra direktørboligen, beveger noen seg i skyggene. Det rasler i løvet, det knirker i porten - det er fare på ferde.

Morgenen etter på andre siden av byen.

Dyredetektiven S. Nute tørker som vanlig sokkene sine i mikrobølgeovnen da det ringer på døren. Utenfor står assistenten hans, Polly, og sier: "Det er krise i Zaza Zoo! Fire dyr har forsvunnet i løpet av natten og Sheila Sjr Raff holder på å slå knute på halsen, hun trenger hjelp straks!"



Innen det har gått ti minutter er S. Nute på plass i Zaza Zoo. Han blir møtt av en fortvilet Sheila Sjr Raff som snakker usammenhengende om forsvunne dyr, mulig kidnapping og tyveri.

"Ta det helt med ro," sier S. Nute rolig. "Vis meg åstedet for forbrytelsen - gjerningsmannen har garantert lagt igjen spor etter seg."

Den oppskjørtede direktøren tar seg kraftig sammen og viser S. Nute første åsted, hvor Pingvinen Pelle har bodd de siste månedene. Pingvindammen er blikkstill. "I love Antarktis"-t-skjorten hans henger over gjerdet og borte ved stupebrettet ligger en kvittering fra Ishakkespesialisten AS.



S. Nute nikker rolig og noterer noe i blokken sin før de går videre til neste åsted.

Lyden av hit-låten "Hakuna matata" gjaller i veggene i det de nærmer seg buret til Løven Leo. Også her er det tomt. Kjøttrester etter gårsdagens middag ligger i matskålen; det var visst bøffelburger med deilig antilopedressing som stod på menyen. "Hvordan smaker egentlig antilopedressing?" lurer S. Nute, og tar en liten smakebit. "Pføy!" utbryter han og spytter ut dressingen. "Det er jo SOLKREM!"



"Det var da underlig", mumler han. Han skribler litt i notisblokken sin og løfter blikket ut mot den overskyete høsthimmelen.



Ettertenksom følger S. Nute etter Sheila Sjr Raff som er på vei til elefantområdet, hvor den karismatiske Elefanten Elena har holdt til. S. Nute studerer Elenas oppslagstavle grundig. Blant annet er det hengt opp siste nummer av Elefantnytt, et signert bilde av Dumbo, en løpeseddel som informerer om at et sirkus er på vei til byen, og en annonse hvor det står: "Har du sjarm og talent, publikumstekke og stil, kan du være dyret vi søker!"

"Som du ser er alt som vanlig her," sier Sheila Sjr Raff en smule fortvilet idet de rusler mot siste åsted.

I motsetning til de andre åstedene er båsen til Bertil mer moderne utrustet. I følge Sheila Sjr Raff er Bertil en kløpper på data og dyrehagens dataspesialist. Datamaskinen til Bertil står på og passordet finner S. Nute raskt: Bæ 123. Bertil kunne kanskje ha funnet på noe bedre, tenker S. Nute... På maskinen finner de bloggen til Bertil, og siste innlegget har overskriften "En villsau på villspor". Han skriver om hjemstedet Bærum, om de grønne markene, de flotte knausene og den lykkelige oppveksten med tvilling-søsteren Berit. "Bærum ja, interessant," sier S. Nute og noterer noe i blokken sin. Sheila Sjr Raff og S. Nute går sammen ut på gårdsplassen.



Sheila Sjr Raff er fortsatt bekymret, og er usikker på hva hun skal fortelle avisene om de forsvunne dyrene. "Vi har jo ingen spor," sier hun fortvilet. S. Nute, derimot, har et lurt smil om munnen. "Der du tar feil, Sheila," sier S. Nute, "med litt hjelp kan jeg finne ut hva som har skjedd."

OPPGAVE 2.

Nå har du fulgt S. Nute og Sheila rundt i Zaza Zoo på jakt etter spor. Men ser de egentlig ut som på bildene...

- Kan du se på markørene av S. Nute og Sheila gjennom PC-skjermen og beskrive hvordan de faktisk ser ut?
- Hvilke likheter og ulikheter ser du?
- Hva skjer når du snur markøren rundt?





OPPGAVE 3.

S. Nute trenger din hjelp for å bli bedre kjent med de forsvunne dyrene.

I boblene nedenfor finner du noen ting som dyrene trenger for å holde på med sin favoritt hobby.

- Kan du plassere riktig ting sammen med riktig dyr?

The diagram consists of a large white rectangular area enclosed by a solid purple border. Inside this area, there are two identical dashed purple rectangular boxes, one positioned above the other. To the right of the top dashed box, there is a purple oval containing the text "TURNDRAKT". A solid purple line connects the right side of the top dashed box to the left side of the "TURNDRAKT" oval. Below the "TURNDRAKT" oval is another purple oval containing the text "NESEKLYPE". A solid purple line connects the right side of the bottom dashed box to the left side of the "NESEKLYPE" oval.



PRINTER



GITAR



OPPGAVE 4.

S. Nute undrer om dyrenes alder kan ha noe med forsvinningen å gjøre.

- Kan du plassere dyrene i rekkefølge sortert etter alder?

OPPGAVE 5.

- Kan du gjenfortelle historien ved å bruke markørene og PC-skjermen?
- Kan du bruke markørene og PC-skjermen og lage din egen versjon av mysteriet?

5. Third Version of the Prototype - Story and Tasks

Dyredetektiv S. Nute og mysteriet i Zaza Zoo



- ei augmented-reality forteljing

Elisabeth Vik
Camilla van Veen
Olaug Eiksund

Det er ein mørk, men langt i frå stille, kveld i Zaza Zoo. Medan direktøren Sheila Sjiraff snorkar høgt frå direktørbustaden, bevegar nokon seg i skuggane. Det raslar i lauvet, det knirkar i porten - det er fare på ferde.

Morgonen etter på andre sida av byen.

Dyredetektiven S. Nute tørkar som vanleg sokkane sine i mikrobølgeomnen då det ringer på døra. Utanfor står Polly, assistenten til S. Nute, og seier: "Det er krise i Zaza Zoo! Fire dyr har forsvunne i løpet av natta og Sheila Sjiraff held på å slå knute på halsen, ho treng hjelp straks!"

OPPGÅVE 1.

- Kan du beskrive korleis S. Nute ser ut?

- 2 -

Innan det har gått ti minutt er S. Nute på plass i Zaza Zoo. Han blir møtt av ei fortvila Sheila Sjiraff som snakkar usamanhengande om forsvunne dyr, mogleg kidnapping og tjuveri.

“Ta det heilt med ro,” seier S. Nute. “Vis meg kvar dyra har helde til, so skal eg bruke detektivkunnskapane mine til å løyse mysteriet.”

OPPGÅVE 2.

- Kan du forklare S. Nute kva Sheila Sjiraff seier?

Direktøren tek seg kraftig saman og viser S. Nute pingvindammen, der Pingvinen Pelle har budd dei siste månadane.

Vatnet i pingvindammen er heilt stille og Pelle er ikkje å sjå nokon stad. "I love Antarktis"-t-skjorta hans heng over gjerdet og borte ved stupebrettet ligg ei lærebok i symjing for fuglar som ikkje kan flyge.

"Nettopp" seier S. Nute og nikkar. Han noterar noko i notisboka si før dei går vidare.

OPPGÅVE 3.

- Kan du hjelpe Pelle med å stupe ut i vatnet?
- Kan du fortelje S. Nute kvar Pelle kjem frå?



- 6 -

Lyden frå kjenningsmelodien til filmen "Løvenes konge" gjallar fra høgtalarane då dei nærmar seg buret til Løva Leo. Også her er det tomt. Kjøtrestar etter middagen frå i går ligg i matskåla; det var herleg afrikansk bøffelburger med antilopedressing som var på menyen. "Korleis smakar eigentleg antilopedressing?" undrar S. Nute, og tar ein liten smakebit. "Pføy!" utbryt han og spyttar ut dressingen. "Det er jo SOLKREM!" Ved sida av matskåla ligg ein reisekatalog for tame villdyr, og S. Nute merkar seg at dei tilbyr restplassar på safari.

"Interessant" seier S. Nute. Han skriblar litt i notisboka si og løftar blikket ut mot den overskyha hausthimmelen.

OPPGÅVE 4.

- Kan du hjelpe Leo med å danse til musikken?
- Kan du fortelje S. Nute kvar Leo kjem frå?

S. Nute følger etter Sheila Sjiraff som er på veg til elefantområdet, der den karismatiske Elefanten Elena har helde til. S. Nute studerar Elena si oppslags-
tavle grundig. Blant anna er det hengt opp siste utgåve av Elefantnytt, eit
signert bilete av Dumbo og ein annonse frå Sirkus Arnoldo der det står: "Har
du sjarm og talent, publikumstekke og stil, kan du vere dyret vi søker!"

"Som du ser har Elena også fordufta" seier Sheila Sjiraff fortvila då dei
ruslar vidare.

OPPGÅVE 5.

- Kan du hjelpe Elena med å ta ein piruett?
- Kan du fortelje S. Nute kvar Elena kjem frå?

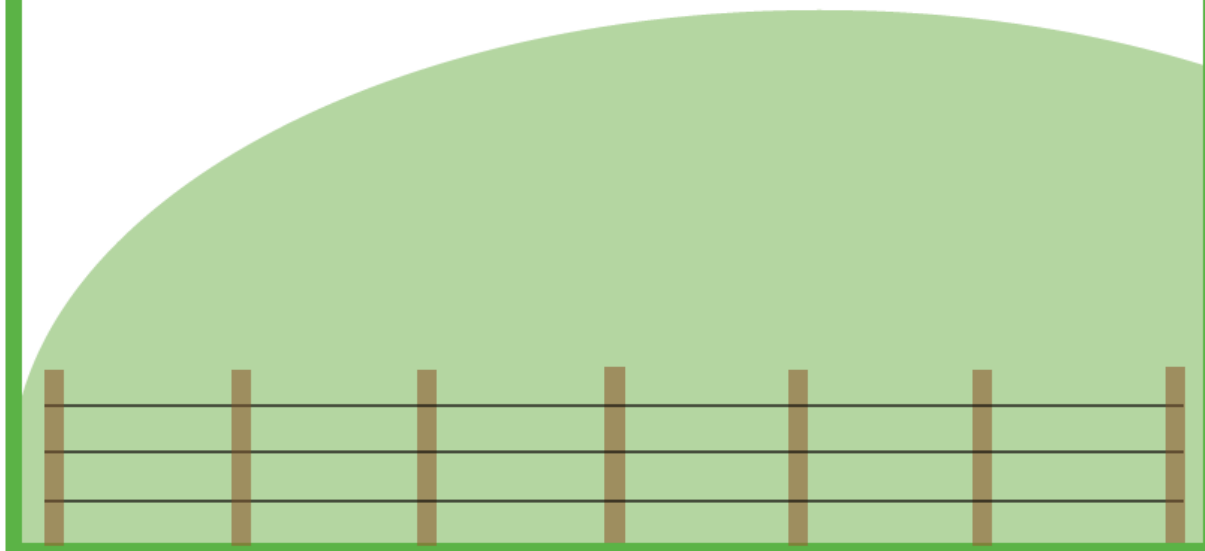
- 10 -

I motsetning til hjå dei andre dyra er båsen til Bertil meir moderne utrusta. I følgje Sheila Sjr Raff er Bertil ein kløppar på data og dyrehagen sin data-spesialist. Datamaskina til Bertil står på og passordet finn S. Nute raskt: Bæ123. Bertil kunne kanskje ha funne på noko betre, tenkjer S. Nute... På maskina finn dei bloggen til Bertil, og det siste innlegget har overskrifta "Ein villsau på villspor". Han skriv om heimstaden sin, om dei grønne markane, dei flotte knausane og den lykkelege oppveksten med tvillingsystema Berit.

"Aha" utbyt S. Nute og noterar ivrig i notisboka si. Sheila Sjr Raff og S. Nute går saman ut på gardsplassen.

OPPGÅVE 6.

- Kan du hjelpe Bertil med å hoppe over gjerdet?
- Kan du fortelje S. Nute kvar Bertil kjem frå?



- 12 -

Sheila Sjiraff er bekymra og ho er usikker på kva ho skal fortelje avisene om dei forsvunne dyra. "Vi har jo ingen spor," seier ho fortvila, men S. Nute har eit lurt smil om munnen. "Der tek du feil, Sheila," seier S. Nute og viftar med notisboka si, "eg har funne løysinga på mysteriet."

"Alle spor peikar mot at Pelle er på ein lang symjetur, så han kjem nok straks tilbake. Leo har reist på safari til solfylte Kenya, som også er heimlandet hans. Elena er på audition på Sirkus Arnoldo, så du kan førebu deg på at ho ønskjer å bytte jobb. Og Bertil, ja Bertil har hatt heimlengsel og har reist til Sauda for å besøkje familia si i helga".

Sheila ser forbløffa på S. Nute og utbryt: "Du er jammen ein dyktig dyre-detektiv - no kan eg puste letta ut. Tusen takk for hjelpa!"

OPPGÅVE 7.

- Kan du sortere Pelle, Leo, Elena og Bertil etter alder med den yngste først?
- Klarer du å sjå alle dyra i skjermen samstundes?

6. Consent Form

Samtykkeerklæring

Namn på studien: "Children's Interaction with Augmented Reality Storybooks – a human-computer interaction study"

Mål med studien: Studien freistar å innhente informasjon om korleis barn oppfattar og tolkar eit Augmented Reality system, og nyttiggjer seg av dette i interaksjon med systemet. Hovudfokus i studien er brukarvennlegheit.

Då Augmented Reality er ein relativt ny, og enno lite brukt, teknologi, er det òg nærliggande å sjå på fysiske, sosiale og kjenslerelaterte aspekt ved barns interaksjon med Augmented Reality systemet.

Deltaking av involverer: Borna vil jobbe saman to og to og vil i fellesskap lese ei forteljing og freiste løyse nokre oppgåver, som gjer at interaksjon med Augmented Reality systemet er naudsynt. Interaksjon med systemet skjer ved hjelp ein liten PC-skjerm, eit webkamera og seks markørar (pappbrikker med bilete på). Evalueringa vil skje klasseromet under tilsyn av kontaktlærer og Olaug Eiksund, som gjennomfører studien.

All data som samlast inn gjennom denne evalueringa vil handterast konfidensielt og studien vil ikkje under nokon omstende identifisere deltakarane.

Spørsmål/meir informasjon: Om de har spørsmål til studien eller har behov for meir informasjon kan Olaug Eiksund kontaktast direkte på e-post: olaugish@gmail.com

Eg har lese og forstått informasjon som er gitt ovanfor og gir mitt samtykke til at mitt barn deltek i denne studien.

Dato: _____ Barnet sitt namn: _____

Føresette sin signatur: _____

7. Adapted Version of the Prototype – Story and Tasks

Dyredetektiv S. Nute og mysteriet i Zaza Zoo



Elisabeth Vik
Camilla van Veen
Olaug Eiksund

Det er ein mørk, men langt i frå stille, kveld i Zaza Zoo. Medan direktøren Sheila Sjiraff snorkar høgt frå direktørbustaden, bevegar nokon seg i skuggane. Det raslar i lauvet, det knirkar i porten - det er fare på ferde.

Morgonen etter på andre sida av byen.



Dyredetektiven S. Nute tørkar som vanleg sokkane sine i mikrobølgeomnen då det ringer på døra. Utanfor står Polly, assistenten til S. Nute, og seier: "Det er krise i Zaza Zoo! Fire dyr har forsvunne i løpet av natta og Sheila Sjiraff held på å slå knute på halsen, ho treng hjelp straks!"

Innan det har gått ti minutt er S. Nute på plass i Zaza Zoo. Han blir møtt av ei fortvila Sheila Sjiraff som snakkar usamanhengande om forsvunne dyr, mogleg kidnapping og tjuveri.



“Ta det heilt med ro,” seier S. Nute. “Vis meg kvar dyra har helde til, så skal eg bruke detektivkunnskapane mine til å løyse mysteriet.”

Direktøren tek seg kraftig saman og viser S. Nute pingvindammen, der Pingvinen Pelle har budd dei siste månadane.



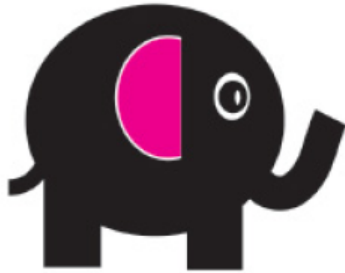
Vatnet i pingvindammen er heilt stille og Pelle er ikkje å sjå nokon stad. "I love Antarktis"-t-skjorta hans heng over gjerdet og borte ved stupebrettet ligg ei lærebok i symjing for fuglar som ikkje kan flyge.

"Nettopp" seier S. Nute og nikkar. Han noterar noko i notisboka si før dei går vidare.

Lyden frå kjenningsmelodien til filmen "Løvenes konge" gjallar fra høgtalarane då dei nærmar seg buret til Løva Leo. Også her er det tomt. Kjøtrestar etter middagen frå i går ligg i matskåla; det var herleg afrikansk bøffelburger med antilopedressing som var på menyen. "Korleis smakar eigentleg antilopedressing?" undrar S. Nute, og tar ein liten smakebit. "Pføy!" utbryt han og spyttar ut dressingen. "Det er jo SOLKREM!" Ved sida av matskåla ligg ein reisekatalog for tame villdyr, og S.Nute merkar seg at dei tilbyr restplassar på safari.



"Interessant" seier S. Nute. Han skriblar litt i notisboka si og løftar blikket ut mot den overskya hausthimmelen.



S. Nute følgjer etter Sheila Sjiraff som er på veg til elefantområdet, der den karismatiske Elefanten Elena har helde til. S. Nute studerar Elena si oppslagstavle grundig. Blant anna er det hengt opp siste utgåve av Elefantnytt, eit signert bilete av Dumbo og ein annonse frå Sirkus Arnoldo der det står: "Har du sjarm og talent, publikumstekke og stil, kan du vere dyret vi søker!"

"Som du ser har Elena også fordufta" seier Sheila Sjiraff fortvila då dei ruslar vidare.

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"Aha" utbyt S. Nute og noterar ivrig i notisboka si. Sheila Sjriff og S. Nute går saman ut på gardsplassen.

Sheila Sjiraff er bekymra og ho er usikker på kva ho skal fortelje avisene om dei forsvunne dyra. "Vi har jo ingen spor," seier ho fortvila, men S. Nute har eit lurt smil om munnen. "Der tek du feil, Sheila," seier S. Nute og viftar med notisboka si, "eg har funne løysinga på mysteriet."

"Alle spor peikar mot at Pelle er på ein lang symjetur, så han kjem nok straks tilbake. Leo har reist på safari til solfylte Kenya, som også er heimlandet hans. Elena er på audition på Sirkus Arnoldo, så du kan førebu deg på at ho ønskjer å bytte jobb. Og Bertil, ja Bertil har hatt heimlengsel og har reist til Sauda for å besøkje familia si i helga".

Sheila ser forbløffa på S. Nute og utbryt: "Du er jammen ein dyktig dyre-detektiv - no kan eg puste letta ut. Tusen takk for hjelpa!"

OPPGÅVER

1. Kva heiter dyredetektiven i forteljinga og kva får du vite om han?
2. Kven er det som viser dyredetektiven rundt i Zaza Zoo?
3. Kva heiter dei fire forsvunne dyra?
4. Finn dyredetektiven nokre mistenkelege spor i bustadane til dyra?
5. Kvar meiner dyredetektiven at dei forsvunne dyra er?

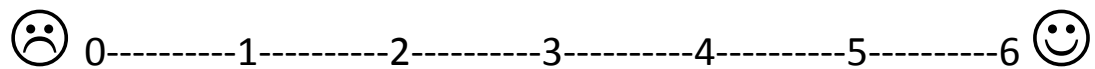
8. Questionnaire

S.Nute og mysteriet i Zaza Zoo – spørjeskjema

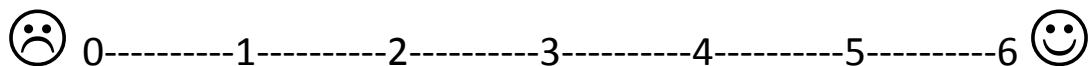
1. Nummer: _____

2. Alder: _____

3. Kor godt likte du forteljinga? (Set kryss på skalaen nedanfor)



4. Kor enkelt synes du at det var å løyse oppgåvene? (Set kryss på skalaen nedanfor)



5. Kva for dyr i forteljinga likte du aller best? _____

6. Likar du å spele dataspel? (Ja eller nei) _____

9. Transcription of Dialogue

9.1 Participants One and Two

Participant 1, jente

Participant 2, jente.

[00:00:04] Evaluator: S. Nute og Mysteriet i Zaza Zoo. Det er ein mørk, men langt i frå stille, kveld i Zaza Zoo. Medan direktøren Sheila Sjiraff snorkar høgt frå direktørbustaden, bevegar nokon seg i skuggane. Det raslar i lauvet, det knirkar i porten - det er fare på ferde.

Morgonen etter på andre sida av byen.

Dyredetektiven S. Nute tørkar som vanleg sokkane sine i mikrobølgeomnen då det ringer på døra. Utanfor står Polly, assistenten til S. Nute, og seier: "Det er krise i Zaza Zoo! Fire dyr har forsvunne i løpet av natta og Sheila Sjiraff held på å slå knute på halsen, ho treng hjelp straks!"

[00:00:56] Evaluator: So e det fyrste oppgåva. Kan dokke beskrive korleis S.Nut ser ut? Det dokke må gjere då, er å plukke opp skjermen, so må dokke finne riktig brikke og prøve å sjå på den gjennom skjermen.

[00:01:25] Participant 1: Okey skal eg bare plukke opp en brikke?

[00:01:19] Evaluator: Jaa, kva for brikke trur dokke er S. Nute?

[00:01:39] Participant 2: Hehe

[00:01:45] S. Nute: Eg er en h...

[00:01:44] Evaluator: Du må sjå heile den svarte kanten i skjermen.

[00:01:57] S. Nute: Hm, interessant eg er en hund etter mysterier.

[00:01:49] Participant 2: Må eg sjå heile den svarte kanten?

[00:01:49] Evaluator: Ja.

[00:01:56] Evaluator: Ser du han?

[00:01:56] Participant 2: Ja.

[00:01:56] Evaluator: Korleis ser han ut?

[00:02:00] Participant 2: Han er brun.

[00:02:04] S. Nute: Hm, interessant eg e en hund etter mysterier.

[00:02:04] Participant 2: Også er han en hund.

[00:02:14] Participant 1: Også kan eg sjå et hode og øyne.

[00:02:24] S. Nute: Hm, interessant eg er en hund etter mysterier.

[00:02:25] Participant 1: Også har han svart nase, svarte øyne og svarte ører, og så er resten brun.

[00:02:25] Evaluator: Ja, flott. Veldig bra. Skal vi lese litt vidare da?

[00:02:51] Participant 1: Det kom sånne grønne prikkar på skjermen...

[00:02:57] Evaluator: Hm, gjorde det det.

[00:02:58] Evaluator: Okey. Innan det har gått ti minutt er S. Nute på plass i Zaza Zoo. Han blir møtt av ei fortvila Sheila Sjiraff som snakkar usamanhengande om forsvunne dyr, mogleg kidnapping og tjuveri.

“Ta det heilt med ro,” seier S. Nute. “Vis meg kvar dyra har helde til, so skal eg bruke detektivkunnskapane mine til å løyse mysteriet.”

[00:03:23] Evaluator: Då e det oppgåve to. Kan du forklare S. Nute kva Sheila Sjiraff seier?

[00:03:30] Participant 2: Hmm.

[00:03:36] Evaluator: Korleis trur dokke at dokke kan få det til? Kva trur dokke?

[00:03:45] Participant 2: At ho seier at dyra har blitt kidnappa, eller noko slikt.

[00:03:48] Participant 1: Og så har det vært tjuveri.

[00:03:51] Evaluator: Viss dokke plukka opp markøren og ser på den gjennom skjermen, høyre dokke noko då?

[00:03:57] Participant 1: Skal eg berre legge den der og ta opp skjermen?

[00:03:58] Evaluator: Det kan du.

[00:04:02] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:04:10] Participant 2: Skal eg.

[00:04:10] Participant 1: Em, ja.

[00:04:17] Participant 2: Oj.

[00:04:19] Participant 1: No kom det ingenting.

[00:04:19] Evaluator: (trekker for gardinen)

[00:04:22] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:04:31] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:04:38] Evaluator: Kva var det ho sa?

[00:04:39] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:04:47] Participant 1: Ho sa å nei Pelle og Helena og B...

[00:05:11] Sheila: Å nei...

[00:05:08] Participant 2: Hihi, det var litt vanskelig.

[00:05:15] Sheila: Pele, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:05:18] Participant 1: Å nei Pelle, Elena...hihihi... forsvunnet i løpet av natta... hjelp.

[00:05:29] Evaluator: Kjempeflott, då veit dokke kva Sheila har sagt også har dokke hjelpt S. Nute.

[00:05:35] S. Nute: Interessant...

[00:05:37] Evaluator: Skal vi bla om?

[00:05:40] Participant 2: Ja

[00:05:42] Evaluator: Direktøren tek seg kraftig saman og viser S. Nute pingvindammen, der Pingvinen Pelle har budd dei siste månadane. Vatnet i pingvindammen er heilt stille og Pelle er ikkje å sjå nokon stad. "I love Antarktis"-t-skjorta hans heng over gjerdet og borte ved stupebrettet ligg ei lærebok i symjing for fuglar som ikkje kan flyge. "Nettopp" seier S. Nute og nikkar. Han noterar noko i notisboka si før dei går vidare.

[00:06:10] Evaluator: Oppgåve tre. Kan du hjelpe Pelle med å stupe ut i vatnet?

[00:06:23] Participant 1: Hold den du.

[00:06:25] Pelle: Plask.

[00:06:26] S. Nute: Eg er en hund etter mysterier

[00:06:33] Pelle: Plask.

[00:06:33] Evaluator: Har dokke hjelpt Pelle stupe i vatnet no?

[00:06:33] Participant 1 og 2: Mmmm, jaaa (nikker).

[00:06:36] Evaluator: Ja, fint. Då er neste spørsmål. Kan dokke fortelle S. Nute kvar Pelle kjem frå?

[00:06:43] Pelle: Plask.

[00:06:49] Participant 2: Em, ant...art...

[00:06:50] Participant 2: Antarktis-

[00:06:53] Evaluator: Ja, heilt rett. Antarktis.

[00:06:55] Evaluator: Då har dokke løyst den oppgåva. Dokke har hjelpt Pelle med å stupe ut i vatnet og dokke har hjelpt S. Nute med informasjon.

[00:07:06] Evaluator: Skal vi bla om?

[00:07:08] Evaluator: Lyden frå kjenningsmelodien til filmen "Løvenes konge" gjallar frå høgtalarane då dei nærmar seg buret til Løva Leo. Også her er det tomt. Kjøtrestar etter middagen frå i går ligg i matskåla; det var herleg afrikansk bøffelburger med antilopedressing

som var på menyen. "Korleis smakar eigentleg antilopedressing?" undrar S. Nute, og tar ein liten smakebit. "Pføy!" utbryt han og spyttar ut dressingen. "Det er jo SOLKREM!" Ved sida av matskåla ligg ein reisekatalog for tame villdyr, og S. Nute merkar seg at dei tilbyr restplassar på safari. "Interessant" seier S. Nute. Han skriblar litt i notisboka si og løftar blikket ut mot den overskya hausthimmelen.

[00:07:58] Evaluator: Då e det oppgåve fire.

[00:08:01] Evaluator: Kan du hjelpe Leo med å danse til musikken?

[00:08:06] Leo: Musikk frå Løvenes konge.

[00:08:10] Participant 2: Hihi.

[00:08:14] Evaluator: Korleis skal dokke få han til å danse?

[00:08:17] Participant 1: Hæ?

[00:08:18] Evaluator: Korleis skal dokke få han til å danse?

[00:08:20] Participant 2: Em.

[00:08:22] Leo: Musikk frå Løvenes konge.

[00:08:37] Participant 1 og Participant 2: Hmmm, hahaha.

[00:08:50] Evaluator: Bra. Det fekk dokke til kjempebra. Då er neste oppgåve. Kan dokke fortelle S. Nute kvar Leo kjem i frå?

[00:08:59] Participant 2: Trenger ikkje vi han igjen?

[00:09:03] Evaluator: Ja, kanskje det.

[00:09:04] Participant 2: Det kan vere vi ser det der.

[00:09:08] Leo: Musikk frå Løvenes konge

[00:09:13] Participant 2: Keee...nya

[00:09:16] Evaluator: Kenya, heilt rett.

[00:09:19] Evaluator: Då kan vi bla om.

[00:09:22] Evaluator: S. Nute følgjer etter Sheila Sjr Raff som er på veg til elefantområdet, der den karismatiske Elefanten Elena har helde til. S. Nute studerar Elena si oppslagstavle grundig. Blant anna er det hengt opp siste utgåve av Elefantnytt, eit signert bilete av Dumbo og ein annonse frå Sirkus Arnoldo der det står: "Har du sjarm og talent, publikumstekke og stil, kan du vere dyret vi søker!" "Som du ser har Elena også fordufta" seier Sheila Sjr Raff fortvila då dei ruslar vidare.

[00:09:56] Evaluator: Då er det oppgåve fem. Kan du hjelpe Elena med å ta en piruett?

[00:10:05] Evaluator: Veit dokke kva ein piruett er?

[00:10:09] Participant 1: Em, eg er ikkje heilt sikker.

[00:10:15] Evaluator: Då snur en seg rundt.

[00:10:15] S. Nute: Interessant...

[00:10:17] Elena: Trommevirvel.

[00:10:28] Evaluator: Klare dokke å samarbeide slik at dokke får det til?

[00:10:27] Elena: Trommevirvel.

[00:10:32] Participant 2: Nei, det var ikkje så lett.

[00:10:43] Evaluator: Var det litt vanskelig ja.

[00:10:45] Participant 2: Eg fikk han nesten rundt.

[00:10:49] Evaluator: Ja. Neste oppgåve. Kan dokke fortelle S. Nute kvar Elena kjem frå?

[00:11:03] Participant 2: Det skjer jo ingenting.

[00:11:08] Evaluator: Der er nok lyset som gjer det (trekker for gardiner).

[00:11:23] Participant 2: Kommer den?

[00:11:24] Elena: Trommevirvel.

[00:11:26] Participant 2: Ja.

[00:11:27] Participant 1 og 2: India (i kor).

[00:11:28] Evaluator: India. Ja.

[00:11:29] Participant 2: Førtifem, hihi.

[00:11:35] Evaluator: Då er det neste. I motsetning til hjå dei andre dyra er båsen til Bertil meir moderne utrusta. I følgje Sheila Sjr Raff er Bertil ein kløppar på data og dyrehagen sin dataspesialist. Datamaskina til Bertil står på og passordet finn S. Nute raskt: Bæ123. Bertil kunne kanskje ha funne på noko betre, tenkjer S. Nute... På maskina finn dei bloggen til Bertil, og det siste innlegget har overskrifta "Ein villsau på villspor". Han skriv om heimstaden sin, om dei grønne markane, dei flotte knausane og den lykkelege oppveksten med tvillingsystema Berit. "Aha" utbyt S. Nute og noterar ivrig i notisboka si. Sheila Sjr Raff og S. Nute går saman ut på gardsplassen

[00:12:22] Evaluator: Då er det oppgåve seks. Kan du hjelpe Bertil med å hoppe over gjerdet?

[00:12:31] Participant 1: Hoppe over gjerdet...

[00:12:38] Bertil: Baaaaaa.

[00:12:43] Participant 2: Haha.

[00:12:54] Participant 2: Nei.

[00:13:01] S. Nute: Eg en hund...

[00:13:01] Bertil: Baaaaaa.

[00:13:05] Bertil: Baaaaaa.

[00:13:10] Participant 2: Løft han forsiktig opp då.

[00:13:15] Participant 1: Nei.

[00:13:18] Participant 2: Nei, han forsvinner.

[00:13:22] Bertil: Baaaaaa.

[00:13:24] Participant 2: Kanskje du berre skal skyve han over gjerdet. Berre rett over.

[00:13:31] Bertil: Baaaaaa.

[00:13:35] Bertil: Baaaaaa.

[00:13:41] Participant 2: Hahaha.

[00:13:47] Participant 2: Kom igjen!

[00:13:49] Participant 2: Han vil ikkje hoppe over gjerdet.

[00:13:55] Bertil: Baaaaaa

[00:14:00] Evaluator: Hm, var det vanskelig?

[00:14:02] Participant 1: Ja.

[00:14:04] Evaluator: Kan dokke fortelle S. Nute kvar Bertil kjem i frå?

[00:14:07] Bertil: Baaaaaa.

[00:14:09] Participant 2: Sa...

[00:14:09] Participant 2: Hæ.

[00:14:13] Bertil: Baaaaaa.

[00:14:16] Participant 2: Sauda.

[00:14:18] Evaluator: Sauda, ja.

[00:14:19] Bertil: Baaaaaa.

[00:14:26] S. Nute: Mysterier...

[00:14:29] Participant 2: Eg sett han (skjermen) her borte.

[00:14:34] Evaluator: Sheila Sjiraff er bekymra og ho er usikker på kva ho skal fortelje avisene om dei forsvunne dyra. "Vi har jo ingen spor," seier ho fortvila, men S. Nute har eit lurt smil om munnen. "Der tek du feil, Sheila," seier S. Nute og viftar med notisboka si, "eg har funne løysinga på mysteriet." "Alle spor peikar mot at Pelle er på ein lang symjetur, så han kjem nok straks tilbake. Leo har reist på safari til solfylte Kenya, som også er heimlandet hans. Elena er på audition på Sirkus Arnoldo, så du kan førebu deg på at ho ønskjer å bytte jobb.

Og Bertil, ja Bertil har hatt heimlengsel og har reist til Sauda for å besøkje familia si i helga". Sheila ser forbløffa på S. Nute og utbryt: "Du er jammen ein dyktig dyredetektiv - no kan eg puste letta ut. Tusen takk for hjelpa!"

[00:15:32] Evaluator: Då er det oppgåve sju. - Kan du sortere Pelle, Leo, Elena og Bertil etter alder med den yngste først?

[00:15:52] Participant 2: Skal berre gå innpå å sjekke.

[00:15:53] Evaluator: Mmm.

[00:15:57] Participant 2: Kanskje vi må ta ein om gongen.

[00:16:04] S. Nute: Hm, interessant, eg er ein hund etter mysterier.

[00:16:13] Evaluator: Er det Pelle, Leo, Elena eller Bertil?

[00:16:15] Participant 1: Nei.

[00:16:17] Participant 2: Dette er hunden.

[00:16:19] Participant 2: Det er hunden dette.

[00:16:29] Elena: Trommevirvel.

[00:16:31] Bertil: Baaaaaa.

[00:16:37] Participant 2: Skal eg gjere det?

[00:16:38] Sheila: Å nei Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:16:45] Participant 1: Kan du gjere det?

[00:16:47] Evaluator: Er det Pelle, Leo, Elena eller Bertil?

[00:16:48] Participant 1 og 2: Nei.

[00:16:51] Elena: Trommevirvel.

[00:17:03] Pelle: Plask.

[00:17:06] Participant 2: Ni, han er ni.

[00:17:07] Evaluator: Mmm.

[00:17:08] Participant 1: Han er ni.

[00:17:12] Participant 2: Han er ni.

[00:17:14] Evaluator: Mmm.

[00:17:16] Evaluator: Også skal dokke ha med Leo, Elena og Bertil.

[00:17:21] Participant 2: Elena er førtifem.

[00:17:24] Evaluator: Huskar du det?

[00:17:25] Participant 2: Nei, eg ser det her.

[00:17:36] Leo: Musikk frå Løvenes konge.

[00:17:37] Participant 2: Fire år.

[00:17:40] Participant 2: Då skal den vere der.

[00:17:46] Participant 1: Ja, den var førtifem den.

[00:17:47] Participant 2: Ja.

[00:17:50] Bertil: Baaaaaa.

[00:17:52] Participant 1 og 2: To år (i kor).

[00:17:53] Participant 2: Hahh!

[00:17:55] Evaluator: Greier dokke å sortere dei da?

[00:18:00] Participant 2: Den.

[00:18:00] Participant 1: Sånn.

[00:18:02] Participant 2: Der.

[00:18:04] Evaluator: Ja, flott.

[00:18:04] Participant 2: Det klarte vi.

[00:18:05] Evaluator: Og då er neste oppgåve. Klarer dokke å sjå alle dyra i skjermen på same tid?

[00:18:13] Participant 2: Sett de litt sammen.

[00:18:15] Participant 1: Sånn.

[00:18:18] Participant 2: Em, vi må sjå alle strekane.

[00:18:20] Evaluator: Mm, sant det var viktig at alle dei svarte strekane viste.

[00:18:23] Participant 2: Ja, nikkar.

[00:18:27] Bertil: Baaaaaa.

[00:18:28] Leo: Musikk frå Løvenes konge.

[00:18:32] Participant 2: Vi får berre opp to stykker.

[00:18:34] Participant 2: Hehe.

[00:18:37] Participant 2: Nei, no får vi det til.

[00:18:39] Participant 1: Fleire no.

[00:18:44] S. Nute: Interessant, eg er en hund etter mysterier.

[00:18:46] Elena: Trommevirvel.

[00:18:51] Participant 2: No ser vi alle fire.

[00:18:52] Evaluator: Mm, flott. Kjempeflott. Då er dokke ferdige. Tusen takk.

[00:18:59] Participant 1: Eg bare lukker denne eg da (boka).

[00:19:00] Participant 1 og 2: (legger på plass markørane).

[00:19:00] Evaluator: Ja.

9.2 Participants Three and Four

Participant 3, gutt.

Participant 4, gutt.

[00:00:07] Evaluator: Det er ein mørk, men langt i frå stille, kveld i Zaza Zoo. Medan direktøren Sheila Sjiraff snorkar høgt frå direktørbustaden, bevegar nokon seg i skuggane. Det raslar i lauvet, det knirkar i porten - det er fare på ferde. Morgonen etter på andre sida av byen. Dyredetektiven S. Nute tørkar som vanleg sokkane sine i mikrobølgeomnen då det ringer på døra.

[00:00:29] Participant 3:Haah.

[00:00:29] Evaluator: Utanfor står Polly, assistenten til S. Nute, og seier: "Det er krise i Zaza Zoo! Fire dyr har forsvunne i løpet av natta og Sheila Sjiraff held på å slå knute på halsen, ho treng hjelp straks!"

[00:00:45] Evaluator: Då er det oppgåve ein. Kan du beskrive korleis S.Nut ser ut?

[00:00:51] Participant 3: Altså han, eeheh, ser ut som et beltedyr.

[00:00:56] Evaluator: Men vist dokke bruka den der (peker på skjermen) og ser på markøren gjennom skjermen. Skjermen kan dokke plukke opp og holde.

[00:01:08] Participant 4: Er skjermen sånn ...

[00:01:11] Participant 4: Skal eg holde han?

[00:01:14] Evaluator: Ja, dokke må samarbeide.

[00:01:15] S. Nute: Mysterier..

[00:01:16] Participant 4: Det er en hund!

[00:01:19] S. Nute: Hm, interessant eg er en hund etter mysterier.

[00:01:25] Participant 4: Ikkje det gjer sånn "navn Participant tre".

[00:01:27] Participant 3: Koffor. Eg skal mose han. Da, da, dush, dush.

[00:01:30] Participant 4: Slutt "navn på Participant tre"!

[00:01:32] S. Nute: Hm, interessant, eg..

[00:01:32] Evaluator: Huskar dokke oppgåva no? Kva var den?

[00:01:34] S. Nute: en hund etter mysterier

[00:01:36] Evaluator: Kan dokke beskrive korleis S. Nute ser ut?

[00:01:37] Participant 4: En hund.

[00:01:38] Evaluator: En hund ja, kva meir.

[00:01:40] S. Nute: Hm, interessant...

[00:01:41] Participant 4: Han har ein lang hals, han har blå auge.

[00:01:44] Participant 3: Nei, han har brune øyne. Nei, han har svarte.

[00:01:47] Participant 4: Ja.

[00:01:48] S. Nute: Interssant...

[00:01:49] Participant 4: Og han e brun.

[00:01:50] Participant 4: Ikkje beveg på han så mykje.

[00:01:52] Participant 3: Eg prøver å holde han i ro.

[00:01:55] S. Nute: Hm, interessant eg er en hund etter mysterier.

[00:01:56] Evaluator: Ja, er dokke fornøgd med oppgåve ein då?

[00:01:57] Participant 4: Ja.

[00:02:01] Evaluator: Då må dokke legge den på plass, så skal vi bla om i boka.

[00:02:08] Evaluator: Bla om her i boka også.

[00:02:10] Participant 3: Trur du det kommer noe om vi tar talet (Participant-nummeret) framfor kameraet?

[00:02:15] Participant 3: Nei, det gjer ikkje det.

[00:02:17] Evaluator: Er vi klar til å lese litt til?

[00:02:18] Participant 3: Ja.

[00:02:19] Participant 4: Ja.

[00:02:20] Evaluator: Innan det har gått ti minutt er S. Nute på plass i Zaza Zoo. Han blir møtt av ei fortvila Sheila Sjiraff som snakkar usamanhengande om forsvunne dyr, mogleg kidnapping og tjuveri.

“Ta det heilt med ro,” seier S. Nute. “Vis meg kvar dyra har helde til, so skal eg bruke detektivkunnskapane mine til å løyse mysteriet.”

[00:02:41] Participant 3: Skal vi ha begge to?

[00:02:44] Evaluator: Då e det oppgåve to. Kan du forklare S. Nute kva Sheila Sjiraff seier?

[00:02:51] Participant 3: Okey. Denne gangen kan eg holde han, så kan du disse to framfor.

[00:02:55] Participant 4: Begge to?

[00:02:56] Participant 3: Ja. fordi...

[00:02:58] Participant 3: Ja, men begge to.

[00:02:58] S. Nute: Hm, interessant

[00:02:59] Evaluator: Oppgåva er...

[00:02:59] Participant 3: Dette blir gøy!

[00:03:02] Evaluator: Oppgåva er at dokke skal forklare kva det er Sheila Sjr Raff seier.

[00:03:06] Participant 4: Skal vi ha sånn?

[00:03:06] Participant 3: Med begge to?

[00:03:10] Participant 3: Den reagerer ikkje nå vi har begge to.

[00:03:11] Bertil: Baaaaaa.

[00:03:15] Participant 3: Vi prøver å ha den bare sånn.

[00:03:18] Participant 4: Nei, det går ikkje.

[00:03:23] Participant 4: Skal eg...

[00:03:24] Participant 3: Kanskje vi må...

[00:03:25] Participant 4: Sjå her.

[00:03:26] S. Nute: Hm, interessant.

[00:03:27] Bertil: Baaaaaa.

[00:03:30] Participant 3: Kor er hunden?

[00:03:33] Participant 3: Ah, såg du det? Det var en sau.

[00:03:37] Participant 4: Ja, eg ser sauene der.

[00:03:40] Participant 3: Det er en sau der borte.

[00:03:43] Bertil: Baaaaaa.

[00:03:45] Evaluator: Skal eg minne dokke på...

[00:03:48] Sheila: Pelle, Leo, Elena og Bertil har forsvunne i løpet av natta.

[00:03:49] Participant 4: Ikkje!

[00:03:50] Evaluator: Skal eg minne dokke på oppgåva?

[00:03:56] Participant 4: Ikkje!

[00:03:58] Participant 3: Eg prøver berre få sjå den her.

[00:04:05] Evaluator: Huska dokke oppgåva som dokke egentlig skulle løyse no?

[00:04:07] Participant 4: Nei.

[00:04:11] Evaluator: Kan dokke gjenta oppgåva som dokke skulle løyse?

[00:04:17] Participant 3: Vi skal forklare den hunden, kva ho seier.

[00:04:19] Evaluator: Ja.

[00:04:21] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunne i løpet av natta, hjelp.

[00:04:23] Evaluator: Hørte dokke det?

[00:04:24] Participant 3: Kan vi ta det en gang til?

[00:04:24] Evaluator: Ja.

[00:04:30] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunne i løpet av natta, hjelp.

[00:04:36] Participant 3: Pelle, Elena, Leo og ... har forsvunne i løpet om natta.

[00:04:41] Evaluator: Ja.

[00:04:42] Participant 3: Jamen har du t...

[00:04:42] Participant 4: "Navn på Participant tre"

[00:04:44] Evaluator: Er dokke fornøgde da?

[00:04:46] Participant 4: Ja.

[00:04:49] Participant 3: Vi kan se sauene.

[00:04:50] Participant 4: No er det pingvinen.

[00:04:52] Evaluator: Men no må vi lese vidare først.

[00:04:54] Participant 3: Ja.

[00:05:00] Evaluator: Då må dokke bla om.

[00:05:06] Participant 3: Pelle pingvin.

[00:05:08] Participant 3: Eg kan ikkje sjå sauene lenger.

[00:05:09] Participant 3: Sauene held på å falle.

[00:05:10] Evaluator: Er dokke klar til å lese vidare?

[00:05:11] Participant 4: Sauene held på å falle.

[00:05:16] Evaluator: Skal vi lese litt vidare?

[00:05:17] Participant 4: Ja.

[00:05:18] Evaluator: Direktøren tek seg kraftig saman og viser S. Nute pingvindammen, der Pingvinen Pelle har budd dei siste månadane. Vatnet i pingvindammen er heilt stille og Pelle er ikkje å sjå nokon stad. "I love Antarktis"-t-skjorta hans heng over gjerdet og borte ved stupebrettet ligg ei lærebok i symjing for fuglar som ikkje kan flyge.

[00:05:40] Participant 3 og 4: Haha

[00:05:40] Evaluator: "Nettopp" seier S. Nute og nikkar. Han noterar noko i notisboka si før dei går vidare.

[00:05:47] Evaluator: Då er det oppgåva tre. Kan du hjelpe Pelle med å stupe ut i vatnet?

[00:05:55] Participant 3: Er det liksom, det (peker i boken).

[00:05:55] Participant 4: Der.

[00:06:01] Participant 4: Eg vet kor vi kan legge han.

[00:06:03] Pelle: Plask.

[00:06:05] Participant 3: Sånn, haha.

[00:06:06] Participant 3: Vent litt, kan vi ta han sånn.

[00:06:14] Participant 4: Eg trur ikkje det går.

[00:06:15] Participant 3: Jo, vent.

[00:06:16] Pelle: Plask.

[00:06:17] Participant 3: Å ja.

[00:06:18] Participant 4: Hahah!

[00:06:19] Evaluator: Flott!

[00:06:20] Pelle: Plask.

[00:06:21] Participant 3 og 4: Hahahaha.

[00:06:22] Evaluator: Ja, då e det neste oppgåve. Kan dokke fortelle S. Nute kvar Pelle kjem frå?

[00:06:28] Participant 4: Pelle?

[00:06:28] Evaluator: Ja.

[00:06:30] Participant 4: Han der pingvinen?

[00:06:31] Participant 3: Antarktis!

[00:06:32] Participant 4: Antarktis!

[00:06:35] Participant 3: Kan eg prøve på noe?

[00:06:37] Participant 3: Se om han kan greie å fly.

[00:06:42] Participant 3: Han vil ikkje fly.

[00:06:43] Pelle: Plask.

[00:06:44] Participant 4: Han flyr!!

[00:06:46] Participant 3: Han flyyyyyyr.

[00:06:48] Pelle: Plask.

[00:06:49] Participant 3: Hahahaha.

[00:06:51] Participant 4: Du som sa han ikkje kunne fly.

[00:06:52] Participant 3: Haha.

[00:06:56] Pelle: Plask.

[00:06:58] Evaluator: Flott. Er dokke fornøgde med oppgåva då?

[00:06:59] Participant 3: Ja.

[00:06:59] Participant 4: Ja.

[00:07:01] Evaluator: Då må vi bla om, og legge den på plass ja.

[00:07:05] Evaluator: Då skal vi vidare. Lyden frå kjenningsmelodien til filmen "Løvenes konge" gjallar frå høgtalarane då dei nærmar seg buret til Løva Leo.

[00:07:15] Participant 3: Den har eg sett.

[00:07:16] Participant 4: Eg viste det.

[00:07:16] Evaluator: Også her er det tomt. Kjøttrestar etter middagen frå i går ligg i matskåla; det var herleg afrikansk bøffelburger med antilopedressing som var på menyen. "Korleis smakar eigentleg antilopedressing?" undrar S. Nute, og tar ein liten smakebit. "Pføy!" utbryt han og spyttar ut dressingen. "Det er jo SOLKREM!" Ved sida av matskåla ligg ein reisekatalog for tame villdyr, og S. Nute merkar seg at dei tilbyr restplassar på safari. "Interessant" seier S. Nute. Han skriblar litt i notisboka si og løftar blikket ut mot den overskya hausthimmelen.

[00:07:55] Participant 3: Det er tv.

[00:07:57] Participant 3: Tv.

[00:07:59] Evaluator: Er dokke klar for oppgåve fire?

[00:08:00] Participant 4: Yes.

[00:08:02] Participant 3: No ser vi på tv.

[00:08:05] Evaluator: Kan dokke hjelpe Leo med å danse til musikken?

[00:08:08] Participant 3: Okey.

[00:08:10] Participant 4: Kom fram Leo.

[00:08:11] Leo: Musikk frå Løvenes konge

[00:08:14] Participant 3: Vent litt, vent litt.

[00:08:16] Participant 4: Eg vil sjå.

[00:08:22] Evaluator: Dansar har no?

[00:08:23] Participant 4: Nei.

[00:08:24] Evaluator: Korleis skal dokke få han til å danse da?

[00:08:25] Participant 4: Anar ikkje.

[00:08:27] Participant 3: Dans, dans!

[00:08:32] Evaluator: Må han ikkje bevege seg for å danse?

[00:08:36] Participant 3: Se han dansar (skyver bordet).

[00:08:43] Participant 3: Eg kan gjøre det.

[00:08:44] Participant 4: Eg kan.

[00:08:45] Participant 3: Eg gjer det.

[00:08:46] Leo: Musikk frå Løvenes konge

[00:08:50] Participant 3: Hehe.

[00:08:53] Participant 3: Sjå, han bevegar seg.

[00:08:55] S. Nute: Eg e..

[00:08:55] Leo: Musikk frå Løvenes konge

[00:08:56] Evaluator: Ja.

[00:08:58] Participant 4: Sånn, slutt no.

[00:09:02] Evaluator: No har dokke løyst oppgåva. Kan dokke fortelle S. Nute kvar Leo kjem frå?

[00:09:06] Participant 3: Em.

[00:09:06] Participant 4: Løvenes konge!

[00:09:09] Evaluator: Kva land kjem han frå?

[00:09:09] Participant 3: Afrika!

[00:09:11] Evaluator: Finn dokke noko hjelp på den?

[00:09:14] Participant 3: Afrika.

[00:09:18] Leo: Musikk frå Løvenes konge

[00:09:25] Participant 4: Kan ikkje eg gjere det.

[00:09:26] Participant 3: Nei eg, please.

[00:09:31] Participant 3: Sjå kor tøff han er!

[00:09:34] Evaluator: Dokke må dele på, sant.

[00:09:36] Participant 3: Du kan holde.

[00:09:40] Participant 4: Kenya.

[00:09:41] Evaluator: Kenya, heilt riktig.

[00:09:44] Participant 3: Kenya, korleis viste du det?

[00:09:46] Participant 4: Der (peker på skjerm).

[00:09:47] Participant 3: Nei, det står Kenada.

[00:09:52] Evaluator: Kenya, og det e heilt rett eit land i Afrika slik du foreslo.

[00:09:55] Evaluator: Skal vi bla om da...

[00:09:55] Participant 3: Ja.

[00:09:56] Evaluator: og lese vidare.

[00:09:57] Participant 3: Eg legger han der.

[00:09:59] Participant 4: No er det elefanten.

[00:10:00] Evaluator: S. Nute følgjer etter Sheila Sjiraff som er på veg til elefantområdet, der den karismatiske Elefanten Elena har helde til. S. Nute studerar Elena si oppslagstavle grundig. Blant anna er det hengt opp siste utgåve av Elefantnytt, eit signert bilete av Dumbo og ein annonse frå Sirkus Arnoldo der det står:

[00:10:19] Participant 3: Dumbo, den har eg sett.

[00:10:21] Evaluator: "Har du sjarm og talent, publikumstekke og stil, kan du vere dyret vi søker!" "Som du ser har Elena også fordufta" seier Sheila Sjiraff fortvila då dei ruslar vidare.

[00:10:32] Evaluator: Oppgåve frem. Kan du hjelpe Elena med å ta en piruett?

[00:10:37] Participant 3 og 4: Kva er en piruett?

[00:10:41] Evaluator: Då bevega nokon seg rundt. Dei snur seg rundt.

[00:10:45] Participant 4: Kan eg gjere det no?

[00:10:46] Participant 3: Okey.

[00:10:47] Participant 3: Vi kan begge holde han.

[00:10:55] Elena: Trommevirvel

[00:10:59] Participant 4: Okey, eg veit kor han kommer frå eg.

[00:11:01] Participant 3: Dumbo.

[00:11:02] Participant 3: Vi får han til å hoppe da, eller fly.

[00:11:05] Participant 4: Skal vi få den til å fly?

[00:11:06] Participant 3: Ja. Nei, vi skal jo...

[00:11:10] Evaluator: Oppgåva er at dokke skal hjelpe elefanten med å ta en piruett, snurre rundt.

[00:11:13] Elena: Trommevirvel.

[00:11:17] Evaluator: Kanskje en kan holde skjermen og en kan holde markøren?

[00:11:23] Participant 3: Eg holder skjermen no.

[00:11:24] Participant 4: Viser han?

[00:11:26] Elena: Trommevirvel.

[00:11:27] Bertil: Baaaaaa.

[00:11:29] Participant 3: Ja, sau.

[00:11:30] Elena: Trommevirvel.

[00:11:32] Participant 3: Slipp. Okey, vent litt.

[00:11:34] Participant 3: Slipp han no.

[00:11:36] Evaluator: Dette var perfekt det!

[00:11:40] Participant 3: Slipp han no!

[00:11:42] Participant 3: Se han tok en salto.

[00:11:42] Evaluator: Du fikk det til, å snu den rundt, du.

[00:11:47] Leo: Musikk frå Løvenes konge.

[00:11:49] Pelle: Plask.

[00:11:51] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta.

[00:11:53] Evaluator: Då e det neste oppgåve. Kan dokke fortelle S. Nute kvar Elena kjem frå?

[00:11:56] Participant 4: Em, India.

[00:11:58] Evaluator: India, heilt riktig.

[00:11:59] Evaluator: Då blar vi om og leser vidare. I motsetning til hjå dei andre dyra er båsen til Bertil meir.

[00:12:04] Leo: Musikk frå Løvenes konge.

[00:12:04] Participant 3: Ops.

[00:12:04] Evaluator: moderne utrusta. I følgje Sheila Sjiraff er Bertil ein kløppar på data og dyrehagen sin dataspesialist. Datamaskina til Bertil står på

[00:12:17] Participant 3: Se eg ser på tv.

[00:12:18] Evaluator: og passordet finn S. Nute raskt: Bæ123. Bertil kunne kanskje ha funne på noko betre, tenkjer S. Nute...

[00:12:29] Evaluator: Vil dokke følge med i boka?

[00:12:30] Evaluator: På maskina finn dei bloggen til Bertil, og det siste innlegget har overskrifta "Ein villsau på villspor". Han skriv om heimstaden sin, om dei grønne markane, dei flotte knausane og den lykkelege oppveksten med tvillingsystema Berit. "Aha" utbyt S. Nute og noterar ivrig i notisboka si. Sheila Sjiraff og S. Nute går saman ut på gardsplassen

[00:13:00] Evaluator: Då er det oppgåve seks. Kan du hjelpe Bertil med å hoppe over gjerdet?

[00:13:07] Participant 3: Em, skal du holde?

[00:13:08] Participant 4: Okey.

[00:13:11] Participant 4: Eg holder denne her eg.

[00:13:12] Participant 3: Jamen, skal begge...

[00:13:16] Evaluator: Dokke må dele, sant.

[00:13:18] Participant 3: Skal du bevege han eller skal eg?

[00:13:20] Participant 4: Eg beveger denne eg.

[00:13:21] Participant 3: Okey.

[00:13:23] Bertil: Baaaaaa.

[00:13:28] Participant 3: Hopp over gjerdet.

[00:13:29] Participant 4: Eg skal holde han eg.

[00:13:31] Participant 4: Må sikkert holde han.

[00:13:33] Bertil: Baaaaaa.

[00:13:39] Bertil: Baaaaaa.

[00:13:40] Participant 3: Sånn, han greidde det.

[00:13:45] Participant 3: Han skal hoppe motsatt vei.

[00:13:45] Bertil: Baaaaaa.

[00:13:47] Participant 3: Ja, han greidde det.

[00:13:47] Evaluator: Greidde han det, ja.

[00:13:49] Bertil: Baaaaaa.

[00:13:49] Evaluator: Då er neste oppgåve.

[00:13:50] Participant 4: Du, lagar han ikkje trommelyd?

[00:13:53] Participant 3: Nei, vent litt.

[00:13:54] Bertil: Baaaaaa.

[00:13:55] Participant 3: Hold han i ro.

[00:13:57] Evaluator: Neste oppgåve. Kan du fortelle S. Nute kvar Bertil kjem frå.

[00:14:02] Participant 3: I frå Norge.

[00:14:02] Participant 4: Kor Bertil kjem i frå?

[00:14:05] Participant 3: Kan komme frå Norge.

[00:14:07] Participant 4: Du, gjer det igjen.

[00:14:09] Participant 3: Ka? Nei, eg skal. Ok.

[00:14:13] Bertil: Baaaaaa.

[00:14:14] Participant 4: Sauda.

[00:14:16] Participant 3: Sauda.

[00:14:17] Evaluator: Heilt rett. Ja, flott.

[00:14:20] Leo: Musikk frå Løvenes konge

[00:14:20] Evaluator: Då skal vi lese litt vidare. Må dokke bla om i boka.

[00:14:27] Participant 3: Okey.

[00:14:32] Sheila Sjiraff er bekymra og ho er usikker på kva ho skal fortelje avisene om dei forsvunne dyra. "Vi har jo ingen

[00:14:37] Bertil: Baaaaaa.

[00:14:37] Evaluator: spor," seier ho fortvila, men S. Nute har eit lurt smil om munnen. "Der tek du feil, Sheila," seier S. Nute og viftar med notisboka si, "eg har funne løysinga på mysteriet."

[00:14:48] Participant 4: Det e pingvinen.

[00:14:51] Evaluator: "Alle spor peikar mot at Pelle er på ein lang symjetur, så han kjem nok straks tilbake. Leo har reist på safari til solfylte Kenya, som også er heimlandet hans. Elena er på audition på Sirkus Arnoldo, så du kan førebu deg på at ho ønskjer å bytte jobb. Og Bertil, ja Bertil har hatt heimlengsel og har reist til Sauda for å besøkje familia si i helga". Sheila ser forbløffa på S. Nute og utbryt: "Du er jammen ein dyktig dyredetektiv - no kan eg puste letta ut. Tusen takk for hjelpa!"

[00:15:31] Evaluator: Er dokke klar for oppgåve sju?

[00:15:31] Participant 3: Ja.

[00:15:31] Participant 4: Ja.

[00:15:33] Evaluator: Kan du sortere Pelle, Leo, Elena og Bertil etter alder med den yngste først?

[00:15:43] S. Nute: Hm.

[00:15:45] Evaluator: Huska dokke kven Pelle var?

[00:15:47] Participant 4: Var ikkje det pingvinen?

[00:15:48] Evaluator: Mmm.

[00:15:50] Participant 3: Er Pelle den yngste?

[00:15:51] Evaluator: Det veit ikkje eg. Det må dokke finne ut av.

[00:15:53] Participant 4: Eg trur Pelle er...

[00:15:56] Participant 3: Eg skal sjekke.

[00:15:58] Participant 3: Du kan ta de frem, så held eg.

[00:15:59] Pelle: Plask.

[00:16:00] Participant 4: Antarktis.

[00:16:00] Participant 3: Pelle.

[00:16:03] Participant 3: Ni år.

[00:16:04] Pelle: Plask.

[00:16:06] Participant 4: Okey, da tar vi Leo.

[00:16:09] Leo: Musikk frå Løvenes konge.

[00:16:10] Participant 3: Han er fire.

[00:16:12] Participant 4: Også, sjiraff.

[00:16:15] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunne i løpet av natta, hjelp.

[00:16:19] Evaluator: Kven er det?

[00:16:20] Participant 4: Sheila.

[00:16:25] Participant 4: Sånn.

[00:16:26] Bertil: Baaaaaa.

[00:16:27] Participant 3 og 4: Han er to.

[00:16:30] Participant 3: Også elefanten.

[00:16:31] Elena: Trommevirvel.

[00:16:32] Participant 3: Oj. Den er førtifem.

[00:16:33] Participant 3: Han var førtifem.

[00:16:38] Evaluator: Då har dokke sortert dei?

[00:16:41] Participant 4: Etter alder. Ja.

[00:16:42] S. Nute: Hm, interessant eg er en hund etter mysterier.

[00:16:43] Evaluator: Då er det ei oppgåve til. Greier dokke å sjå alle dyra i skjermen på same tid?

[00:16:49] Participant 3: Okey.

[00:16:52] Participant 3: Hei "navn på gut i klassen" sjå på dette her da.

[00:16:56] Evaluator: Han skal få prøve etterpå.

[00:17:01] S. Nute: Eg er en hund...

[00:17:01] Elena: Trommevirvel

[00:17:01] Leo: Musikk frå Løvenes konge

[00:17:04] Pelle: Plask.

[00:17:05] Participant 3: Nei, det greier vi ikkje.

[00:17:07] Evaluator: Kva må dokke gjere for å få det til?

[00:17:08] Participant 4: Kan eg prøve?

[00:17:10] Participant 3: Okey, då kan..

[00:17:10] Participant 4: Hold!

[00:17:12] Participant 4: Legg det i same rekkefølge som det var.

[00:17:13] Participant 3: Okey, først tar vi den yngste.

[00:17:17] Sheila: Å nei, Pelle, Leo, Elena og Bertil..

[00:17:17] Participant 4: Eg har tre.

[00:17:20] Participant 4:"Navn på Participant tre", ta dei bort her.

[00:17:22] Participant 4: Eg har tre.

[00:17:26] Elena: Trommevirvel.

[00:17:32] Participant 3: Får du ein til?

[00:17:33] Pelle: Plask.

[00:17:34] Sheila: Å nei...

[00:17:36] Participant 3: Sånn då har vi fire.

[00:17:36] Sheila: Pelle, Leo, Elena og Bertil har forsvunne i løpet av natta...

[00:17:39] Elena: Trommevirvel.

[00:17:41] Participant 3: Ta den litt til...

[00:17:42] S. Nute: Hm, interessant eg er en hund etter mysterier.

[00:17:46] Participant 3: Sånn.

[00:17:48] Participant 3: Nei, nei. Sånn ja.

[00:17:51] Participant 3: Fort.

[00:17:54] Leo: Musikk frå Løvenes konge.

[00:17:55] Participant 3: Nei, vent.

[00:18:00] Participant 3: Nei, nei, ikkje, jo.

[00:18:01] Participant 4: Jo, ja, da har vi alle.

[00:18:05] Evaluator: Flott!

[00:18:06] Participant 3: Kan eg bare sjå på han igjen.

[00:18:08] Evaluator: Skal du sjå på han, ja.

[00:18:09] Participant 3: Bare en gang til.

[00:18:10] Evaluator: Det er friminutt, dersom dokke vil ha ei lita pause.

[00:18:13] Participant 3: Kan vi vere inne?

[00:18:14] Evaluator: Det er eg ikkje sikker på, då må vi spørre læraren dokka.

[00:18:18] Participant 3: Se på disse dyra.

[00:18:21] Participant 3: Se!

[00:18:22] S. Nute: Hm, interessant..

9.3 Participants Five and Six

Participant 5, jente

Participant 6, gutt

[00:00:05] Evaluator: Det er ein mørk, men langt i frå stille, kveld i Zaza Zoo. Medan direktøren Sheila Sjiraff snorkar høgt frå direktørbustaden, bevegar nokon seg i skuggane. Det raslar i lauvet, det knirkar i porten - det er fare på ferde. Morgonen etter på andre sida av byen. Dyredetektiven S. Nute tørkar som vanleg sokkane sine i mikrobølgeomnen då det ringer på døra. Utanfor står Polly, assistenten til S. Nute, og seier: "Det er krise i Zaza Zoo! Fire dyr har forsvunne i løpet av natta og Sheila Sjiraff held på å slå knute på halsen, ho treng hjelp straks!"

[00:00:42] Evaluator: Då er det oppgåve ein. Kan du beskrive korleis S. Nute ser ut?

[00:00:49] Evaluator: Då må dokke plukke opp skjermen, velge rett brikke også prøve å sjå om dokke ser S. Nute gjennom skjermen.

[00:00:57] Participant 6: Skal vi ta opp en sånn?

[00:00:59] Evaluator: Ja. Men kva for brikke trur dokke er S. Nute?

[00:01:01] Participant 6: Av de?

[00:01:02] Evaluator: Mmm.

[00:01:04] Participant 6: Løva.

[00:01:08] Participant 5: Eg trur kanskje det er denne.

[00:01:12] Evaluator: Mmm.

[00:01:24] Evaluator: For at dokke skal sjå dyret på brikken, må heile det svarte feltet vise. Det betyr at dokke må holde brikken lenger i frå, eller so må dokke plukke opp skjermen.

[00:01:43] Bertil: Baaaaaa.

[00:01:45] Participant 5: Hihi.

[00:01:48] Participant 6: Det viste en hund.

[00:01:55] Evaluator: Dokke har lov til å stå dersom det er enklare å holde skjermen da.

[00:02:03] Bertil: Baaaaaa.

[00:02:03] Elena: Trommevirvel.

[00:02:04] Participant 6: Eg ser ein hund.

[00:02:09] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:02:13] Leo: Musikk frå Løvenes konge.

[00:02:18] Evaluator: Korleis ser han ut, greier dokke å beskrive han?

[00:02:20] Participant 6: Em, den.

[00:02:21] Evaluator: Mmm.

[00:02:23] S. Nute: Hm interessant eg er en hund etter mysterier.

[00:02:28] Participant 5: Han er brun.

[00:02:29] Evaluator: Ja.

[00:02:34] Participant 6: Han har poter.

[00:02:38] Participant 5: Også...

[00:02:40] Participant 6: Også ser vi ikkje ørene.

[00:02:41] Participant 5: Jo, ørene henger litt ned, sånn, de ser ut som streker.

[00:02:46] Evaluator: Ja.

[00:02:48] Participant 5: Også har han, der ser ut som han har mørkebrun snute.

[00:02:53] Evaluator: Mmm. Ja, flott. Då har dokke beskrive S. Nute, som var første oppgåva. Då kan dokke sette skjermen ned og så kan vi bla om.

[00:03:06] Leo: Musikk frå Løvenes konge.

[00:03:07] Bertil: Baaaaaa.

[00:03:09] Evaluator: Kan dokke bla om i boka og så leser vi vidare.

[00:03:13] Evaluator: Innan det har gått ti minutt er S. Nute på plass i Zaza Zoo. Han blir møtt av ei fortvila Sheila Sjiraff som snakkar usamanhengande om forsvunne dyr, mogleg kidnapping og tjuveri. "Ta det heilt med ro," seier S. Nute. "Vis meg kvar dyra har helde til, so skal eg bruke detektivkunnskapane mine til å løyse mysteriet."

[00:03:36] Evaluator: Oppgåve to. Kan du forklare S. Nute kva Sheila Sjiraff seier?

[00:03:43] Evaluator: Kva trur dokke at dokke må gjere for å få det til?

[00:03:54] Evaluator: Sjå på brikken gjennom skjermen?

[00:03:52] Participant 6: Ja.

[00:03:53] Participant 6: Kanskje sjiraffen.

[00:03:54] Evaluator: Mmm.

[00:04:01] Participant 6: Eh.

[00:04:04] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunne i løpet av natta, hjelp.

[00:04:11] Evaluator: Hørte dokke kva ho sa?

[00:04:12] Sheila: Å nei, Pelle, Leo, Elena og Bertil har forsvunne i løpet av natta, hjelp.

[00:04:20] Participant 5: Eh, hihi.

[00:04:23] Evaluator: Hørte dokke kva ho sa?

[00:04:27] Evaluator: Var det nokon som hadde forsvunne?

[00:04:28] Participant 5 og 6: Ja.

[00:04:30] Participant 5: Det var e... em...

[00:04:36] Evaluator: Var det vanskelig å høyre namna kanskje?

[00:04:36] Participant 6: Ja.

[00:04:38] Evaluator: Men ho ba om hjelp?

[00:04:38] Participant 5 og 6: Ja.

[00:04:39] Evaluator: Mmm. Skal vi lese vidare da?

[00:04:43] Participant 5: Ja.

[00:04:47] Evaluator: Direktøren tek seg kraftig saman og viser S. Nute pingvindammen, der Pingvinen Pelle har budd dei siste månadane. Vatnet i pingvindammen er heilt stille og Pelle er ikkje å sjå nokon stad. "I love Antarktis"-t-skjorta hans heng over gjerdet og borte ved stupebrettet ligg ei lærebok i symjing for fuglar som ikkje kan flyge. "Nettopp" seier S. Nute og nikkar. Han noterar noko i notisboka si før dei går vidare.

[00:05:16] Evaluator: Då er vi komt til oppgåve tre. Kan du hjelpe Pelle med å stupe ut i vatnet?

[00:05:24] Elena: Trommevirvel.

[00:05:26] Participant 6: Då er det denne.

[00:05:27] Evaluator: Mmm.

[00:05:31] Pelle: Plask.

[00:05:43] Pelle: Plask.

[00:05:46] Evaluator: Greier dokke å sjå i skjermen at han stuper i vatnet?

[00:05:51] Pelle: Plask.

[00:05:52] Participant 5: Nei, høyrer det berre.

[00:05:57] Evaluator: Då er det neste oppgåve. Kan dokke fortelle S. Nute kvar Pelle kjem i frå?

[00:06:04] Participant 6: Emm, Antarktis.

[00:06:05] Evaluator: Antarktis, ja.

[00:06:07] Elena: Trommevirvel.

[00:06:11] Participant 5: Det, hihi , er en elefant på skjermen, hihi.

[00:06:16] Evaluator: Hehe, er det det.

[00:06:15] Participant 5: Ja.

[00:06:17] Evaluator: Då skal vi bla om. Skal vi lese vidare?

[00:06:22] Evaluator: Kan dokke også bla om i boka?

[00:06:25] Elena: Trommevirvel.

[00:06:27] Evaluator: Lyden frå kjenningsmelodien til filmen "Løvenes konge" gjallar frå høgtalarane då dei nærmar seg buret til Løva Leo. Også her er det tomt. Kjøtrestar etter middagen frå i går ligg i matskåla; det var herleg afrikansk bøffelburger med antilopedressing som var på menyen. "Korleis smakar eigentleg antilopedressing?" undrar S. Nute, og tar ein liten smakebit. "Pføy!" utbryt han og spyttar ut dressingen. "Det er jo SOLKREM!" Ved sida av matskåla ligg ein reisekatalog for tame villdyr, og S. Nute merkar seg at dei tilbyr restplassar på safari. "Interessant" seier S. Nute. Han skriblar litt i notisboka si og løftar blikket ut mot den overskya hausthimmelen.

[00:07:17] Evaluator: Då er det oppgåve fire.

[00:07:21] Evaluator: Kan du hjelpe Leo med å danse til musikken?

[00:07:30] Evaluator: Kva trur dokke at dokke må gjere da?

[00:07:33] Participant 5: Vi må ta den.

[00:07:34] Evaluator: Mmm.

[00:07:41] Leo: Musikk frå Løvenes konge.

[00:07:45] Participant 6: Hehe.

[00:07:48] Evaluator: Korleis kan dokke få han til å danse da?

[00:07:51] Participant 5: Um, veit ikkje...

[00:07:54] Leo: Musikk frå Løvenes konge

[00:08:00] Participant 5: Han beveger seg. Hihihhi.

[00:08:07] Participant 5: Han beveger litt på hodet.

[00:08:08] Evaluator: Mmm.

[00:08:14] Participant 6: Gå vekk (til elev som stikker hovudet innom skjerm Brettet)

[00:08:18] Evaluator: Ja, då er det neste oppgåve. Kan dokke fortelle S. Nute kvar Leo kjem frå?

[00:08:28] Evaluator: Var der nokon tips på denne?

[00:08:31] Participant 5: Hmm.

[00:08:31] Participant 6: Mumler...

[00:08:42] Participant 5: Em...

[00:08:43] Leo: Musikk frå Løvenes konge.

[00:08:48] Participant 5: Kee...nya. Kenya.

[00:08:48] Participant 6: Kenya.

[00:08:49] Evaluator: Ja. Kenya.

[00:08:52] Participant 6: Det var vanskelig å lese på grunn av at løven var framfor.

[00:08:58] Participant 5: Sto liksom litt oppå.

[00:08:59] Evaluator: Skal vi lese vidare da? Da må vi bla om.

[00:09:05] Evaluator: S. Nute følgjer etter Sheila Sjiraff som er på veg til elefantområdet, der den karismatiske Elefanten Elena har helde til. S. Nute studerar Elena si oppslagstavle grundig. Blant anna er det hengt opp siste utgåve av Elefantnytt, eit signert bilete av Dumbo og ein annonse frå Sirkus Arnoldo der det står: "Har du sjarm og talent, publikumstekke og stil, kan du vere dyret vi søker!" "Som du ser har Elena også fordufta" seier Sheila Sjiraff fortvila då dei ruslar vidare.

[00:09:43] Evaluator: Då er det oppgåve frem.

[00:09:44] Leo: Musikk frå Løvenes konge.

[00:09:48] Evaluator: Kan du hjelpe Elena med å ta en piruett?

[00:09:54] Participant 5: Kanskje, hehe.

[00:09:57] Participant 6: Ser du det same som vi der?

[00:09:59] Evaluator: Ja.

[00:10:01] Elena: Trommevirvel.

[00:10:01] Evaluator: Veit dokke kva ein piruett er for noko?

[00:10:06] Participant 5: Ja, for eg dansar ballett.

[00:10:13] Evaluator: Ja, så bra.

[00:10:11] Participant 5: Ja, eg kan det sidan eg dansar.

[00:10:16] Elena: Trommevirvel.

[00:10:16] Evaluator: Korleis kan dokke hjelpe Elena med å ta en piruett?

[00:10:19] Participant 5: Veit ikkje.

[00:10:40] Elena: Trommevirvel.

[00:10:30] Participant 5: Hihi.

[00:10:43] Participant 5: Hold den. Hold skjermen.

[00:10:52] Participant 5: Haha.

[00:10:53] Participant 6: Eg ser ingenting.

[00:10:58] Elena: Trommevirvel.

[00:11:07] Elena: Trommevirvel.

[00:11:10] Evaluator: Den gikk nesten heilt rundt den.

[00:11:13] Elena: Trommevirvel.

[00:11:17] Participant 6: Handa kjem i veien.

[00:11:19] Evaluator: Does it.

[00:11:20] Participant 6: Eg ser den. Kan du ta den?

[00:11:24] Elena: Trommevirvel.

[00:11:37] Elena: Trommevirvel.

[00:11:40] Evaluator: Det var veldig bra teknikk.

[00:11:43] Evaluator: Skal eg gi dokke neste oppgåve også. Kan dokke fortelle S. Nute kvar Elena kjem frå?

[00:11:47] Participant 5: India.

[00:11:50] Evaluator: India ja.

[00:11:50] Participant 5: Eg leste det der.

[00:11:51] Evaluator: Kjempeflott. Då blar vi om og lesar vidare.

[00:11:57] Evaluator: I motsetning til hjå dei andre dyra er båsen til Bertil meir moderne utrusta. I følgje Sheila Sjiraff er Bertil ein kløppar på data og dyrehagen sin dataspesialist. På maskina finn dei bloggen til Bertil, og det siste innlegget har overskrifta "Ein villsau på villspor". Han skriv om heimstaden sin, om dei grønne markane, dei flotte knausane og den lykkelege oppveksten med tvillingsystema Berit. "Aha" utbyt S. Nute og noterar ivrig i notisboka si. Sheila Sjiraff og S. Nute går saman ut på gardsplassen

[00:12:50] Evaluator: Då er det oppgåve seks. Kan du hjelpe Bertil med å hoppe over gjerdet?

[00:12:55] Participant 6: Bertil det er den.

[00:12:56] Leo: Musikk frå Løvenes konge

[00:13:00] Participant 5: Er det en sau? Er det sauen?

[00:13:02] Evaluator: Mmm.

[00:13:06] Leo: Musikk frå Løvenes konge

[00:13:07] Bertil: Baaaaaa.

[00:13:11] S. Nute: Hm interessant...

[00:13:16] Bertil: Baaaaaa.

[00:13:18] Participant 5: Nei, haha.

[00:13:19] Participant 6: Prøv igjen.

[00:13:21] Bertil: Baaaaaa.

[00:13:22] Participant 5: Du kan sjå han? Hihi.

[00:13:27] Participant 5: Hihhi.

[00:13:29] Participant 5: Du må prøve.

[00:13:30] Bertil: Baaaaaa.

[00:13:31] Participant 6: Kva skal vi gjere?

[00:13:32] Participant 5: Hoppe.

[00:13:43] Participant 6: Mmm.

[00:13:52] Participant 5: Nei, vi får ikkje han inn.

[00:13:56] Evaluator: Nei, det fordi lyset... (flytter på gardin).

[00:14:03] Participant 6: Sånn, no går det.

[00:14:14] Participant 5: Eg får ikkje det til.

[00:14:17] Bertil: Baaaaaa.

[00:14:19] Bertil: Baaaaaa.

[00:14:24] S. Nute: eg er en hund etter mysterier.

[00:14:27] Participant 5: Såg ut som det var en sånn pitteliten som hoppet rundt..

[00:14:31] Evaluator: Mmm.

[00:14:32] Participant 5: Det var det, hihi.

[00:14:32] Bertil: Baaaaaa.

[00:14:36] Participant 5: Han har hoppet over gjerdet den, også var det en sånn pitteliten en også.

[00:14:39] Evaluator: Då skal dokke få neste oppgåve. Kan du fortelle S. Nute kvar Bertil kjem frå.

[00:14:44] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:14:44] Participant 6: Kven, Bertil?

[00:14:45] Evaluator: Ja, kor kom han i frå?

[00:14:47] Participant 6: Eh.

[00:14:50] Participant 5: Sauda.

[00:14:51] Participant 6: Sauda.

[00:14:52] Evaluator: Sauda, ja.

[00:14:54] S. Nute: Hm...

[00:14:54] Evaluator: Då skal vi lese vidare.

[00:14:54] S. Nute: ...interessant, eg er en hund etter mysterier.

[00:14:57] Evaluator: Sheila Sjiraff er bekymra og ho er usikker på kva ho skal fortelje avisene om dei forsvunne dyra. "Vi har jo ingen spor," seier ho fortvila, men S. Nute har eit lurt smil om munnen. "Der tek du feil, Sheila," seier S. Nute og viftar med notisboka si, "eg har funne løysinga på mysteriet." "Alle spor peikar mot at Pelle er på ein lang symjetur, så han kjem nok straks tilbake. Leo har reist på safari til solfylte Kenya, som også er heimlandet hans. Elena er på audition på Sirkus Arnoldo, så du kan førebu deg på at ho ønskjer å bytte jobb. Og Bertil, ja Bertil har hatt heimlengsel og har reist til Sauda for å besøkje familia si i helga". Sheila ser forbløffa på S. Nute og utbryt: "Du er jammen ein dyktig dyredetektiv - no kan eg puste letta ut. Tusen takk for hjelpa!"

[00:15:55] Evaluator: Då er det oppgåve sju. Kan du sortere Pelle, Leo, Elena og Bertil etter alder med den yngste først?

[00:16:16] Participant 6: Hm, kan vi finne ut av den først.

[00:16:21] Participant 6: Skal vi sjå kven som er yngst?

[00:16:22] Evaluator: Mmm.

[00:16:23] Participant 5: Det er en hund der.

[00:16:25] Bertil: Baaaaaa.

[00:16:27] Bertil: Baaaaaa.

[00:16:30] Bertil: Baaaaaa.

[00:16:32] Participant 6: En sau.

[00:16:34] Evaluator: Klarer dokke å finne ut kor gammal den er?

[00:16:45] Bertil: Baaaaaa.

[00:16:46] Leo: Musikk frå Løvenes konge.

[00:16:49] Participant 5: Finne ut av sauen.

[00:16:50] Participant 5: Snu på den.

[00:16:50] Bertil: Baaaaaa.

[00:16:55] Participant 5: Sauen er to år.

[00:16:56] Evaluator: Ja.

[00:16:57] Bertil: Baaaaaa.

[00:16:59] S. Nute: Hm interessant.

[00:17:01] Pelle: Plask.

[00:17:02] Participant 5 og 6: Ni år.

[00:17:03] Evaluator: Mmm.

[00:17:04] Participant 6: Og Leo... han er.

[00:17:06] Bertil: Baaaaaa.

[00:17:07] Participant 6: Tre år.

[00:17:08] Participant 5: Eg trur kanskje han er fire.

[00:17:08] Bertil: Baaaaaa.

[00:17:10] Leo: Musikk frå Løvenes konge.

[00:17:13] Participant 6: Ja, fire.

[00:17:17] Participant 5: So då er den rekkefølgen.

[00:17:18] Evaluator: Mmm.

[00:17:22] Bertil: Baaaaaa.

[00:17:22] Elena: Trommevirvel.

[00:17:26] Leo: Musikk frå Løvenes konge.

[00:17:28] Participant 5: Elena. Eg trur hun var førtifem.

[00:17:34] Evaluator: Mmm.

[00:17:35] Participant 6: Førtifem år. Det er sånn som faren min det.

[00:17:38] Evaluator: Er det, hehe.

[00:17:39] Evaluator: Då er det siste oppgåva. Klarer dokke å sjå på alle dyra i skjermen på samme tid?

[00:17:45] Leo: Musikk frå Løvenes konge.

[00:17:47] Bertil: Baaaaaa.

[00:17:51] Participant 5: Eg må prøve noko.

[00:17:56] Participant 5: Flytt på dei.

[00:18:03] Participant 5: Vi ser...

[00:18:04] Bertil: Baaaaaa.

[00:18:05] Participant 6: Vi ser kun to.

[00:18:12] Participant 5: Mangla...

[00:18:14] Participant 6: Dansa den?

[00:18:17] Participant 6: Vi fekk jo fram fire i sted.

[00:18:22] Participant 5: Ja.

[00:18:25] Elena: Trommevirvel.

[00:18:26] Participant 6: Sånn.

[00:18:27] Participant 5: Ja.

[00:18:28] Evaluator: Ja, der har dokke dei. Flott. Då var dokke ferdige.

9.4 Participants Seven and Eight

Participant 7, jente.

Participant 8, jente.

[00:00:04] Evaluator: Det er ein mørk, men langt i frå stille, kveld i Zaza Zoo. Medan direktøren Sheila Sjiraff snorkar høgt frå direktørbustaden, bevegar nokon seg i skuggane. Det raslar i lauvet, det knirkar i porten - det er fare på ferde. Morgonen etter på andre sida av byen. Dyredetektiven S. Nute tørkar som vanleg sokkane sine i mikrobølgeomnen då det ringer på døra. Utanfor står Polly, assistenten til S. Nute, og seier: "Det er krise i Zaza Zoo! Fire dyr har forsvunne i løpet av natta og Sheila Sjiraff held på å slå knute på halsen, ho treng hjelp straks!"

[00:00:43] Evaluator: Då er det oppgåve ein. Kan du beskrive korleis S. Nut ser ut?

[00:00:49] Participant 8: Eh, korleis han ser ut?

[00:00:54] Evaluator: Ja, korleis han ser ut. So då må dokke finne rett brikke også må dokke sjå på den gjennom skjermen.

[00:01:02] Participant 8: Em, er det den?

[00:01:03] Evaluator: Em, S. Nute, hunden.

[00:01:05] Participant 8: Den?

[00:01:06] Evaluator: Mmmm.

[00:01:13] Participant 7: Skal vi filme den?

[00:01:14] Evaluator: Mmmm.

[00:01:25] Participant 8: Sånn?

[00:01:26] Evaluator: Heile brikken må vise i skjermen.

[00:01:29] Participant 8: Sånn!

[00:01:32] Participant 7: Skal eg holde han.

[00:01:32] Participant 8: Ja.

[00:01:38] Evaluator: Heile det svarte feltet må vise i skjermen for at dokke skal sjå figuren.

[00:01:44] Participant 8: Eg ser han no.

[00:01:44] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:01:54] Evaluator: Ser dokke korleis han ser ut?

[00:01:55] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:01:59] Evaluator: Greie dokke å beskrive han?

[00:02:00] Participant 8: Han er en hund. Han har svart neste. Også er han brun.

[00:02:04] Participant 7: Han har svarte øyne.

[00:02:06] Evaluator: Mmm.

[00:02:10] Participant 7: Også har han svart hale.

[00:02:11] Evaluator: Ja.

[00:02:15] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:02:23] Participant 7: Han er stor.

[00:02:24] Evaluator: Ja. Er dokke fornøgde med beskrivelsen?

[00:02:26] Participant 7 og 8: Ja.

[00:02:29] Evaluator: Då kan vi lese vidare.

[00:02:32] Participant 8: Skal eg bare ta denne på plass?

[00:02:34] Evaluator: Det kan du.

[00:02:36] Evaluator: Innan det har gått ti minutt er S. Nute på plass i Zaza Zoo. Han blir møtt av ei fortvila Sheila Sjiraff som snakkar usamanhengande om forsvunne dyr, mogleg kidnapping og tjuveri. "Ta det heilt med ro," seier S. Nute. "Vis meg kvar dyra har helde til, so skal eg bruke detektivkunnskapane mine til å løyse mysteriet."

[00:02:57] Evaluator: Oppgåve to. Kan du forklare S. Nute kva det er Sheila sjiraff seier?

[00:03:07] Evaluator: Den ja.

[00:03:17] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:03:26] Participant 7: Hun har svart hale og grå nede på foten. Også har hun sånn ulike prikker.

[00:03:32] Evaluator: Mmm.

[00:03:33] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:03:36] Evaluatør: Høyre dokke kva ho seier?

[00:03:38] Participant 8: Em.

[00:03:39] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:03:44] Participant 8: Ånei...

[00:03:46] Participant 7: Skjønte det ikkje heilt.

[00:03:47] Participant 8: Ånei, P... Leo, eh...

[00:03:54] Participant 7: Forsvunnet i løpet av natta.

[00:03:58] Participant 8: Pelle, Leo... og Bertil.

[00:04:05] Evaluatør: Ja, då he dokke hørt kva ho har sagt. Skal vi gå vidare da?

[00:04:06] Participant 8: Ja.

[00:04:10] Evaluatør: Direktøren tek seg kraftig saman og viser S. Nute pingvindammen, der Pingvinen Pelle har budd dei siste månadane. Vatnet i pingvindammen er heilt stille og Pelle er ikkje å sjå nokon stad. "I love Antarktis"-t-skjorta hans heng over gjerdet og borte ved stupebrettet ligg ei lærebok i symjing for fuglar som ikkje kan flyge. "Nettopp" seier S. Nute og nikkar. Han noterar noko i notisboka si før dei går vidare.

[00:04:40] Evaluatør: Då er vi komt til oppgåve tre. Kan du hjelpe Pelle med å stupe ut i vatnet?

[00:04:47] Participant 8: Eh...

[00:04:47] Participant 7: Ja det er den pingvingen.

[00:04:53] Participant 8: Eg skal bare legge den ned.

[00:04:56] Pelle: Plask.

[00:04:59] Pelle: Plask.

[00:05:01] Participant 7: Han er svart, kvit og orange nebb.

[00:05:05] Participant 8: Og føtter.

[00:05:08] Participant 7: Også svarte ringar rundt øynene.

[00:05:10] Pelle: Plask.

[00:05:13] Participant 8: Også sånn svart her rundt.

[00:05:22] Participant 8: Også gul her, sånt nebb.

[00:05:23] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:05:28] Evaluatør: Kan dokke fortelle S. Nute kvar det er Pelle kjem i frå?

[00:05:29] Participant 8: Em, Antarktis.

[00:05:33] Evaluator: Antarktis, ja. Skal vi lese vidare da?

[00:05:34] Participant 8: Mmm.

[00:05:36] Evaluator: Lyden frå kjenningsmelodien til filmen "Løvenes konge" gjallar frå høgtalarane då dei nærmar seg buret til Løva Leo. Også her er det tomt. Kjøtrestar etter middagen frå i går ligg i matskåla; det var herleg afrikansk bøffelburger med antilopedressing som var på menyen. "Korleis smakar eigentleg antilopedressing?" undrar S. Nute, og tar ein liten smakebit. "Pføy!" utbryt han og spyttar ut dressingen. "Det er jo SOLKREM!" Ved sida av matskåla ligg ein reisekatalog for tame villdyr, og S. Nute merkar seg at dei tilbyr restplassar på safari. "Interessant" seier S. Nute. Han skriblar litt i notisboka si og løftar blikket ut mot den overskya hausthimmelen.

[00:06:21] Evaluator: Då er det oppgåve fire. Kan dokke hjelpe Leo med å danse til musikken?

[00:06:31] Participant 8: Den er løven.

[00:06:34] Leo: Musikk frå Løvenes konge.

[00:06:45] Evaluator: Korleis skal dokke få han til å danse?

[00:06:45] Participant 8: Eh, hehe.

[00:06:51] Evaluator: Bevega han på seg?

[00:06:51] Participant 8: Nei.

[00:06:53] Evaluator: Nei, korleis skal dokke få han til å bevege seg da?

[00:06:53] Leo: Musikk frå Løvenes konge.

[00:07:00] Participant 8: Eh, veit ikkje.

[00:07:04] Participant 7: Em....

[00:07:09] Leo: Musikk frå Løvenes konge.

[00:07:10] Participant 7: Ja.

[00:07:12] Participant 8: Hehe.

[00:07:14] Evaluator: Det gikk.

[00:07:17] Participant 8: Ja.

[00:07:18] Evaluator: Då er det neste oppgåve. Kan dokke fortelle S. Nute kvar Leo kjem i frå?

[00:07:20] Participant 8: Afrika.

[00:07:27] Evaluator: Såg dokke om det var nokon tips på den?

[00:07:28] Participant 8: Em, nei.

[00:07:31] Leo: Musikk frå Løvenes konge

[00:07:33] Participant 7: Leo. Fire. Og Kenya.

[00:07:37] Evaluator: Kenya, nettopp. Leo kjem frå Kenya.

[00:07:43] Evaluator: Då les vi vidare. S. Nute følgjer etter Sheila Sjiraff som er på veg til elefantområdet, der den karismatiske Elefanten Elena har helde til. S. Nute studerar Elena si oppslagstavle grundig. Blant anna er det hengt opp siste utgåve av Elefantnytt, eit signert bilete av Dumbo og ein annonse frå Sirkus Arnaldo der det står: "Har du sjarm og talent, publikumstekke og stil, kan du vere dyret vi søker!" "Som du ser har Elena også fordufta" seier Sheila Sjiraff fortvila då dei ruslar vidare.

[00:08:15] Evaluator: Oppgåve fem. Kan du hjelpe Elena med å ta en piruett?

[00:08:19] Participant 8: Kva er ein piruett?

[00:08:20] Participant 7: Eh.

[00:08:22] Evaluator: Veit du det?

[00:08:22] Participant 7: Eh, nei.

[00:08:23] Evaluator: Det er når nokon snur seg rundt.

[00:08:30] Participant 8: Elefanten.

[00:08:32] Participant 8: Sånn.

[00:08:32] Evaluator: Mmm.

[00:08:37] Elena: Trommevirvel.

[00:08:43] Participant 7: Elena, India.

[[00:08:47] Elena: Trommevirvel.

[00:08:50] Participant 7: Ja, han snur seg rundt.

[00:08:52] Elena: Trommevirvel.

[00:08:55] Participant 7: Ja.

[00:08:58] Elena: Trommevirvel.

[00:09:06] Participant 7: Det står iallefall Elena, India.

[00:09:07] Participant 8: India!

[00:09:08] Evaluator: Ja flott! Så då er Elena frå India, ja.

[00:09:12] Participant 8: Ja.

[00:09:15] Evaluator: Då leser vi vidare. I motsetning til hjå dei andre dyra er båsen til Bertil meir moderne utrusta. I følgje Sheila Sjiraff er Bertil ein kløppar på data og dyrehagen sin dataspesialist. På maskina finn dei bloggen til Bertil, og det siste innlegget har overskrifta

”Ein villsau på villspor”. Han skriv om heimstaden sin, om dei grønne markane, dei flotte knausane og den lykkelege oppveksten med tvillingsystema Berit. ”Aha” utbyt S. Nute og noterar ivrig i notisboka si. Sheila Sjr Raff og S. Nute går saman ut på gardsplassen

[00:10:05] Evaluator: Då er det oppgåve seks. Kan du hjelpe Bertil med å hoppe over gjerdet?

[00:10:13] Bertil: Baaaaaa.

[00:10:16] Participant 7: Han må over.

[00:10:23] Participant 7: Hehehe.

[00:10:24] Participant 8: Ja, hopp.

[00:10:25] Participant 8: Ja.

[00:10:27] Bertil: Baaaaaa.

[00:10:29] Evaluator: Kjempebra.

[00:10:30] Bertil: Baaaaaa.

[00:10:32] Participant 7: Ja, hehe.

[00:10:33] Participant 8: Hihhi.

[00:10:33] Bertil: Baaaaaa.

[00:10:35] Evaluator: Bra. Kan dokke løyse neste oppgåve også da. Fortell S. Nute kvar Bertil kjem i frå?

[00:10:39] Participant 8: Da må vi se på den igjen.

[00:10:43] Bertil: Baaaaaa.

[00:10:44] Participant 7: Bertil. Em, Sauda.

[00:10:46] Participant 8: Sauda.

[00:10:47] Evaluator: Sauda, ja.

[00:10:51] Evaluator: Då leser vi vidare. Sheila Sjr Raff er bekymra og ho er usikker på kva ho skal fortelje avisene om dei forsvunne dyra. ”Vi har jo ingen spor,” seier ho fortvila, men S. Nute har eit lurt smil om munnen. ”Der tek du feil, Sheila,” seier S. Nute og viftar med notisboka si, ”eg har funne løysinga på mysteriet.” ”Alle spor peikar mot at Pelle er på ein lang symjetur, så han kjem nok straks tilbake. Leo har reist på safari til solfylte Kenya, som også er heimlandet hans. Elena er på audition på Sirkus Arnoldo, så du kan førebu deg på at ho ønskjer å bytte jobb. Og Bertil, ja Bertil har hatt heimlengsel og har reist til Sauda for å besøkje familia si i helga”. Sheila ser forbløffa på S. Nute og utbryt: ”Du er jammen ein dyktig dyredetektiv - no kan eg puste letta ut. Tusen takk for hjelpa!”

[00:11:46] Evaluator: Då er det oppgave sju. Kan du sortere Pelle, Leo, Elena og Bertil etter alder med den yngste først?

[00:11:56] Participant 8: Korleis kan vi sjå kven som er eldst da?

[00:11:59] Participant 7: Jo vi ser det.

[00:12:01] Participant 7: Det står jo nummer der.

[00:12:07] Participant 8: Pelle.... og Bertil.

[00:12:18] Participant 8: Oj.

[00:12:18] Elena: Trommevirvel.

[00:12:19] Bertil: Baaaaaa.

[00:12:20] Leo: Musikk frå Løvenes konge.

[00:12:27] Participant 8: Leo er fire.

[00:12:30] Participant 8: Eh, Bertil er to.

[00:12:34] Participant 8: Elena er førtifem.

[00:12:39] Participant 8: Denne da.

[00:12:38] Pelle: Plask.

[00:12:40] Participant 7: Eh, ni.

[00:12:40] Participant 8: Ni.

[00:12:40] Evaluator: Mmm.

[00:12:43] Participant 8: Denne var eldst, den der.

[00:12:46] Participant 8: Og så kom...

[00:12:56] Pelle: Plask.

[00:12:58] Participant 7: Ni, nei.

[00:12:59] Participant 8: Jo, ni.

[00:13:00] Evaluator: Mmm.

[00:13:02] Bertil: Baaaaaa.

[00:13:04] Participant 8: Og så var det den. Sånn.

[00:13:09] Evaluator: Flott.

[00:13:09] Participant 8: Han bare står der, hehe.

[00:13:11] Evaluator: Då var det siste oppgave. Klarer dokke å sjå på alle alle dyra i skjermen samtidig?

[00:13:16] Participant 7: Alle?

[00:13:17] Evaluator: Mmm.

[00:13:21] Participant 7: Hehe.

[00:13:31] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:13:34] Bertil: Baaaaaa.

[00:13:35] Leo: Musikk frå Løvenes konge.

[00:13:36] Participant 7 og 8: Hihihhi.

[00:13:39] Elena: Trommevirvel.

[00:13:44] Evaluuator: Ja, det er lov å reise seg opp.

[00:13:52] Participant 7: Ja, vi klarer det, vi klarer det!

[00:13:59] Participant 8: Em.

[00:14:24] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:14:31] Pelle: Plask.

[00:14:33] Elena: Trommevirvel.

[00:14:36] Participant 7 og 8: Hihihhi.

[00:14:34] Leo: Musikk frå Løvenes konge.

[00:14:38] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:14:54] Participant 8: Sånn der har vi alle!

[00:14:56] Evaluuator: Kjempeflott! Då var dokke ferdige.

9.5 Participants Nine and Ten

Participant 9, jente.

Participant 10, gutt.

[00:00:05] Evaluuator: Det er ein mørk, men langt i frå stille, kveld i Zaza Zoo. Medan direktøren Sheila Sjiraff snorkar høgt frå direktørbustaden, bevegar nokon seg i skuggane. Det raslar i lauvet, det knirkar i porten - det er fare på ferde. Morgonen etter på andre sida av byen. Dyredetektiven S. Nute tørkar som vanleg sokkane sine i mikrobølgeomnen då det ringer på døra. Utanfor står Polly, assistenten til S. Nute, og seier: "Det er krise i Zaza Zoo! Fire dyr har forsvunne i løpet av natta og Sheila Sjiraff held på å slå knute på halsen, ho treng hjelp straks!"

[00:00:44] Evaluuator: Oppgåve ein. Kan du beskrive korleis S.Nut ser ut?

[00:00:48] Participant 10: Den?

[00:00:48] Evaluator: Ja.

[00:00:50] Participant 9: Han er litt brun.

[00:00:53] Participant 10: Også har han svart kropp.

[00:00:56] Evaluator: Mmm.

[00:00:57] Participant 10: Brune føtter.

[00:00:58] Participant 9: Og svart snute.

[00:01:01] Evaluator: Vist dokke plukka opp skjermen no og ser på den gjennom, kva ser dokke då?

[00:01:07] Participant 9: Skal vi liksom filme?

[00:01:11] Evaluator: Ja, brikken.

[00:01:18] Participant 10: Ja.

[00:01:21] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:01:28] Evaluator: Også må dokke sjå heile det svarte feltet i skjermen for å sjå figuren.

[00:01:29] Participant 10: Hehehe.

[00:01:31] Evaluator: Korleis ser han ut no?

[00:01:32] Participant 9: Helt brun.

[00:01:34] Participant 10: Og litt svart.

[00:01:36] Participant 9: Svarte øyne og svart snute.

[00:01:40] Bertil: Baaaaaa.

[00:01:50] Participant 10: Hehehe.

[00:01:50] Participant 10: Kult.

[00:01:51] Evaluator: Ja, skal vi lese vidare da?

[00:01:51] Participant 9: Mmm.

[00:01:53] Evaluator: Då må dokke også bla om.

[00:01:56] Evaluator: Innan det har gått ti minutt er S. Nute på plass i Zaza Zoo. Han blir møtt av ei fortvila Sheila Sjiraff som snakkar usamanhengande om forsvunne dyr, mogleg kidnapping og tjuveri. "Ta det heilt med ro," seier S. Nute. "Vis meg kvar dyra har helde til, so skal eg bruke detektivkunnskapane mine til å løyse mysteriet."

[00:02:16] Evaluator: Då er det oppgåve to. Kan du forklare S. Nute forklare kva det er Sheila Sjiraff seier?

[00:02:23] Participant 10: Forklare det...

[00:02:23] Evaluator: Ja.

[00:02:30] Evaluator: Kva trur dokke at dokke må gjere for å finne det ut?

[00:02:30] Participant 9: Em. Den.

[00:02:34] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:02:40] Participant 10: Åååå.

[00:02:41] Evaluator: Hørte dokke kva ho sa?

[00:02:43] Participant 10: To gongar.

[00:02:42] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:02:51] Participant 10: Det var morsomt.

[00:02:53] Evaluator: Hørte dokke kva so sa?

[00:02:56] Participant 10: Det var nokon som hadde forsvunne.

[00:02:56] Evaluator: Ja.

[00:02:57] Participant 9: Hjelp.... Leo

[00:03:02] Evaluator: Ja.

[00:03:07] Participant 10: Kan eg prøve igjen.

[00:03:08] Evaluator: Ja, det kan du.

[00:03:08] Participant 10: Eg likte det.

[00:03:16] Participant 10: Ho sier ikkje noko.

[00:03:17] Participant 10: Kvifor seier den ikkje noko?

[00:03:25] Participant 9: Sånn.

[00:03:26] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:03:29] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:03:32] Bertil: Baaaaaa.

[00:03:33] Participant 10: Hmmm.

[00:03:34] Participant 9: Å nei... eh.

[00:03:38] Participant 10: En sånn, Bertil.

[00:03:39] Participant 9: Pelle, Leo, Helena og..

[00:03:45] Participant 10: Bertil.

[00:03:46] Participant 9: Forsvunnet i løpet av natta.

[00:03:51] Evaluator: Ja, heilt riktig. Då kan vi lese vidare.

[00:03:54] Evaluator: Direktøren tek seg kraftig saman og viser S. Nute pingvindammen, der Pingvinen Pelle har budd dei siste månadane. Vatnet i pingvindammen er heilt stille og Pelle er ikkje å sjå nokon stad. "I love Antarktis"-t-skjorta hans heng over gjerdet og borte ved

stupebrettet ligg ei lærebok i symjing for fuglar som ikkje kan flyge. "Nettopp" seier S. Nute og nikkar. Han noterar noko i notisboka si før dei går vidare.

[00:04:23] Evaluator: Oppgåve tre. Kan du hjelpe Pelle med å stupe ut i vatnet?

[00:04:29] Participant 10: Da tar vi den; Pelle?

[00:04:30] Evaluator: Mmm.

[00:04:33] Pelle: Plask.

[00:04:36] Participant 10: Igjen!

[00:04:37] Pelle: Plask.

[00:04:39] Participant 10: Hehehe.

[00:04:41] Pelle: Plask

[00:04:41] Leo: Musikk frå Løvenes konge

[00:04:41] Evaluator: Ja. Då er det neste oppgåve. Kan du fortelle S. Nute kvar Pelle kjem i frå?

[00:04:49] Participant 9: Antarktis.

[00:04:51] Evaluator: Antarktis, mmm.

[00:04:55] Participant 10: Oj, no var det langt.

[00:04:56] Evaluator: Lyden frå kjenningsmelodien til filmen "Løvenes konge" gjallar frå høgtalarane då dei nærmar seg buret til Løva Leo. Også her er det tomt. Kjøtrestar etter middagen frå i går ligg i matskåla; det var herleg afrikansk bøffelburger med antilopedressing som var på menyen. "Korleis smakar eigentleg antilopedressing?" undrar S. Nute, og tar ein liten smakebit. "Pføy!" utbryt han og spyttar ut dressingen. "Det er jo SOLKREM!" Ved sida av matskåla ligg ein reisekatalog for tame villdyr, og S. Nute merkar seg at dei tilbyr restplassar på safari. "Interessant" seier S. Nute. Han skriblar litt i notisboka si og løftar blikket ut mot den overskyha hausthimmelen.

[00:05:44] Evaluator: Oppgåve fire. Kan dokke hjelpe Leo med å danse til musikken?

[00:05:48] Participant 10: Ja, eg er klar.

[00:05:49] Evaluator: Du er klar, hehe, ja.

[00:05:53] Leo: Musikk frå Løvenes konge

[00:06:01] Evaluator: Dansar han no?

[00:06:03] Participant 10: Ja, han er opp ned.

[00:06:11] Participant 9: Han dansar.

[00:06:11] Participant 10: Der er det en sau.

[00:06:15] Participant 10: Eg ser en sau.

[00:06:24] Bertil: Baaaaaa.

[00:06:25] Participant 10: Sauen lagar lyd.

[00:06:26] Evaluator: Ja. Neste oppgåve. Kan dokke fortelle S. Nute kvar Leo kjem i frå?

[00:06:29] Participant 9: Kenya.

[00:06:31] Evaluator: Kenya, ja. Då les vi vidare.

[00:06:36] Evaluator: S. Nute følgjer etter Sheila Sjiraff

[00:06:37] Participant 10: Er det ho?

[00:06:37] Evaluator: som er på veg til elefantområdet, der den karismatiske Elefanten Elena har helde til. S. Nute studerar Elena si oppslagstavle grundig. Blant anna er det hengt opp siste utgåve av Elefantnytt, eit signert bilete av Dumbo og ein annonse frå Sirkus Arnoldo der det står: "Har du sjarm og talent, publikumstekke og stil, kan du vere dyret vi søker!" "Som du ser har Elena også fordufta" seier Sheila Sjiraff fortvila då dei ruslar vidare.

[00:07:10] Evaluator: Då er det oppgåve fem. Kan du hjelpe Elena med å ta en piruett?

[00:07:15] Participant 10: Oj, den.

[00:07:17] Evaluator: Veit dokke kva ein piruett er?

[00:07:17] Participant 9: Ja, der er sånn der å stå på eit bein og snurre rundt.

[00:07:22] Evaluator: Mmm, ja.

[00:07:23] Elena: Trommevirvel.

[00:07:29] Elena: Trommevirvel.

[00:07:30] Participant 10: Ho gjorde det litt.

[00:07:33] Participant 10: Hun vil ikkje.

[00:07:35] Participant 10: Der kom det en sau.

[00:07:45] Elena: Trommevirvel.

[00:07:50] Pelle: Plask.

[00:07:53] Participant 9: Nei, ikkje sånn.

[00:07:59] Participant 9: Ikkje sånn.

[00:08:01] Evaluator: Kanskje du må forklare korleis du meiner han skal gjere.

[00:08:04] Participant 9: Em, sånn snu den rundt.

[00:08:10] Participant 9: Hold.

[00:08:13] Participant 9: Eg skal bare snu han.

[00:08:14] Participant 10: Litt lenger vekk.

[00:08:18] Participant 9: Snu han sånn.

[00:08:21] Elena: Trommevirvel

[00:08:34] Participant 10: No forsvant han.

[00:08:35] Evaluator: Ja.

[00:08:38] Elena: Trommevirvel

[00:08:39] Participant 9: Nei, eg får ikkje...

[00:08:47] Participant 9: Han forsvant.

[00:08:47] Participant 10: Hehe.

[00:08:48] Participant 10: Det går ikkje.

[00:08:50] Participant 9: Hihi.

[00:08:54] Participant 10: Dusteelefant.

[00:09:04] Elena: Trommevirvel.

[00:09:05] Evaluator: Kanskje dokke kan fortelle S. Nute kvar Elena kjem i frå?

[00:09:06] Participant 10: Hva var det?

[00:09:08] S. Nute: Hm interessant, eg er en hund etter mysterier.

[00:09:08] Participant 10: Eg så noe, en hund, hunden.

[00:09:13] Elena: Trommevirvel

[00:09:18] Participant 9: Hun kommer frå India.

[00:09:19] Evaluator: India ja.

[00:09:20] Participant 10: Ja, det sto til og med.

[00:09:24] Participant 10: Her.

[00:09:27] Participant 10: No er det sauen (plukker opp markøren).

[00:09:28] Evaluator: I motsetning til hjå dei andre dyra er båsen til Bertil meir moderne utrusta. I følgje Sheila Sjr Raff er Bertil ein kløppar på data og dyrehagen sin dataspesialist. På maskina finn dei bloggen til Bertil, og det siste innlegget har overskrifta "Ein villsau på villspor". Han skriv om heimstaden sin, om dei grønne markane, dei flotte knausane og den lykkelege oppveksten med tvillingsystera Berit. "Aha" utbyt S. Nute og noterar ivrig i notisboka si. Sheila Sjr Raff og S. Nute går saman ut på gardsplassen

[00:10:14] Evaluator: Oppgåve seks. Kan du hjelpe Bertil med å hoppe over gjerdet?

[00:10:15] Participant 10: Eg kan prøve.

[00:10:18] Bertil: Baaaaaa

[00:10:19] Participant 10: Det er ikkje gjerde her.

[00:10:25] Bertil: Baaaaaa.

[00:10:24] Evaluuator: Kanskje dokke kan bruke det i boka?

[00:10:25] Bertil: Baaaaaa.

[00:10:28] Participant 9: Du må liksom ta den over.

[00:10:30] Participant 10: Det er det eg gjer.

[00:10:32] Participant 9: Em, ikkje sånn.

[00:10:33] Participant 9: Ta den over.

[00:10:41] Participant 10: Sånn?

[00:10:44] Bertil: Baaaaaa.

[00:10:47] Participant 10: Hah, et hopp.

[00:10:48] Evaluuator: Då er det neste oppgåve. Kan du fortelle S. Nute kvar det er Bertil kjem i frå?

[00:10:50] Participant 10: Em.

[00:10:50] Participant 9: Sauda.

[00:10:52] Evaluuator: Sauda ja.

[00:10:53] Participant 10: Korleis veit du det?

[00:10:54] Participant 9: Fordi eg ser det der.

[00:10:54] Bertil: Baaaaaa.

[00:10:55] Participant 10: Åja, Sauda.

[00:10:58] Evaluuator: Sheila Sjiraff er bekymra og ho er usikker på kva ho skal fortelje avisene om dei forsvunne dyra. "Vi har jo ingen spor," seier ho fortvila, men S. Nute har eit lurt smil om munnen. "Der tek du feil, Sheila," seier S. Nute og viftar med notisboka si, "eg har funne løysinga på mysteriet." "Alle spor peikar mot at Pelle er på ein lang symjetur, så han kjem nok straks tilbake. Leo har reist på safari til solfylte Kenya, som også er heimlandet hans. Elena er på audition på Sirkus Arnoldo, så du kan førebu deg på at ho ønskjer å bytte jobb. Og Bertil, ja Bertil har hatt heimlengsel og har reist til Sauda for å besøkje familia si i helga". Sheila ser forbløffa på S. Nute og utbryt: "Du er jammen ein dyktig dyredetektiv - no kan eg puste letta ut. Tusen takk for hjelpa!"

[00:11:52] Evaluuator: Då er det oppgåve sju. Kan du sortere Pelle, Leo, Elena og Bertil etter alder med den yngste først?

[00:12:07] Participant 9: Pelle.

[00:12:10] Participant 9: Er det Pelle?

[00:12:10] Evaluator: Mmm.

[00:12:13] Participant 10: Korleis veit du kven som er minst?

[00:12:14] Participant 9: Pelle og Leo og Elena og Bertil.

[00:12:23] Evaluator: Mmm.

[00:12:30] Participant 9: Skal eg sjå på alle samtidig?

[00:12:30] Evaluator: Det bestemmer dokke sjølv.

[00:12:33] Leo: Musikk frå Løvenes konge.

[00:12:42] Pelle: Plask.

[00:12:42] Evaluator: Greier dokke å sortere dei etter alder?

[00:12:43] Participant 10: Kult.

[00:12:53] Participant 10: Alle sammen sto samtidig.

[00:12:57] Leo: Musikk frå Løvenes konge.

[00:12:58] Pelle: Plask.

[00:12:58] Elena: Trommevirvel.

[00:13:00] Bertil: Baaaaaa.

[00:13:02] Participant 9: Sånn.

[00:13:05] Evaluator: Ja, flott. Då er det neste oppgåve. Klare dokke å sjå på alle dyra i skjermen samtidig?

[00:13:13] Participant 10: Det har vi jo alt gjort.

[00:13:13] Participant 9: Og med den.

[00:13:19] Participant 10: Detektiven også.

[00:13:22] Participant 10: Trur du vi klarer det?

[00:13:25] Elena: Trommevirvel.

[00:13:27] Leo: Musikk frå Løvenes konge.

[00:13:40] Participant 10: Nesten alle.

[00:13:43] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:13:45] Participant 10: Vi må flytte de litt.

[00:13:51] Participant 10: Flytte de sånn bort.

[00:13:55] Participant 10: Å, du ser kva vi ser, hehe.

[00:13:57] Evaluator: Mmmm.

[00:14:01] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natta, hjelp.

[00:14:05] Leo: Musikk frå Løvenes konge

[00:14:07] Participant 10: Fikk du til ?

[00:14:16] Participant 10: Det går ikkje.

[00:14:19] Evaluator: En som manglar.

[00:14:21] Elena: Trommevirvel

[00:14:45] Participant 9: Elena forsvant.

[00:14:45] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natten, hjelp.

[00:14:48] Participant 10: Kanskje vi må flytte Elena.

[00:14:50] S.Nute: Hm interessant, eg er en hund etter mysterier.

[00:14:53] Participant 10: Sånn, det går.

[00:14:57] Leo: Musikk fra Løvenes konge

[00:14:57] S.Nute: Hm interessant, eg er en hund etter mysterier.

[00:14:57] Sheila: Ånei, Pelle, Leo, Elena og Bertil har forsvunnet i løpet av natten, hjelp.

[00:14:57] Pelle: Plask

[00:15:05] Evaluator: Elena har fått en liten brett.

[00:15:09] Participant 10: Den har fått en brett.

[00:15:19] Participant 10: Trur du det da?

[00:15:23] Evaluator: Den viser ikkje fordi den har blitt bretta.

[00:15:25] Participant 10: Åja.

[00:15:27] Evaluator: Dokke fikk jo det til, bortsett frå elefanten.

[00:15:31] Evaluator: Ja, tusen takk.