NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT3920 - MASTER IN INFORMATICS

Exploring Methodological Challenges and Diverse Stakeholder Perspectives

A Case Study on Preventing Dental Anxiety in Children through a Digital Interactive Narrative

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Abstract

This thesis explores the methodological challenges of applying a participatory design approach in designing a digital narrative for reducing dental anxiety among children. The aim is to (1) understand the perspectives of stakeholders and users and negotiate their diverse viewpoints, and (2) assess the stakeholders' and users' learning outcome from participating in the design process and (3) explore to what extent to the resulting design can be considered participatory. The research questions focus on understanding the differing perspectives of stakeholder groups, the learning outcomes for participants, and the level of participation achieved in the design process.

By examining a project targeting dental anxiety reduction in children, which involved collaboration with dentistry experts and participation of children, this study addresses the challenges of designing for stakeholders with various perspectives. The project revealed challenges in collaboration and understanding children's design intentions. Nevertheless, involving stakeholders and users as participants proved valuable, although further improvements are needed for a fully participatory outcome.

Despite the encountered challenges, this approach can serve as a valuable starting point for future projects attempting participatory design in dental anxiety reduction for children. The thesis contributes a set of methodological recommendations for effectively involving children with differing perspectives from stakeholders in the design process.

Sammendrag

Denne avhandlingen utforsket metodologiske utfordringer som kan oppstå når man forsøker en tilnærming inspirert av deltakende design for å utforme en digital interaktiv fortelling som forebygger tannlegeskrekk hos barn. Tannleger deltok som interessenter i semi-strukturerte intervjuer og bidro med verdifull kunnskap. Barna bidro med ideer til historien i workshops. Designerne forhandlet og balanserte gruppens innsikt i en prototypingprosess. Både tannleger og barn evaluerte den resulterende prototypen. Ved å være aktiv deltager og designer i prosjektet har forfatteren av denne avhandlingen reflektert på tilnærmingen som er brukt og utfordringer som er møtt på.

Prosjektet avdekket utfordringer knyttet til samarbeid og gjensidig læring. Videre begrenset barnas deltakelse som brukere muligheten til å uttrykke intensjonene bak alle designideene. Til tross for disse utfordringene var involvering av interessenter og brukere som aktive deltakere verdifullt for prosessen og resultatene. Imidlertid er ytterligere forbedringer nødvendig for å oppnå et fullstendig deltakende og vellykket resultat i den utviklede designen.

Til tross for dette kan tilnærmingen være en god start for å forsøke en deltakende tilnærming til å utforme en digital fortelling for å redusere tannlegeskrekk hos barn. Derfor kan det være nyttig å lære av denne i lignende fremtidige prosjekter. Den viktigste bidraget fra denne avhandlingen er derfor en serie metodiske anbefalinger for hvordan man kan involvere barn i en designprosess der de har forskjellige perspektiver fra interessentene.

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Chapter 1

Introduction

User involvement is a widely recognized principle in the development of usable applications [1]. By involving stakeholders and users in the design process of an application, designers can deepen their understanding of the stakeholders' and users' needs and preferences. Furthermore, involving users in the design process can increase user satisfaction and acceptance, as users can participate in decision-making and recognize their contributions [2][3].

There are many ways to involve users in a design process, with participatory design as one example. Participatory design is a set of various practices that highlights a high level of user involvement. By actively involving stakeholders and users in the design process, designers gain a deeper understanding of their needs and promote empowerment among users. Specifically, Participatory Design emphasizes giving users the power and a say in developing and shaping a product that will influence their everyday lives [2][4].

However, design often includes multiple stakeholders and users with potentially conflicting perspectives, and unique requirements and priorities. Therefore, a major challenge is balancing the different stakeholders' diverse perspectives and voices during the design process. For that reason, it is interesting to explore these challenges, and to examine how involved stakeholders and users feel in shaping and decision-making in the design. With this in mind, the following research questions guide this thesis:

What methodological challenges can arise when attempting a participatory approach to designing a digital narrative for reducing dental anxiety among children?

- **RQ1:** In what way do the stakeholder groups' perspectives differ, and how can they be negotiated?

- **RQ2:** What do participants learn from participating in a design process?

- **RQ3:** To what extent can the emerging design solution be considered a participatory result?

To address the challenge of designing an application with stakeholders and users with different perspectives, I examined the design process of a project aimed at reducing dental anxiety among children. This project aimed to familiarize children with a dental office and the treatments they may receive at a dental visit. The project drew inspiration from participatory design practices and involved children and dentistry experts. The author of this master's thesis also participated as a designer and developer, acquiring firsthand experience in the design process. Therefore, through reflecting on the design decisions and user feedback that shaped this project, valuable insights were sought regarding the involvement of stakeholders and users with diverse perspectives in the design process. Furthermore, the objective was to identify and address the challenges encountered throughout the process.

The project uncovered challenges related to collaboration and mutual learning. Furthermore, children's participation as users posed limitations in articulating their intentions behind all design ideas. Despite these challenges, involving stakeholders and users as active participants proved valuable for the overall process and outcomes. However, further improvements are necessary for a fully participatory and successful outcome in the emerged design.

Despite that, the approach could be a good starting point for attempting a participatory approach to designing a digital narrative for reducing dental anxiety among children. It can therefore be useful to learn from in similar future projects. Therefore, this thesis's main contribution is a set of methodological recommendations for how to involve children in a design process where they have different perspectives from the stakeholders.

Chapter 2

Participatory Design

Participatory design (PD) is a design approach that actively involves stakeholders and end-users in the design process, empowering them to shape their futures [2]. Recognizing the valuable knowledge and insights possessed by those who will ultimately use or be affected by design, PD places them as genuine participants at the center of the process. Collaboration, inclusivity, and democratic decision-making are key characteristics of PD, fostering active engagement and fostering that the voices and contributions of stakeholders and end-users are valued throughout the design journey [2].

In the early PD projects of the 1980s, the primary focus was on promoting "democracy at work" and empowering industrial workers who faced the risk of job loss due to automation [2][5]. Designers took sides with the workers to empower them [6]. However, with the increasing digitalization of society, PD has been employed more widely to tackle design challenges beyond the workplace [7]. It has also been used to develop solutions that bridge the perspectives and needs of multiple stakeholder groups [7][8]. This expansion into new territories has sometimes necessitated practitioners to make compromises that deviate from more idealistic notions of PD [7][8].

2.1 Diverse Perspectives in Stakeholder Groups

One important aspect of PD is acknowledging and considering diverse perspectives. In this thesis perspectives are considered as viewpoints that are influenced by individuals' and group's experiences, beliefs, values, culture, and knowledge, shaping their opinions and perceptions of the world. In this project, dental experts share similar educational backgrounds and professional experiences. Conversely, children may have diverse perspectives influenced by their limited life experiences and cognitive development. The presence of diverse perspectives, including varying knowledge and experiences, can lead

to both asymmetric power dynamics and conflicts among the different stakeholder and user groups [9][8][10][11].

2.2   Equalizing Power Relations

PD addresses power dynamics that exist within design processes. Power and influence can be imbalanced between stakeholders with differing roles, backgrounds, and perspectives. By actively addressing and equalizing power relations, PD aims to create an environment where all participants, regardless of their status, can contribute and have their voices heard [4]. In this project, it is important to recognize the power dynamics between dental experts and children, as children may be used to adults and dentists making decisions that affect them. By ensuring the meaningful involvement of children as participants, we can consider their perspectives and needs when designing the digital interactive narrative.

2.3   Democratic Practices

Equalizing power relations is an important part of the democratic practices that form the foundation of participatory design, emphasizing the involvement of all stakeholders in decision-making processes. As Kensing and Greenbaum [4] highlighted, PD seeks to value and amplify diverse voices and perspectives by fostering open dialogue, active participation, and collective decision-making. This approach allows for the inclusion of marginalized groups and cultivates a sense of ownership and shared responsibility among participants [4].

2.4   Collaboration and Mutual Learning

Kensing and Greenbaum [4] additionally emphasized that collaboration and mutual learning are essential principles in PD. Recognizing that designers and users bring unique perspectives and expertise, PD encourages an environment of openness, curiosity, and respect for diverse viewpoints. This collaborative learning environment enriches the design process and outcomes, emphasizing that all participants have valuable knowledge and experiences to contribute [4].

Chapter 3

Case: Tooth Tales

Tooth Tales is the name of the digital interactive narrative created in this project. It is a digital interactive narrative created with the aim of being a supplement to existing measures to prevent dental anxiety in children. This chapter will outline the background for Tooth Tales, outlining the challenge Tooth Tales is attempting to address, why a digital interactive narrative is an interesting solution, and finally, the concept of Tooth Tales.

3.1 Dental Anxiety

Preventing dental anxiety is the challenge Tooth Tales is attempting to address. Overcoming this issue and supplementing the existing measures requires understanding why it is a problem, its causes, its consequences, and, eventually, the existing measures to prevent and treat dental anxiety. This subchapter will shortly describe these elements of dental anxiety.

3.1.1 Definition and Prevalence

Over half of the population experiences some level of discomfort when visiting the dentist. However, for some individuals, visiting the dentist can evoke significant stress and anxiety, negatively impacting oral health. Dental anxiety is characterized by the anticipation of negative emotions during dental treatments [12]. Approximately 10%-20% of children and young people suffer from dental anxiety, which leads to significant anxiety and worry during dental visits [13].

3.1.2 Causes

Dental anxiety often develops during childhood. Thus, this makes childhood a critical period for addressing dental anxiety [14]. People with dental anxiety have often had previous negative experiences at the dentist. Factors such as discomfort, pain, fear of the unknown, lack of trust, and fear of blood, syringes, and needles contribute to dental anxiety. Difficulty relinquishing control stemming from past traumatic experiences can also lead to anxiety [14][15].

3.1.3 Consequences

Dental anxiety has several consequences, including poorer dental health, increased treatment avoidance, and delays in seeking necessary dental care [14][15]. Avoiding dental treatment creates a vicious cycle where delayed treatment leads to more extensive and uncomfortable procedures, further heightening anxiety [16]. Poor oral health is associated with mental and somatic health issues, such as depression, social anxiety, cardiovascular diseases, diabetes, and reduced quality of life [14][17].

3.1.4 Prevention and Treatment

Early intervention is important to prevent and treat dental anxiety. Providing children with control and predictability during dental visits helps alleviate anxiety. The "tell-show-do" approach, where the dentist explains the procedure and demonstrates it before performing it, proves to be effective [15][18]. Healthcare professionals widely utilize cognitive behavioral therapy (CBT) for treating anxiety, including dental anxiety. Exposure therapy, gradually exposing patients to feared elements in a safe environment, is a form of CBT used for dental anxiety to make patients more comfortable with the elements they fear [15].

In recent years, digital solutions have been testing CBT and exposure therapy, including virtual reality exposure therapy (VRET), as methods for gradually exposing patients to anxiety-inducing situations [19][20]. These technologies have been well-documented for preoperative use in reducing anxiety [15]. However, in dentistry, these methods have yet to be widely adopted as treatments, despite some studies indicating that they may be beneficial [15][20].

3.1.5 Conclusion

Dental anxiety is a prevalent issue with significant consequences for individuals. Dental anxiety is a problem that often starts in childhood, and this period is critical when trying to prevent dental anxiety. Early action, focusing on control, explanation, and predictability, and approaches based on exposure therapy can help prevent and treat dental anxiety. Digital solutions, like VRET, show promise but require further research. However, VRET requires specialized equipment often unavailable at home, so it is interesting to explore a digital solution that can be easily accessible to all children.

3.2 Digital Interactive Narratives

A digital interactive narrative is a digital solution that can be accessible to many children. Children today are exposed to technology at a young age, with screen time playing a significant role in their lives [21]. The widespread availability of tablets and digital devices [22] has led to a surge in digital storybooks, for instance, in education and learning [21]. The following sections will explore the aspects of learning and motivation within digital interactive narratives and finally highlight their potential in preventing dental anxiety in children.

3.2.1 Learning and Motivation

The research around digital interactive books needs to be more cohesive. Studies show that they have the potential to motivate and challenge children [23]. However, the current research also suggests both positive and negative effects on the learning outcome for children [21][23].

Dual coding is an essential aspect of digital interactive books, which involves presenting information through multiple sensory channels, resulting in enhanced learning [21]. Digital books utilize various multimedia elements such as text, sound, graphics, video, animation, interaction with elements, and interactions influencing the story's outcome [23][24]. Multimedia is more effective than printed books when children engage with them independently [25]. Animation, sound, and interactive features can help children connect and understand the narrative [21]. In addition, users can decide how they want to engage with the content by utilizing the multiple interaction types and scene combinations available to them. Additionally, allowing users to personalize their learning experience based on their unique learning styles [26].

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Furthermore, when digital storybooks include interactivity, the user is put in a situation where they are actively involved with the story and receives meaningful feedback through the movement of the plot [24]. One can also view interactivity in line with another theory in education called constructivism. It states that learners develop their knowledge through active and subjective processes [27].

However, the appropriate utilization of multimedia can positively impact the learning outcome. It is crucial to ensure that the multimedia elements complement each other and do not overwhelm the users' working memory, being children [21][23]. Children's working memory has limitations regarding how much information they can hold at once. When children are required to constantly switch between processing different information without integration, it can result in cognitive overload and hinder their understanding of the story [21].

3.2.2 Digital Interactive Narrative in Dentisty

Explanation and giving the patient information is crucial in making predictability and giving the patient control to prevent or treat dental anxiety [15][18]. A digital interactive narrative has the potential to motivate and educate children if used the right way [21]. However, researchers and practitioners need to explore the use of digital interactive narratives in dentistry. Therefore, it is interesting to investigate if digital interactive narratives can be a powerful tool for giving information and explaining a dental treatment, further making predictability and giving control to the users.

3.3 Tooth Tales: Concept

The main concept of tooth tales is to create narratives where users can explore and go through dental treatments. It has children as its intended end-users, considering childhood is a critical period for developing dental anxiety [14]. Tooth tales being a digital interactive narrative makes it a solution that is accessible to most children. Furthermore, allowing children to experience dental treatments can provide them with valuable information and explanations about how the procedures work. This approach aims to promote predictability and empower children by giving them a sense of control before dental treatments. The ultimate goal is to foster a feeling of safety and confidence in visiting the dentist, effectively preventing the development of dental anxiety. The following sections will give an overview of how the concept is implemented and the limitations of implementing this project.

3.3.1 Implementation

This section will provide an overview of the implementation of the digital interactive narrative. It will show the structure and flow of the narrative the user follows.

Beginning: Choosing Treatment and Creating Character

Tooth Tales begins with a front page, presenting the title of the digital interactive narrative. After the front page, users can select the dental treatment they wish to explore and learn more about. Once the user has chosen their preferred tale, they receive an invitation to join a dental appointment corresponding to the selected treatment. Before the appointment, users create the character who will accompany them throughout the journey. Figure 3.1 illustrates the corresponding interface.
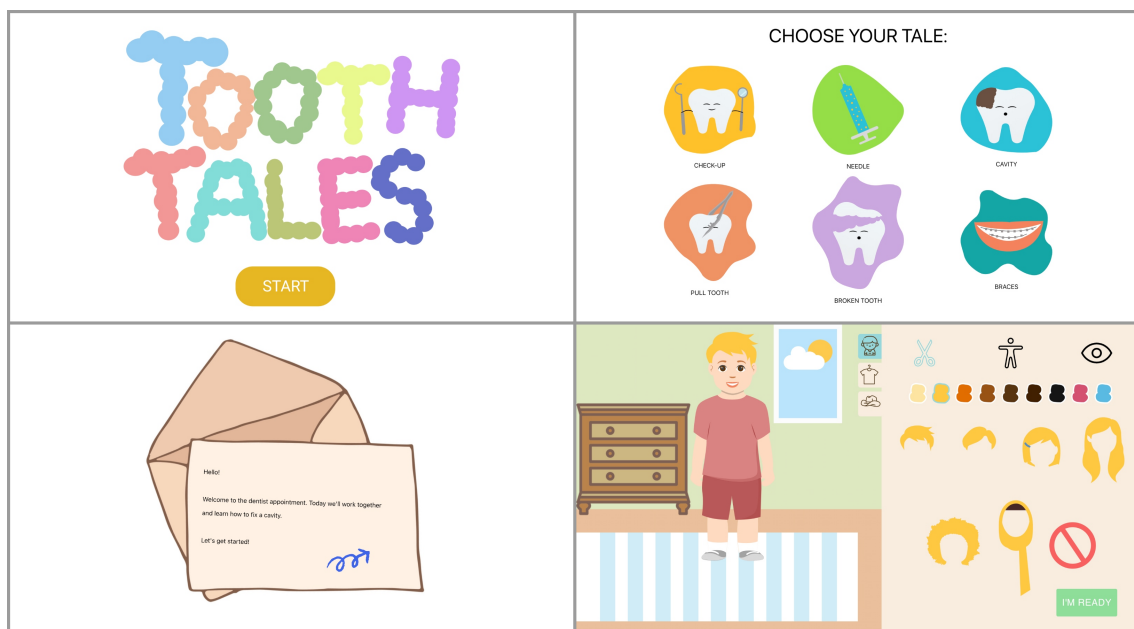
Figure 3.1: The first four pages the user meets. Picture 1: Front page. Picture 2: Choosing tale and treatment. Picture 3: User invited to the dental treatment. Picture 4: Creating a character.

Waiting Room and Dental Office

Once the user has completed character creation, the narrative transitions into the dental appointment scenario, and the user finds themselves in a waiting room, where their character awaits the treatment. The tooth fairy greets them and serves as a guide through the story. In the waiting room, users can interact by brushing their character's teeth and selecting a companion from a box with toys and animals to accompany them during

the appointment. Once ready, the user can proceed through the door and enter the dental office, where the dentist will greet them. Figure 3.2 illustrate the waiting room scenes.
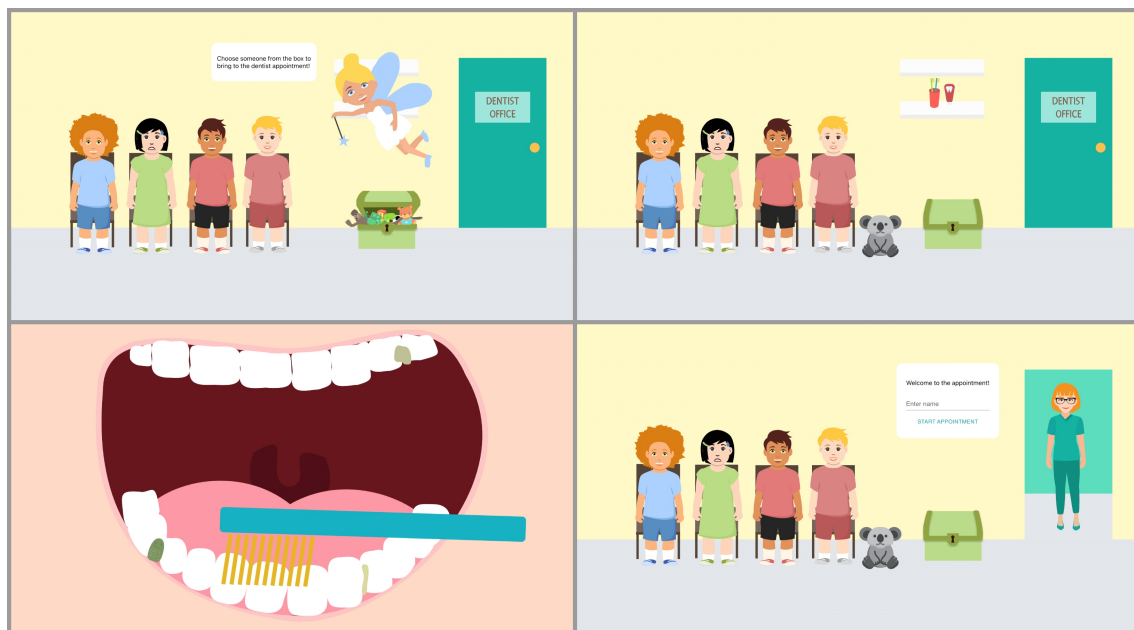
Figure 3.2: Four scenarios in the waiting room. Picture 1: Greeted by the tooth fairy. Picture 2: The user can explore and interact with the toy box and toothbrush. Picture 3: Brushing teeth. Picture 4: Greeted by the dentist.

Furthermore, the user enters the dental office, which serves as the setting for the treatment. Here, the dentist briefly explains the importance of undergoing the treatment. Subsequently, the user is allowed to explore the dental office, becoming acquainted with its layout and familiarizing themselves with the dental equipment. The interactive exploration aims to enable the user to develop a sense of comfort and familiarity within the dental environment. Figure 3.3 represents the dental office scenes.
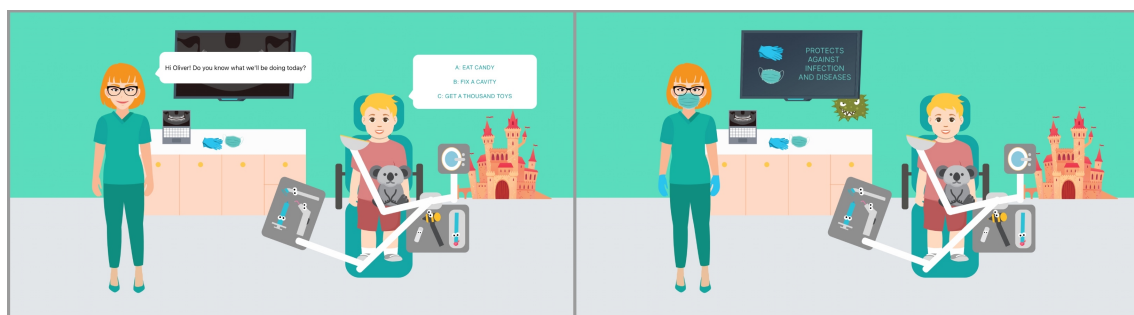
Figure 3.3: Dental office. Showing an introduction by the dentist and exploring the dental office.

Tooth Castle

Users can also access a more detailed explanation regarding the significance of undergoing the treatment. Specifically, for a cavity treatment scenario, an interactive element in the form of a castle located in the background of the dental office is available for the user to click on. The dental office in Figure 3.3 shows the castle in the background. Clicking on the castle unfolds a story, illustrating the importance of fixing cavities. The story portrays the tooth as a castle and bacteria as monsters. It also introduces a knight who comes to the rescue, defending the tooth castles from these monsters and fixing the castle. Figure 3.4 visually represents a segment from the tooth castle story.
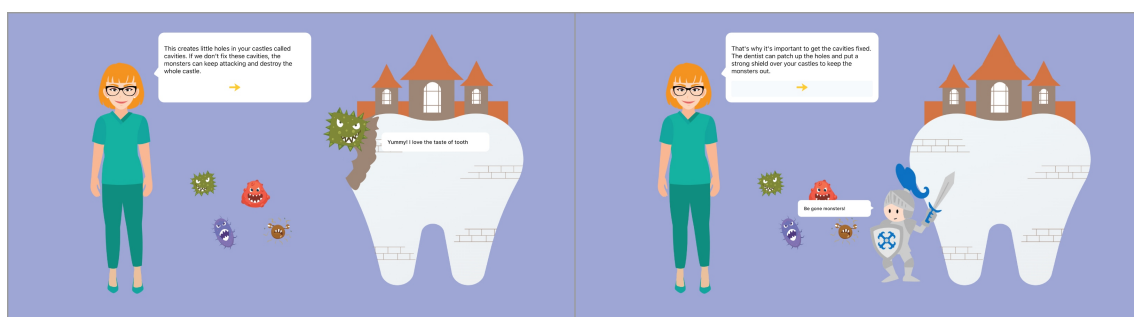
Figure 3.4: Tooth castle

Undergoing the Treatment

Within the dental office, users have the power to initiate the treatment by clicking on the dentist. This action triggers a focused and close-up visualization of the tooth and the instruments involved. To ensure a gradual learning process, we introduce the treatment step-by-step, targeting the user's avoidance of being overwhelmed by excessive information or elements all at once. Each step focuses on introducing a few dental instruments, accompanied by explanations, and visual and audio representations, such as the instruments' images, animations, and sound. They communicate the purpose and significance of each step and the equipment used in the treatment. The tooth fairy also appears during the treatment, providing guidance and assistance with certain steps. The users are additionally active in the treatment by assisting in selecting the instrument used. The initial steps of the cavity treatment are shown in Figure 3.5.
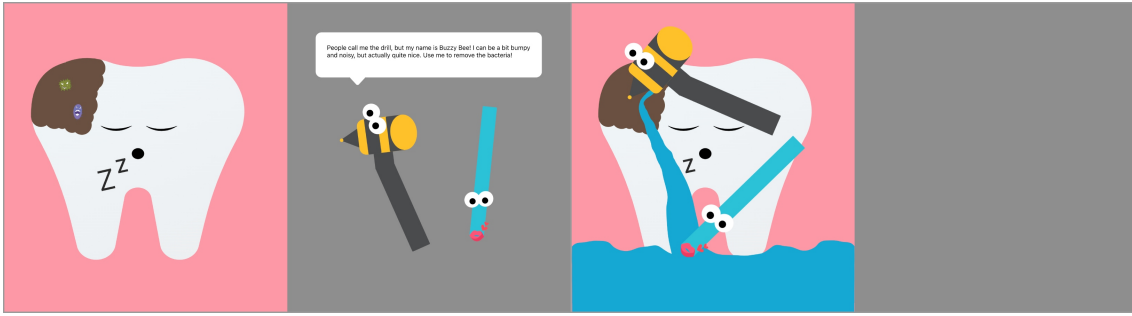
Figure 3.5: Up close visualization of tooth and dental instruments. It illustrates two of the initial steps of the cavity treatment.

Ending: Receiving a Reward

After the user and their character have completed the dental treatment, the narrative zooms out, returning the focus to the dental office setting. At this point, the user and character are rewarded for their effort during the treatment and receive a toy and compliment as an appreciation by the dentist and tooth fairy. This moment serves as a positive reinforcement, reinforcing the user's sense of accomplishment and further fostering a positive association with dental visits. Figure 3.6 shows the ending.
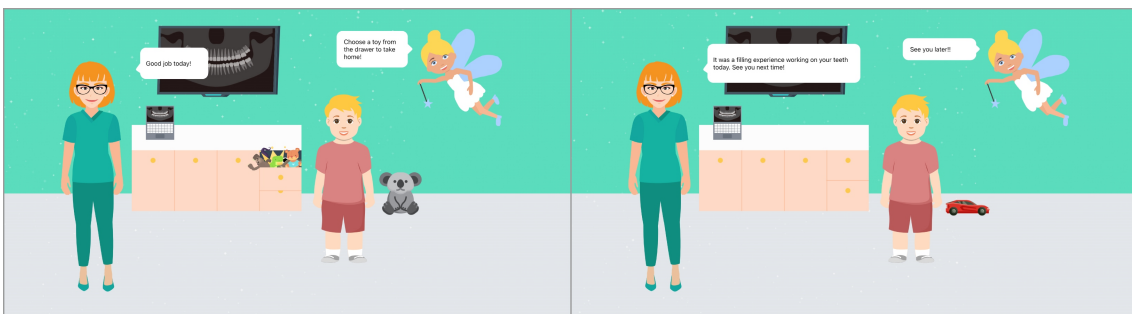
Figure 3.6: End of story

3.3.2 Limitations

The project is constrained by time, imposing certain limitations on implementing the Tooth Tales concept. The initial idea was to create a narrative that allowed children to choose from various dental treatments. However, due to time constraints, the project focused on implementing a single dental treatment to test the concept. The chosen dental treatment is cavity treatment, which children frequently encounter for the first time during childhood. It is also a procedure many children have yet to experience, making it an ideal scenario for testing the learning outcomes of the digital interactive narrative.

Furthermore, the project's goal is not to implement a finished product but to test the concept of a digital interactive narrative to prevent dental anxiety in children. As a result, the project's outcome will be a prototype that serves as a testing ground for evaluating the effectiveness of the concept.

Chapter 4

Research Design

This chapter provides an overview of the research design used in the project. The overview includes the overall approach of involving stakeholders and users, the importance of critical reflection in the project, and the data collection and analysis methods.

4.1 Participatory and User-Centered Design

This project takes inspiration from a user-centered design approach and participatory design activities. User-centered design prioritizes the needs of end-users and stakeholders at every step of the design process. This approach emphasizes the importance of designers deeply understanding users' needs to design accessible and effective solutions [1].

User-centered and participatory designs are similar in that they prioritize the needs of users and stakeholders. However, participatory design additionally emphasizes stakeholders' active involvement and empowerment in the design process. The goal is to empower stakeholders by giving them a voice in the design process and having a say in the final product [2]. Furthermore, participatory design is not an approach but provides many various participation practices that can be combined, adapted, and extended [28]. This project, therefore, uses participatory design activities to achieve a higher level of involvement of the stakeholders and users in the design process.

Additionally, it is noteworthy that the main reason for including stakeholders and users in the design process is to acknowledge their valuable perspectives and ensure that their needs are incorporated into the design solution. The key priority was on the users, specifically the children, as active participants in the decision-making process, aiming to increase user engagement and enhanced user experiences. Simultaneously, dental experts for their expertise with evident measures and experience in preventing dental anxiety.

The reason for the approach was not influenced by any particular political agenda or the involvement of a vulnerable group, unlike many other participatory design projects.

Furthermore, it is important to note that the project did not aim to develop a finalized product. It rather focused on exploring the concept through research and design activities, coming up with a prototype, and evaluating it. Simultaneously, the primary objective of this thesis was to explore the process and participatory approach employed in conducting such a project.

A project plan was created prior to commencing any research or design work. It consisted of an initial analysis of the project's timeline and resources. Additionally, we looked at opportunities of involving users in the design process. Through careful planning, we gained valuable insight into the limitations of the project and identified the optimal time to engage with stakeholders and users throughout the process. Subsequently, the following steps were part of the process:

4.1.1 Telling: Gathering Insight

In the initial stage of the design process, the focus is on getting the stakeholders and users to tell and share their various experiences and viewpoints related to the design challenge [28]. The telling phase also involves gathering information about the users, stakeholders, tasks, and the environment in which the product will be used, also known as the context of use. By understanding the context of use, designers can better identify the users' needs, preferences, and limitations and tailor the design accordingly [1].

Preliminary semi-structured interviews and workshops were conducted to create a space for users and stakeholders to express their voices freely. These activities have resulted in the understanding and specification of the context of use. To concretize the context, we created personas and scenarios, found in Appendix A. The telling phase further led to specifying requirements for the digital interactive narrative, found in Appendix B. The requirements define the goals, tasks, and needs of the user and serve as a guide for the design [1].

4.1.2 Making: Producing Design Solutions

Making refers to the collaborative process of generating design ideas, concepts, or prototypes based on the insights gathered during the telling phase [28]. We use the insights gathered from the initial phase to generate solutions that meet the requirements iden-

tified by the stakeholders and users. The different perspectives of the stakeholders and users were important to consider and reflect upon during this phase of the process.

In this project, the making step involved designing the interface for the system and the flow and interactions with the system. The interface was visualized through the use of sketches and prototypes. In addition, the users were involved and given a voice in the decision-making through workshops. They participated in generating ideas and making the plot of the digital interactive narrative.

4.1.3   Enacting: Evaluating Design

Enacting focuses on putting the design ideas into action and evaluating them [28]. After implementing the design ideas and developing a functional prototype, the users and stakeholders evaluated it. The evaluation was done by observing the users and stakeholders test the functional prototype and gather feedback. After that, we compared the results against the requirements defined in the initial phase. The design evaluation is essential for gaining valuable feedback, identifying usability issues, and improving the system's user experience [1]. Additionally, it was an evaluation of how much the users and stakeholders experience being involved in the design process and solution and how empowered and actively engaged they have been.

4.2   Critical Reflection

Critical reflection is essential and implicit in a design process with user involvement. It has been important throughout this process, particularly in balancing the various perspectives of the stakeholders and users and empowering them. It is therefore important to do both reflections throughout and after every activity in the process, referred to as "reflection in and on action" by Schön [29].

"Reflection in action" refers to the ability to reflect while actively engaged in an action or process. It involves being aware of one's actions, making conscious choices, and continuously adapting to the situation based on reflection and learning in real-time. [29]. Reflection in action is therefore important in the activities in this project to facilitate, adapt and encourage stakeholders and users to use their voices and express their opinions during the activity.

Furthermore, "reflection on action" involves reflection after completing an activity. It

provides the opportunity to look back on the experiences, analyze the outcomes, and identify what worked well and can be improved. [29]. Reflection on action is therefore additionally important to learn as a facilitator and a designer how to better encourage and empower the stakeholders and users and address the challenges one can face. Additionally, this type of reflection is critical to evaluate how the diverse perspectives have been balanced in the process and design solution.

4.3 Data Collection Methods

This chapter presents the different data collection methods used in the different steps of the project. Figure 4.1 shows the various activities in the corresponding phase of the design project.
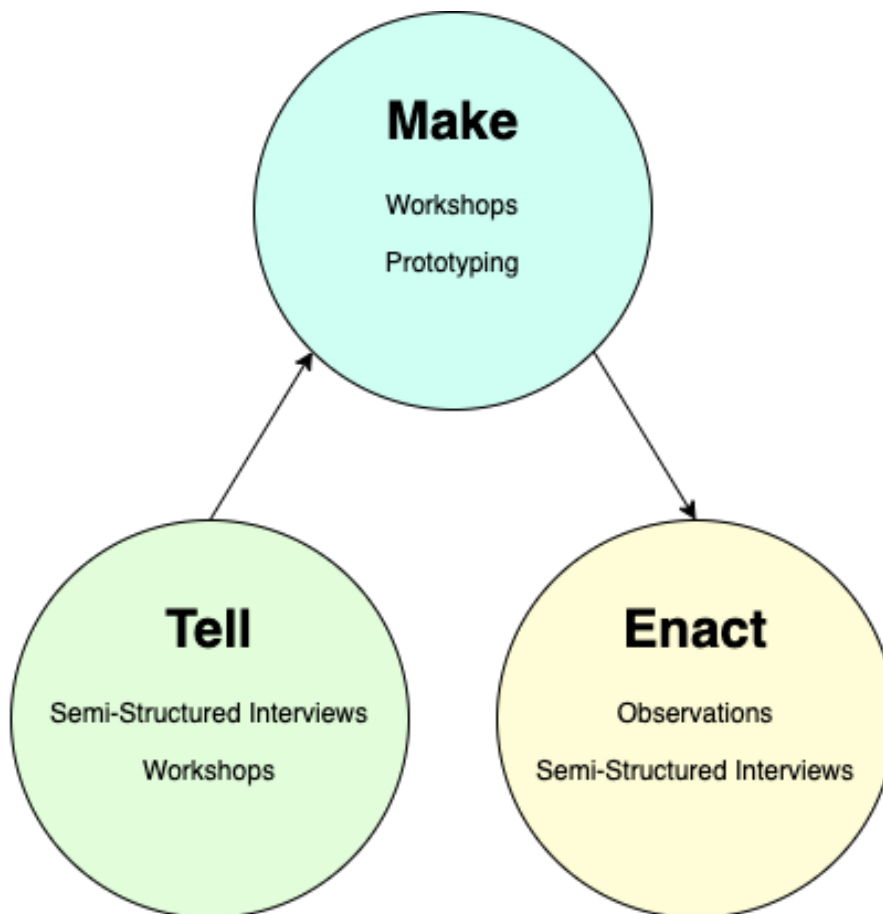
Figure 4.1: The data collection methods used in the different steps of the project

4.3.1 Semi-Structured Interviews

Compared to structured interviews, semi-structured interviews are more open-ended and flexible, allowing participants to elaborate on their answers and provide more in-depth information. By providing participants to speak more freely, these interviews can reveal valuable information about experiences and needs that might be missed in more structured interviews. Through the semi-structured interviews, designers can better understand users' perspectives and identify potential design challenges or opportunities [30]. These are used in the preliminary semi-structured interviews with dental experts to gather insight. Additionally, we use these interviews after the dental experts and children test the prototype to guide the conversations.

4.3.2 Workshops

Workshops are a commonly used practice in participatory design. These collaborative sessions bring together designers and stakeholders to co-create and make design solutions. Workshops often involve structured activities to create new ideas, explore different design options, and refine prototypes. This way, designers can gain valuable insights, identify design challenges, and generate creative solutions that better meet users' needs [28]. Workshops are in this project used for getting insight into children's perspectives and getting the children to create design ideas for the digital interactive narrative.

4.3.3 Prototyping

Prototyping is also widely used in participatory design, particularly to visualize representations of how the future can be. A prototype is a preliminary version of a design solution used to test and refine its functions, features, and usability. Designers can gain valuable feedback on the design solution's functionality, usability, and overall effectiveness by involving stakeholders in the making and testing of prototypes [28]. In this project, prototyping is used to produce design ideas and solutions. The outcome of the project is the final prototype in the prototyping process.

4.3.4 Observation

The observation method is a valuable evaluation technique that collects data by observing users' experiences with a product [31]. It is widely used in usability testing to measure efficiency, effectiveness, and satisfaction [32]. The approach is to have a session with end users and observe them while performing a task [33]. In this project, the stakeholders and users use the prototype while their interactions, navigation, and comments are

recorded. The facilitator also captures facial expressions, body language, and the user's environment. After each test, users provide subjective feedback through semi-structured interviews regarding learning, engagement, and satisfaction levels.

4.4 Data Analysis Method

Thematic analysis is a popular method of data analysis used to identify and analyze patterns and themes within qualitative data. This method involves examining the data, grouping it into categories, and then interpreting the underlying meaning of the patterns and themes. This project uses thematic analysis to identify the main themes and patterns present in the data gathered from the semi-structured interviews, workshops, and observations. Finding the themes and patterns will help gain a deeper understanding of the insights shared by participants [34]. All research activities were video-recorded to ensure accurate documentation. The recordings were transcribed through Microsoft Word 365 [35] software. There were three steps conducted in the analysis of the activities.

In the initial step, the designers shared the transcriptions among themselves. Further, it involved the identification of key themes found in the data. Some examples of the categories identified from the semi-structured interviews with dental experts were "Cause of fear," "Measures inside the dental office," and "Measures outside the dental office."

During the second stage of analysis, the identified themes underwent further exploration and coding to capture the underlying meaning of the data fully. Specific codes were assigned to different parts of the transcripts, where the key theme, "Measures inside the dental office," from the first step, for instance, included codes like: "Make child in control," "Demonstrating and explaining," and "Metaphors and storytelling." These codes represented the meaning of the themes discussed by the participants.

Finally, in the third step, the researchers reviewed and compared each other's coding to ensure consistency and coherence. The focus was on identifying similarities and merging related themes across the data sources to understand the research findings comprehensively. The thematic analysis yielded a set of categories which will be further elaborated on in the subsequent chapter of the research activities.

Chapter 5

Research and Design Activities

This chapter describes the research and design activities in the project process. The chapter has been subdivided into several subchapters, each describing a specific activity during the process. Each subchapter outlines a specific research activity, including its (1) purpose, (2) participants, (3) the preparation in advance, as well as (4) the implementation of the activity.

Further, the subchapter for each activity will shortly highlight the (5) key findings derived from the research activity regarding design considerations. The objective of this section is to gain a comprehension of the stakeholders' and users' diverse perspectives. Understanding their perspectives will also help better understand the (6) methodological discoveries and (7) methodological reflections. These topics will be elaborated at the end of each activity's subchapter.

5.1   Activity 1: Preliminary Interviews with Dentists

This subchapter describes the execution and results of the preliminary semi-structured interviews with dental experts. The semi-structured interviews were the first research activity done with any of the participants in this project.

5.1.1   Purpose

The purpose of conducting semi-structured interviews was to gain insight into the viewpoints of stakeholders regarding the goals, requirements, circumstances, and conditions of the concept. The goal was to get a deeper understanding of the dentist's experience with working with children and how they usually interact with children with various nervousness levels. This ensured that the digital interactive narrative was grounded in

evident measures. We also aimed to get insights about the dental office, dental instruments, and other equipment they use in dental appointments. We, therefore, placed the conversations in the dentists' workplace.

Another intention of the semi-structured interviews was to gather insights into the dental experts' opinions regarding a digital interactive narrative as a means to prevent dental anxiety. Furthermore, we aimed to get design ideas from the dental experts by encouraging them to participate in generating ideas for the narrative during our conversations.

5.1.2 Participants

The semi-structured interviews involved six participants from Australia and Norway. The participants were selected based on their dentistry expertise and experience working with young children and patients with dental anxiety. All the dental experts were women. See Table 5.1 for the participants.

Profession	Work experience in dentistry	Country
Dentist, special interests in making young patients overcome their dental anxiety	10 years	Australia
Dentist, special interests in health for young children	1 year	Australia
Oral health therapist, works at a pediatric specialist dental office	8 years	Australia
Dental therapist, works at a dental clinic for families and children	15 years	Australia
Dentist, specializes in torture and abuse victims and people with strong fear of dental treatment	26 years	Norway
Dentist and Research advisor, works at a Competence Center for Dental Health Services	15 years	Norway

Table 5.1: Participants in the semi-structured interviews

The recruitment happened through contacts and going between dental clinics to find dental experts who wanted to participate. In Australia, we had to visit multiple dental clinics

to find participants for the study. The recruitment process presented several challenges due to the time constraints imposed by the project timeline and the participants' busy schedules. Several dentists could not participate due to their demanding schedules with booked patient appointments. Consequently, finding participants who were available and willing to participate during their lunch breaks was critical to the recruitment process. For this reason, the research team had to be flexible in scheduling interviews to fit the participants' availability.

Similarly, time constraints were also a challenging case with the Norwegian participants, where the meetings had to be planned well in advance to fit into their calendars. However, the Norwegian participants were recruited through contacts. Recruitment through contacts reduced the time it took to recruit them compared to the Australian participants.

5.1.3 Preparations

The preparation for the semi-structured interviews started with researching dental anxiety. The research enabled us to structure the interviews, gather relevant information, and ask insightful questions. Subsequently, we developed an interview guide, outlined in Appendix C, which covered relevant topics and guiding questions. The selection of these topics was guided by our research objective, focusing on areas such as their implemented measures and interactions with children across different levels of nervousness, identifying causes and specific fears, as well as gathering perspectives on the potential of a digital interactive narrative as a preventive measure for dental anxiety, including its possible content.

5.1.4 Implementation

The semi-structured interviews began with the researcher introducing themselves and explaining the study's purpose to the participants. Informed consent was then obtained, emphasizing the participants' understanding of the research's nature, their rights as participants, and the confidentiality of their responses. The researcher then engaged in small talk to establish a connection, allowing the participants to feel more at ease and willing to share their experiences.

The interviews followed the prepared interview guide, which served as a flexible framework for the conversation. One interviewer took the lead in actively listening and delving deeper into the interview topics, while one or two additional researchers took notes to capture key points and important details. The interviews were also recorded using au-

dio recording devices, enabling precise capturing of the participants' responses for later analysis. Each interview lasted approximately 30 minutes. The semi-structured interviews with the Australian dental experts were conducted in their dental office, while the interviews with the Norwegian dental experts were done through a digital meeting.

5.1.5 Key Findings: Design Considerations

This section presents the key findings from the preliminary semi-structured interviews regarding design considerations and understanding the dental experts' perspectives, objectives, and priorities for the digital interactive narrative. These can be summarized in these points:

- Target group: 6 to 10 years old

- Tool to use before a dental treatment

- Establish control, predictability, and familiarity

- Create positive associations and trust in the dentist

- Use storytelling and metaphors

The following paragraphs will outline each point.

Target group: 6 to 10 years old

Children go to the dentist from the age of 3. However, dentists do not experience that children at this age understand much of what they are undergoing. Hence, dentists experience that children typically do not develop dental anxiety until they age 6 to 10. Consequently, this age range emerged as the target group. Additionally, the main objective of the solution is to prevent dental anxiety, and the target group, therefore, consists of children who do not already have dental anxiety.

Tool to Use Before a Dental Treatment

The dental experts participating in the semi-structured interviews were positive to a digital interactive narrative as a measure to prevent dental anxiety. The dental experts were interested in young patients' health and dental anxiety. Consequently, they were supportive of measures that had the potential to help with this problem that they meet in their everyday life, where one stated *"I think it's really good what you're doing"* (ID-1.1).

Another participant expressed interest in incorporating the digital tool as a future idea at the competence center dedicated to creating a safe dental environment for children by stating, *"That would be great. There will always be a need for further development and new ideas within the service. Anything that helps children is fantastic."* (ID-1.4).

However, it was clear that a digital tool cannot replace existing practices, such as the relationship between the dentist and the patient, where a good relationship is an essential measure to make anxious patients feel safe. Nevertheless, a digital interactive narrative can be used as a supplement to existing practices. One dentist expresses, *"I believe in digital tools and interactivity. It's a great reinforcement, although it can't replace the methods that already exist. Some people remember very little about a treatment. But it's true that dentists explain things, but it's also true that many people don't remember what they experience at the dentist. Remembering what the provider explains is important. If you're better prepared, you'll remember better."* (ID-1.5). She observed that patients frequently struggled to remember what the dentist had explained to them, and she recognized the potential benefit of utilizing a digital tool as a practical means of repetition for patients.

Additionally, it was highlighted by the dentists that knowing the story in the digital interactive narrative would be beneficial. They expressed the importance of understanding the narrative to maintain continuity and effectively communicate with young patients during dental treatments. The dentist stated, *"[...] the dentist would need to know what the story was to kind of like make sure that there was a continuity there."* (ID-1.1). Using the same story during the treatments would create familiarity, which is further described in the next section.

Establish Control, Predictability, and Familiarity

The findings revealed that several key factors contribute to nervousness before a dental appointment, including a perceived lack of control during the appointment, an overactive imagination, and fear of the unknown. These perspectives align well with the research conducted in the field, as earlier described in Section 3.1.2, about causes for dental anxiety. However, the interviews revealed concrete measures to help young patients feel less nervous before a dental appointment.

One way the dentist makes the young patients feel in control during a dental appointment is to let them make choices, like one dental expert expressed, *"We let them have a lot of control, like 'what would you like to do?' 'Would you like to count the top or bottom*

teeth'. So, we give them options. And yeah, so they feel like they're in control and a bit more comfortable in this setting." (ID 1.3). Additionally, the dentists never perform any procedure or action against the patient's wishes, with one dental expert expressing, *"It is crucial to show children that they have control, that we stop when they indicate. For example, if they raise their left hand, we will stop. And it's important that we don't mislead them, that they can trust us."* (ID-1.4). Furthermore, one dentist shared an experience showing what imagining and not knowing can lead to, telling:

"I had this patient. She was like super anxious about getting a tooth out and you could tell that she kind of understood about what was going on. But she was like, she had an infection. She did it. It was a horrendous experienced you know. She is crying, her mom is like really stressed. Yeah, I'm nearly crying. Accidents happen sometimes, but then the tooth came out and she was just like 'Oh, is that it?' 'Yeah, but like, what did you imagine' but she was like 'I thought it was gonna be all black and there was gonna be infection and there was gonna be blood and...'. Oh, so you just think like? A lot of anxiety problems just come from unknown" (ID-1.2).

Therefore, dentists commonly emphasize the importance of explaining and demonstrating the dental treatment to instill a sense of safety in patients. One dentist highlighted that even though a patient experiences pain or another negative experience, explaining and demonstrating is important, stating *"Predictability before a negative experience can help limit it."* (ID-1.5).

By clearly understanding what procedures involve, patients can feel a greater sense of control, alleviating their tendency to imagine unfavorable scenarios and reducing their fear of the unknown. Another dentist expresses, *"Yeah, so show them. Let them touch and let them feel. [...] let them have some sort of idea of what it's going to feel like. Like so that when it does go into their mouth it's not such a chock for them."* (ID-1.2). While another dentist continues with, *"And hear the noise. It's like you have to introduce the suction before you put it in their mouth, otherwise 'ough'. So yeah, that acclimatization and desensitization is probably like the most important."* (ID-1.1).

Furthermore, they expressed that explanations and demonstrating keeps children from imagining bad things, stating, *"Then they already know what I've shown them. They don't have that space to like make up their own little stories. So just show them for like a really pre-empt, and just show them everything in advance. Just show them."* (ID-1.2). Additionally, they suggested that incorporating visual explanations and demonstrations

within a digital interactive narrative could be advantageous, expressing, "[...] but visually would be good as well. 'Cause we were talking about that, like, how like some like kids have anxiety or they're imagining things." (ID-1.1).

Explanations and demonstrations further create familiarity with the dental equipment and producers, another important aspect of making the patient feel safe. That is also one reason they make patients come routinely to the dentist from an early age. Children come in from age 2, and the dentists try to make the young patients comfortable with the dental environment gradually. One of the dentists also mentioned that she could send masks and gloves home with the children, so they could play "dentist" at home and become more comfortable with the dental environment.

Another measure of creating familiarity and predictability before an appointment is preparing young patients with informative videos to look at before an appointment. One clinic had created informative videos about, for instance, anesthesia and cavity treatment to show what the dental instruments look like and explain the reasons behind using the instruments inside the patient's mouth. Three other dentists mentioned that they could recommend watching "Peppa Pig Goes to the Dentist" or other child-friendly videos for young patients. However, one dentist added, "That's probably the best resource, but it could be better." (ID-1.1).

Another dentist also suggested how familiarity and predictability could be included in the digital interactive narrative, expressing, "I think it's just familiarity. Like you just gotta show them an actual room in the app so when they come to the appointment, they recognize it and are like 'Oh, I saw this chair on the app' and like 'I saw this person and I know their masks'" (ID 1.3) and "They recognize all the tools and all the steps and they're like, 'OK we've talked about this before'." (ID 1.3).

Create Positive Associations and Trust in the Dentist

The dentist experiences that many children have heard about various dental treatments from family or friends before. However, some types of familiarity with the dentist do not necessarily help. Several dentists experienced that young patients' reasons for being nervous before a dental appointment had roots in hearing about negative experiences from family or friends, with one expressing, "Maybe parents or kids at school or older siblings have said, like 'Oh, you're going to the dentist! Oh, you're gonna get your teeth filled out or it's gonna hurt'" (ID 1.1). Hearing negative experiences about the dentist can evoke feelings of unease and doubt during their dental procedure: "So, when they

come in, they're like 'I know what you're going to do, and I'm not going to sit here for it'" (ID 1.1). Additionally, the dentists encountered that previous negative experiences with other dentists also could lead to anxiety during a dental visit.

Therefore, one way to alleviate anxiety related to dental visits is by creating a positive association with the dentist, which may encourage young patients to return for future appointments. Several dentists encourage parents to have positive conversations or, at the very least, avoid negative remarks about dentists in front of their children. On expressed, *"We also encourage the parents not to say that so you always associate us with positive things, never associated with negative feelings even when like, because kids will pick it up."* (ID-1.3).

In addition, many dentists mentioned that they try to make the appointment fun for young patients. One approach could involve turning the process of checking teeth into a "game" by counting the teeth and comparing the result to the patient's siblings. Furthermore, dentists use positive reinforcement for their young patients. To give the children a feeling of mastery, they praise them for their achievements at the end of the appointment. Additionally, the children get to choose a toy or sticker at the end as a reward and positive reinforcement.

However, there is still a premise regarding speaking positively about the dentist. Even though the dentists want the children to have positive associations with the dental environment, the dentists were persistent about not lying. So, if something is uncomfortable for the child, it is better to tell the children the truth. One expert stated, *"[...] it's important that we don't mislead them, that they can trust us. I think that's really important, that we tell them what's going to happen if they want to know."* (ID-1.4).

Additionally, another dentist added that many of those who develop dental anxiety also have other experiences in life, which makes trust very important, stating, *"Research shows that authenticity is crucial. In a treatment setting, authenticity holds great value especially for those who have undergone relational trauma. Being genuine in a treatment situation is very important. Try to explain as clearly as possible what will happen."* (ID-1.5). The dentist means that providing false information about the procedures can harm the dentist-patient relationship. It may result in a lack of trust from the patients, causing them to question the dentist's credibility regarding other aspects of dental treatment.

Use Storytelling and Metaphors

As mentioned above, several dentists said they tried to make dental appointments fun for young children. Another way to do this was to use storytelling during the appointments. Especially the Australian dental experts could make up stories about what they were doing inside the young patients' mouths and tell it to the children during the dental treatment. As an illustration, one expert narrated *"I'm going to offer the tooth fairy to come in and make the tooth fall asleep. I'm going to draw a little X here so she knows where to land, and you know you might feel like your mouth is becoming like a marshmallow. That's ok and after it's numb, which takes about 2 minutes"* (ID-1.3). The purpose of this type of storytelling is to provide children with a fun experience and distract them from the medical procedures they are undergoing.

Metaphors and pet names for the instruments were common story elements among dental experts. The experts perceived that, *"Everything looks scary 'cause it's like made out of metal"* (ID-1.1). However, they experienced that metaphors and pet names made dental instruments sound less scary and were understandable for children, stating: *"[...] you can give them each a little pet name. Something that a child would understand. How they can visualize and understand and not be as scared off. Then everything, 'cause like, I've had a child that was scared of that cotton roll, and it was just the cotton roll. So, if you just get them to hold it and it's just a tooth pillow. Something soft, it's fine."* (ID-1.2). Other examples they came with were:

- "Sleepy juice" for the needle and syringe with anesthesia

- "Showering the tooth" for drilling and cleaning a cavity

- "Buzzy Bee" for the drill

- "Giving kisses" describes the water suction

- "Tooth shampoo" is a numbing agent gel to pretreat the tooth

The dentists also considered the metaphors and pet names for the dental instruments to create familiarity about the sensory experience with the instruments. They try to give the instrument names that the children already know so that they can associate the experience with the instrument with something familiar. For instance, "Buzzy Bee" describes the sound of the noisy drill.

5.1.6   Key Findings: Methodological Discoveries

The preliminary semi-structured interviews additionally led to the discovery of some challenges with this research activity that could further influence the attempt to accommodate the voices of the dental experts. The following points summarize the key findings linked with the execution and results from the semi-structured interviews:

- Challenge to recruit experts

- Limited tangible design ideas

The details of the points will be elaborated in the subsequent sections.

Challenge to Recruit Experts

To recruit Australian dental experts, as mentioned above, we went between clinics and asked if they wanted to chat about preventing dental anxiety. Before trying this strategy, we contacted dental clinics through Mail, but we have yet to succeed. Despite encountering multiple rejections while visiting dental clinics, this recruitment strategy yielded significantly better results. Many rejections were due to full calendars with patients, so finding willing participants with extra interest in the subject was essential to get them to participate, as most of them had to join during their lunch breaks.

However, the recruitment of Norwegian dental experts through Mail proved successful. In contrast to the Australian dental experts, the Norwegians were recruited through contacts and with the knowledge of them having a special interest in dental anxiety. Therefore, it was easier to get them to participate. Despite that, they also had full schedules, so the meetings had to be planned well in advance to fit into their calendars. It was, therefore, essential to allocate sufficient time to find experts for preliminary semi-structured interviews. Given the dentists' demanding schedules, we also had to adapt to their free time while maximizing our limited available time with them.

Limited Tangible Design Ideas

As mentioned, the dental experts had tight schedules, which required us to optimize the limited time we had available. The length of their lunch break usually bounded the available time. Ideally, we would have time to gather insights into their expertise and experiences in working with children and dental anxiety and create creative design ideas and proposals. However, with minimal time, the priority was their expertise and experiences. Thus, the time left for exploring design ideas could have been improved.

Dental professionals suggested several ideas during this time, primarily through verbal communication. However, time constraints with the participants made design thinking exercises impractical. Reflecting upon this, we might have missed potential opportunities and good, tangible design ideas from the dental experts.

5.1.7 Methodological Reflections

As I participated in conducting semi-structured interviews, I reflected on my experiences of accommodating the voices of the participating dental experts. The reflections can be summarized as follows:

- Efficient to understand objectives and priorities

- Response variability

- Interviewer biases

The upcoming sections will provide more details on these reflections.

Efficient to Understand Objectives and Priorities

The preliminary semi-structured interviews with dental experts were valuable and efficient in identifying the key content and desired outcomes they prioritize in a digital interactive narrative to prevent dental anxiety. As the interviews consisted of open-ended questions and the flexibility to elaborate, exploring interesting points that arose throughout the conversation was possible. By conducting interviews with the dental experts accordingly, we got an in-depth insight about important aspects of their work and how they interact with children with different degrees of nervousness and anxiety.

Consequently, we got a deeper understanding of how a digital interactive narrative could supplement their existing practices, as well as key elements to include to make young patients feel safe at the dental office. The dental experts could be concrete about the measures they did, and we could ask follow-up questions if something was unclear or of special interest.

Additionally, being in several of the dental experts' offices gave us extensive knowledge about the structure and looks of the dental office and treatments. This aspect was particularly beneficial for this case, considering that the solution's content is centered on the events and procedures within a dental office.

In total, all this insight was valuable for understanding the experts' perspectives and priorities concerning the content and objectives of the digital interactive narrative. The goals the dental experts prioritized for the outcome of the digital interactive narrative is earlier presented in section 5.1.5, about the key findings for design considerations.

Response Variability

Semi-structured interviews promote active participation and open dialogue with participants in the interviews, enabling them to share their perspectives and experiences freely. This also promotes a more engaging and collaborative conversation with the participants, empowering their voices to be heard. In my experience, the dentists opened up about their experiences and how they interact with children with different nervousness levels in a dental setting. Especially since we did these interviews with one or two experts at the time, there was room for the experts to voice their opinions and be heard. Accordingly, semi-structured interviews are a research activity that engages the participants to share experiences and thus empowers participants to elaborate and express their voices and perspectives.

On the other hand, the responses from participants can also vary considerably due to the semi-structured interview's open-ended nature. Some participants may provide brief answers, while others offer lengthy, detailed responses. Mainly during the questions regarding coming up with design ideas, the variability in responses became evident in the interviews. Some dental experts were more open and appeared to share their thoughts freely, while others were more cautious and might have needed more time and other activities to produce ideas.

In hindsight, those who came up with the most design ideas during this session also gave us designers the impression of being most engaged in the process and design. Looking back, those experts also had the most influence on the requirements and ideas used in the digital interactive narrative.

If dental experts had been given more time and the opportunity to engage in design thinking exercises, a wider range of perspectives would likely have been considered. If so, we as designers would also have facilitated acknowledgment for additional perspectives and voices and further a possibility for the dental experts to influence the design of the digital interactive narrative even more.

Interviewer Biases

The interviewer's biases, perspectives, or expectations can unintentionally influence the interview process. This bias may impact how questions are framed, responses are interpreted, or follow-up questions are asked. Being aware of these biases before an interview can be important to minimize their influence and ensure objectivity in processes. However, complete objectivity is a challenge, and the interviewer somehow uses their perspectives to choose what topics are of more interest to explore and ask follow-up questions. This can be beneficial as the interviewer's expertise contributes to exploring relevant subjects but may also lead to overlooking certain perspectives from participants on other topics.

In retrospect, our predefined choice of a digital interactive narrative as a solution may have influenced the topics we explored. When the subject of storytelling and metaphors arose, it became closely linked to the narrative and was extensively explored. Consequently, this topic was deemed significant and greatly influenced the design process.

Additionally, it is worth noting that some ideas suggested by the participants fell outside the project's scope, focusing on addressing dental anxiety. As the target users did not include individuals with existing anxiety, these ideas were deprioritized by us as designers.

5.2 Activity 2: Workshops with Children

This subchapter describes the execution and results of the workshops done with children from a primary school. The children participated in two workshops each, each lasting one hour.

5.2.1 Purpose

The main objective of both workshops was to create ideas for story elements, setting, plot, and direction of the story that could be further developed and used in a digital interactive narrative to prevent dental anxiety. There was also a goal to gain insight into the children's preferences for the main character and potential supporting characters.

On top of that, an objective was to gain more knowledge from the children about their dental knowledge and feelings and thoughts associated with dentistry. In each workshop, there were different activities to fulfill the various objectives. These activities are elaborated in the section about preparations for the workshop.

5.2.2 Participants

The workshops included 32 children between 8 to 10 years old. To recruit children in the appropriate age group, we considered it easiest to recruit children from a primary school or after-school care. Therefore, the recruitment happened from going around between primary schools and after-school cares in Australia, asking if they would be interested in participating in our workshop. Eventually, one private primary school was interested in participating. The school had an interest in preventing anxiety, as well as enthusiasm for letting the children participate in something new and enriching for their students, such as a design process.

Children from three different classes in the appropriate age group were offered the opportunity to participate in the workshops. The children and their parents received an information letter outlining the workshop details and a consent form to be signed. Only the children who returned a signed consent form from a parent within the specified time frame could participate in the workshops.

In total, 32 children participated in all the workshops. 22 of these children participated in both workshops. 7 children only participated in the second round of workshops due to absence from school on the first workshop day. 3 children only participated in the first

workshop and were absent from school on the second workshop day. The participating students were between 7 to 9 years old. 18 of the participants were girls, while 14 were boys, resulting in a small majority of girls.

There were a combined total of six workshops distributed among three groups. Each group consisted of 9 to 12 children participating in the workshops together. The groups participated in two workshops each, where one workshop lasted for one hour. Our contact at the school, who also knew the children participating, was the one creating the groups. The easiest way for the school to set up the groups was to put the students from the same class in the same groups. Consequently, the children in the workshop knew each other. Table 5.2 shows the distribution of children in groups and workshops.

Group number	#Participants workshop 1	#Participants workshop 2	#Total participants
Group 1	8	11	12
Group 2	10	9	11
Group 3	7	9	9
All groups	25	29	32

Table 5.2: Participants in the workshops

5.2.3 Preparations

In order to plan the workshops, we researched designing workshops specifically tailored for children, as well as exploring enjoyable activities to involve the children. Before deciding the activities and structure of the workshop, we decided the purpose of the workshops, outlined in Section 5.2.1 Purpose. We then discussed which activities would best suit the different objectives and how to utilize the time available best. The following bullet points show a summary of the structure and activities for both workshops. A detailed version is in Appendix D.

Workshop 1

- Intro: Introduce ourselves

- Main part:

    - Individual and warm-up activity: Create characters
    - Group activity: Create a story about a character going to the dentist

- Outro: Summary + Feedback from the children

Workshop 2

- Intro: Recap from the first workshop

- Main part:

  - Group activity: Continue on the story about a character going to the dentist

- Outro: Present stories + Feedback from the children

The primary objective of the introduction phase in Workshop 1 was to establish a connection with the children, aiming to make them feel at ease within the workshop environment and comfortable with us as facilitators. The intention was to create an open and friendly environment, with the ultimate goal of building trust to engage the participants fully.

The character-making activity centered around drawing but also included a character template to fill in with additional information about the character they created if they desired. The character-making was an individual warm-up exercise to activate the children's imagination and prepare the participants for the main part, the story-making activity. By individually engaging them in character creation, we aimed to trigger their thought processes and inspire them to be creative with the narratives. Furthermore, this activity served as a means to gain insights into the types of characters they envisioned in the digital interactive narrative.

The story-making activity, where the children were creating a narrative about going to the dentist, was, on the other hand, a collaborative activity. The children in the workshop were separated into two groups, with 3 to 6 children in each group. Each group had its facilitator, while one facilitator had the overall responsibility. The idea behind having one facilitator for each group was to pick up the ideas generated and potentially overshadowed by other participants who have a louder and stronger voice. Additionally, that one facilitator for the smaller groups would make it easier to supervise the children.

Furthermore, we created some boundaries for the stories the children would make. The groups were given papers showing the start and end of the story to ensure that they stayed within the scope of the project, namely dentistry and a dental appointment. The story starts with a letter inviting the main character to a cavity treatment and ends with a door outside the dental office with the text "The End." The papers showing the start and end of the story are presented in Figure 5.1.
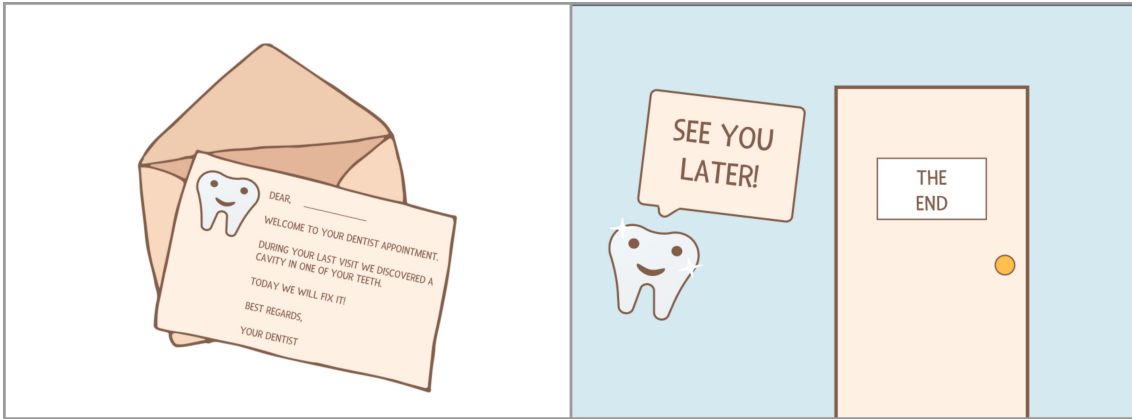
Figure 5.1: Start and end of story

Additionally, we print out pre-made cutouts of various elements to use in the narrative. The cutout contained equipment found in the dental office but also a bunch of random elements and characters they could use. See Figure 5.2 for all the pre-made cutouts.
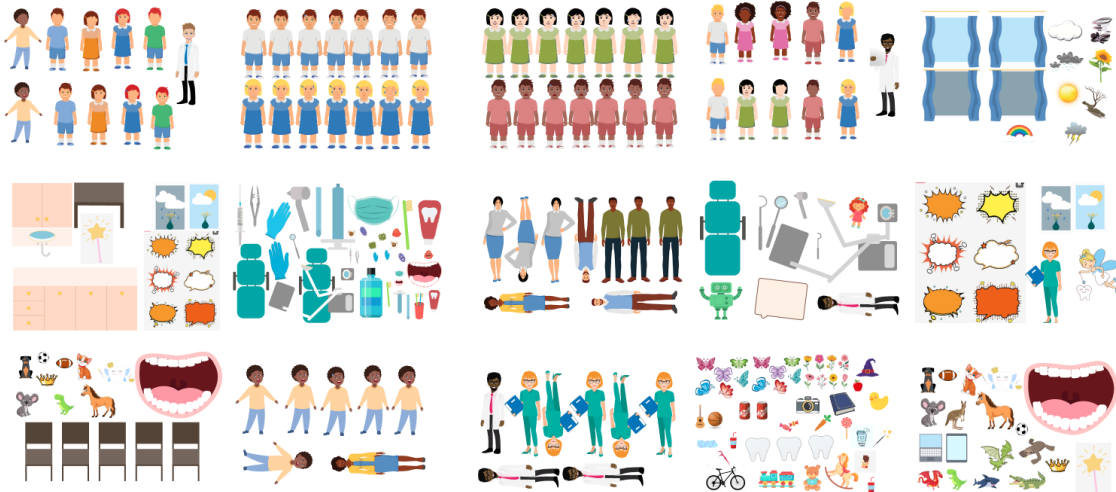
Figure 5.2: Pre-made cutouts

The children were also allowed to draw story elements if they wanted to. We alternatively considered making the children draw the whole story themselves. However, we found this to be time-consuming and not an efficient use of the available time. Other activities considered in the workshop were role play and acting, puppet theater, and making a song. However, we also found these activities to be time-consuming. Additionally, we considered that fewer children felt at ease engaging in these types of performative activities, limiting their ability to express themselves fully. On the other hand, we evaluated that using paper and pre-made cutouts provides a greater sense of freedom for the children to express themselves through written or verbal means or a combination of both.

Thus, we provided opportunities for the children to verbally share and present their stories at the end of the workshops. By planning to combine visual and oral presentations, we aimed to capture a diverse range of perspectives from the children and their stories. However, we took measures to accommodate children who preferred to speak less sparingly. We wanted to respect their comfort levels and would not require them to present their stories to everyone. Instead, we devised an alternative option where we engaged with them individually to understand their interpretation of the story. In cases where verbal communication was challenging, we could rely on visual representations to capture their ideas and perspectives.

5.2.4   Implementation

The workshops took place at the school the children went to during school time. Half of the workshops were conducted in the school library, where each group could unfold and occupy plenty of space. The library was occupied for the other half of the workshops, and because the school was also renovating, there were few rooms to conduct the workshop in. Therefore the remaining half of the workshops were carried out in a teacher's office where the groups had minimal area to unfold their stories. However, in both rooms, each group had one table with the same pre-made cutouts. The children made stories on A4 paper, where they decided if they would work on the floor or a table.

Furthermore, the execution of our workshops sometimes proceeded according to plan, as unforeseen circumstances arose beyond our control. In the first workshop with the first group, the children arrived at the latter part of the session, leaving us with insufficient time to carry out the planned activities. However, the school was understanding and suggested rescheduling the workshop. Surprisingly, this unexpected turn of events worked to our advantage. The limited time in the initial workshop allowed us to familiarize ourselves with the workshop environment and the children, fostering a sense of comfort and familiarity when we returned for the subsequent session.

Moreover, we encountered additional unforeseen challenges throughout the workshops. We were not informed that the children who were absent in the first workshop but had returned their participation forms would be attending the second workshop. Consequently, some of the groups became larger and more challenging to manage. This unexpected change also posed difficulties concerning the ongoing storylines developed by the previous workshop participants. The facilitators encouraged collaboration with the new participants, but they were however excluded. When new participants began critiquing

their stories, harsh comments were exchanged, and tensions arose. Consequently, they needed more interest in listening to each other's ideas.

To resolve this, we allowed the new participants to start a completely new and independent part of the story. In the two later workshops, we made the new participants choose whether to collaborate on the existing story or start a new story. The majority chose to start a new story.

Another challenge arose when one of our facilitators fell ill during the last two workshops, when we also had additional children join the sessions. Due to this, we had one less facilitator to supervise the children and no longer one dedicated facilitator for each group.

To address this, we allowed the children to work in more loosely formed groups, considering we already had allowed this for the new participants. Those who wished to continue their previous stories were given the opportunity to do so, while others could start fresh with a new storyline, resulting in smaller groups cooperating.

In summary, these implementation challenges required us to quickly adapt and find creative solutions. While the circumstances posed some difficulties, they also presented valuable opportunities for learning and growth. The subsequent reflections will delve deeper into the implications and interpretations of these experiences.

5.2.5 Key Findings: Design Considerations

This subchapter presents the key findings from the workshops with children regarding the children's perspectives and ideas on the design of the digital interactive narrative. The children's ideas for the storyline of the digital interactive narrative to prevent dental anxiety can be summarized in these points:

- Keep the story in the real world

- Main character resemblance and supporting characters

- Address feelings and reaching a happy ending

- Decorations, animals, and toys

- Elements of magic and surprise

The following paragraphs will outline each point.

Keep the Story in the Real World

Most of the children, 30 out of 32 participants, chose to set the story within the real-world setting of the waiting room and dental office rather than in a parallel or magical world, indicating a preference for a realistic setting. They drew inspiration from their understanding of a dental office and waiting room, incorporating familiar objects such as chairs, tables, desks, and various oral care products and tools, as shown in Figure 5.3. Despite being unfamiliar with the exact dental instruments and procedure of cavity treatment, they creatively represented the dentist working inside the mouth filled with bacteria and with dental instruments and toothbrushes, utilizing the tools they recognized.

Figure 5.3: Parts from stories in dental office

In addition, the children's stories followed a chronological structure, starting with a child receiving a letter and progressing through the waiting room and dental office, and ending with leaving the dental office. This adherence to a chronological narrative structure was a notable trend observed during the workshops.

Main Character Resemblance and Supporting Characters

The children often chose a main character who resembled themselves in gender, hair color, and skin color. This preference towards self-representation indicated a desire for personal connection and identification with the story. For instance, one group consisted of children, and everyone played football. Therefore the character they made also liked football.

Additionally, supporting characters, such as animals, stuffed animals, parents, or toys, were commonly included in the stories. The characters were often to support the main character going to the dentist, where they, for instance, described them as *"therapy dogs"* (ID-2.8) and *"teddies that you can squeeze every time you get scared"* (ID-2.9). Furthermore, the presence of other children waiting in the waiting room was a recurring theme, adding a sense of realism and social context to the narratives.

Address Feelings and Reaching Happy Ending

To address the theme of dental anxiety, several children opted to portray the main character as initially nervous before visiting the dentist, where one was telling that the character *"[...] is scared because she has watched bad videos of the dentist"* (ID-2.9). This conflict was a driving force in the stories, as the main character's anxiousness gradually transformed into a positive resolution, leading to a happy ending, with another child telling *"Now she's back home happy and wearing a crown!"* (ID-2.21).

Decorations, Animals, and Toys

The waiting room and dental office were often depicted with many cutouts, which the children perceived as decorations, animals, or toys, as displayed in Figure 5.4 One child described parts of their story illustrating the extensive inclusion of animals and toys, telling, *"[...] we put him (the main character) in a coma, like sleeping pills. He goes to sleep. He holds the teddy bear. The fairy and the kid's friends appear in his dreams. And a rainbow. He has a crown. Butterflies. Dinosaur. Clean teeth. And the tooth fairy is there too. And then they are singing a song like 'teeth cleaning, teeth cleaning blablabla'"* (ID 2.2).

Many participants emphasized the importance of considering toys as essential in attracting and engaging young readers, stating, *"It has to be child friendly. It's all toys to attract kids, cause most kids don't like going to the dentist, so it's to make them (the kids) go to the dentist"* (ID-2.23). This highlights the significance of incorporating fun elements into the interactive narrative design.

Figure 5.4: Parts from stories

Elements of Magic and Surprise

While most stories maintained a realistic setting, many children incorporated magic or surprise elements into their narratives. Some examples of magical elements the children included were; *"[...] the God of teeth"* (ID-2.26), *"[...] a real tooth fairy"* (ID-2.20) or that *"[..] suddenly the wizard appears"* (ID-2.27). These elements can also be seen in Figure 5.4. Additionally, the participants created some unexpected event in their stories that evoked much laughter among the children, for instance, *"This lady came out with a dog head"* (ID-2.17) and that the main character *"[...] "pooped himself because he's so scared of the dentist"* (ID-2.16). These magical and unexpected elements added humorous elements to the stories, seemingly creating a sense of excitement and playfulness for the children.

5.2.6 Key Findings: Methodological Discoveries

The workshops further led to six key methodological discoveries with the collaboration in the workshops that could influence accommodating the voices of the participating children. The following points summarize the key findings connected to the execution and results from the workshops:

- Active engagement in storytelling

- Pride in contribution

- Varied descriptions of story element purpose

- New participants excluded

- Curiosity in developing an app

- Share personal experiences

The following sections describe each finding in detail.

Engagement in Storytelling

One of the key methodological findings from the workshops was the children's enthusiasm for story-making and telling using pre-made cutouts. The children showed higher interest in using pre-made cutout elements than in drawing their own illustrations. Even though we arranged to use pre-made cutouts, the option to draw was available, and we encouraged them to do so if they wanted to. However, it became evident that drawing was less preferred among many participants, as only a few children selected this alternative in addition to using the cutouts. The children were also eager to pick cutouts for their stories. Several children ran up to the table when they were given the opportunity.

Furthermore, it was evident that the children enjoyed creating and crafting their own stories. They demonstrated a genuine passion and enthusiasm for the task at hand. Several children showed enthusiasm when they saw us returning to the school for the second round of workshops. As we came to the school while the children had their lunch break, they came running towards us, asking if it was their turn to continue on the storytelling that day. During the workshop, most children were also devoted to their tasks throughout the workshops.

The feedback session at the end of the workshops demonstrates that the children enjoyed the workshop's content. The children were asked to rate the workshops with a

thumbs up, side, or down. 25 out of 29 children at the second workshop gave thumbs up to how they felt about the workshop. The children's elaboration on their responses illustrates how the creation of stories engages them. One child expressed their love for creating things, stating, *"I love to create things"* (ID-2.10). Another participant enthusiastically shared their enjoyment, stating, *"I loved it so much. Loved it because we get to make stuff"* (ID-2.9). The desire to continue making stories was evident in a comment, expressing, *"I wish we could do this every day* (ID-2.8).

Moreover, the children's engagement was evident in their reflections on their abilities and the collaborative nature of the workshops. One participant highlighted their new-found storytelling skills, stating, *"I loved it. I really enjoyed it cause it was really fun. And I discovered that I could tell a story, cause I did not think that I would be this good at it"* (ID-2.26). The importance of teamwork in the storytelling process was emphasized by another participant, who stated, *"The best part with making the story was teamwork"* (ID-2.22), with several other children agreeing with her statement. Furthermore, the participants expressed excitement about the opportunity to engage in a novel activity, with one participant remarking, *"It was really fun. Nice to be a part of making an app because I never made one"* (ID-2.24).

However, it is worth noting that a minority of participants did not provide positive feedback or show enthusiasm in their feedback. Negative feedback was primarily observed in the group where tensions arose, and sharp exchanges occurred between the original and new members during the second workshop. The newcomers had eagerly anticipated joining the storytelling activity, and one participant expressed disappointment at not being able to contribute as much as he had hoped, stating, *"I am a good story writer, so I could have turned this into a good story"* (ID-2.12). Another new participant expressed their dissatisfaction with being excluded from the original group, stating, *"I did not like it because he was rude"* (ID-2-11).

Despite this, the overall enjoyment and enthusiasm displayed by the children for the pre-made cutouts and the storytelling process highlighted its impact on engaging the children in creating a story for the digital interactive narrative.

Pride in Contribution

During the workshop, a sense of pride was observed among the participating children as they eagerly presented their completed stories. This observation was particularly evident in Group 2 and Group 3, which consisted of smaller and more loosely formed groups.

Children voluntarily lined up, demonstrating enthusiasm and pride to share their creations with the facilitators. Their eagerness to present their work indicated personal connection and ownership toward the storytelling experience.

As the workshop stories were finished, the children sought validation and recognition for their creative efforts. One participant expressed their pride in the story by stating, *"It was good. I am going to show it to the teacher!"* (ID-2.27) after already telling the story several times. Statements from other participants further reinforced this sense of pride. Confidently, they proclaimed, *"We made some amazing stories"* (ID-2.17). Notably, one participant articulated their attachment by stating, *"I like this part best because it is the one I created"* (ID-2.11). This statement demonstrates their pride and emotional connection in their individual contributions.

Throughout the workshop, several instances highlighted the children's eagerness to display their stories and seek acknowledgment. They actively approached facilitators, asking, *"Can I show you my story now?"* (ID-2.26), demonstrating their eagerness to share their creative work. Moreover, the children exhibited a sense of pride by spontaneously sharing their stories without any prompting from the facilitators. Their enthusiasm was evident as they exclaimed, *"Look at my story!"* (ID-2.17), proudly presenting each other their stories.

The children's awareness of the value and delicacy of their stories was also noteworthy. One child expressed concern, cautioning, *"Be careful with it, it is very delicate"* (ID-2.23), and another asked, *"Are you guys gonna put them (the stories) somewhere safe?"* (ID-2.31). These quotes indicate that the stories hold significant value for the children, further emphasizing their attachment to their creations.

These quotes and observations demonstrate the children's sense of pride in their stories. Their excitement to share their creations and expressions of accomplishment highlight their connection and investment in the storytelling process.

Varied Descriptions of Story Element Purpose

During the design process, the children actively engaged and found joy in incorporating several elements from the cutouts into their narratives, as previously mentioned. However, their ability to clearly articulate the intention behind each story element varied. Some participants expressed uncertainty about the elements' purpose:

One participant presented their story, mentioning, *"[...] and this is a needle, but I don't know what that's for"* (ID-2.16), while another also remarked, *"[...] and a cat! I don't know why"* (ID-2.13), highlighting a lack of clarity regarding the intention of certain elements.

The inclusion of animals also prompted discussions among other participants, as one participant asked, *"Why do we have a dog in here (in the waiting room)?"* (ID-2.9), and another participant replied, *"I wanted a dog in the waiting room"* (ID-2.8). However, this led to further curiosity, with another participant also questioning, *"But why do we have two dogs in here?"* (ID-2.10), without getting any answer, suggesting a lack of purpose for the element.

Similarly, another child curiously questioned a second participant, *"Why is there a dinosaur there?"* (ID-2.23), to which another child responded, *"I don't know"* (ID-2.15), also indicating a spontaneous decision without a concrete explanation.

Even though many elements had a purpose, these statements highlight the challenges the children faced in sometimes articulating the purpose behind each element incorporated in their stories. While their engagement and creativity were evident, understanding the intentions behind each element in their narratives took work.

New Participants Excluded

There were seven new participants in the second round of workshops. Regarding the involvement of the new participants in the second round of workshops, there are several noteworthy observations.

The groups already felt pride and connection to the stories when the second workshop started. The existing connection led to the situation where, in certain groups, new participants needed help integrating with the original participants who were already acquainted with the story from the initial workshop. Certain original participants displayed a level of understanding regarding the story, creating obstacles for the new participants to integrate and actively participate seamlessly.

One participant demonstrated her connection by stating, *"This is the girl we will be using. We already made this, so we have the information in our heads"* (ID-2.8) to the new participants in the group. The facilitators made several attempts to include the new members in the story. However, the whole group seemed most satisfied with the solution:

the two new participants started a completely new part of the story.

Nevertheless, in this case, the new participants expressed dissatisfaction with their contribution level. In a disappointed voice, one new participant stated, *"At least me and *Name of Participant ID-2.11* got to do two things"* (ID-2.12), emphasizing their desire to play a more significant role in shaping the story. The same participant further added, *"I am a good story writer, so I could have turned this into a good story"* (ID-2.12), indicating the desire to have a greater impact on the story. Similarly, the other new participant conveyed their disappointment, remarking, *"I didn't like it because he was rude"* (ID-2-11), expressing disappointment with being excluded from the group.

In yet another group, one of the original participants demonstrated a lack of interest in involving new participants, immediately proceeding with the story and gathering more cutouts without involving the new participants. Despite the facilitator's attempt to go around the table and invite input from all participants, including the newcomers, the efforts to engage the new participants were met with limited success, with one new participant only answering *"I don't know"* (ID-2.6). However, after using time with the new participants and taking them to the table with cutouts, the new children gradually cooperated more with the other members throughout the workshop, bringing their ideas and thoughts. As the workshops unfolded, however, the group cooperated in smaller groups within their original groups, giving each member more room to participate with their ideas.

For subsequent workshops, the facilitators, therefore, organized smaller and more flexible groups. Still, it was observed that the new participants used a longer time to generate ideas and initiate their stories. Understandably, the new participants required more guidance and encouragement from the facilitators to begin the task. However, despite these initial challenges, they exhibited greater involvement in shaping the stories. They expressed higher levels of satisfaction in their feedback regarding the workshop., where one expressed *"I enjoyed creating the story"* (ID-2.28) after sitting focused on the task throughout the workshop. Similarly, another new participant enjoyed the workshop and chose to remain seated after the school bell rang, eager to complete the last part of the story.

Curiosity in Developing an App

The school openly embraced the opportunity to engage in something new and educational, such as the process of developing an app. Many children participating in the

workshop had never experienced a design process or app development before, triggering their curiosity and prompting them to ask insightful questions. Their queries reflected their eagerness to understand the purpose and implications of creating an app.

One participant inquired, *"Why do you need our help?"* (ID-2.27), demonstrating an interest in their role in the app development process. Participants were also curious about how their stories would be used, as one participant asked, *"How are you gonna use our stories?"* (ID-2.21).

The children additionally sought clarification on the nature of a workshop, with one participant asking, *"What is a workshop?"* (ID-2.17). Some children also showed interest in further development, illustrated by one asking, *"When are you gonna start developing the app?"* (ID-2.13). Moreover, one participant wondered, *"Is this gonna be on a real app?"* (ID-2.10), indicating their curiosity about the tangible outcome of their creative efforts.

Furthermore, several children inquired about the app's availability, illustrated by one asking, *"Is the app gonna be at the app store?"* (ID-2.8). Another participant asked, *"Is the app going to be free?"* (ID-2.31), showing curiosity about the app's accessibility to potential users.

These quotes exemplify the children's curiosity to participate in the app development process. Their questions showcased their interest in the project and provided valuable insights into their expectations as active contributors.

Share Personal Experiences

Children actively drew upon their personal experiences and preferences during the character creation, infusing the character with relatable and authentic characteristics. Sharing their feelings and perspectives about going to the dentist played a pivotal role in shaping the character's traits.

Most children willingly expressed their thoughts and emotions regarding dental visits. Some children felt eased with the dental visits, while others openly shared their nervousness. One participant voiced a common concern, saying, *"You think it's gonna hurt"* (ID-2.24), while another expressed the fear of potential mistakes and tooth loss (ID-2.31). Further, a participant conveyed her apprehension about cavities and not wanting to drill (ID-2.25), and another stated his dislike, *"I don't wanna go"* (ID-2.30).

Interestingly, in one group, a girl struggled to comprehend why anyone would fear the dentist. However, her understanding deepened as she listened to others' experiences and perspectives. Surprisingly, she suggested that the character should embody nervousness about dental visits. Similar dynamics unfolded in other groups, with at least one member admitting to feeling slightly nervous before dental appointments. The process of sharing personal experiences fostered an atmosphere of understanding and empathy among the participants, creating a character who is nervous about going to the dentist.

Ultimately, the children's openness to sharing their personal experiences and perspectives during the character-creation process played a central role in shaping the character's characteristics. Through their honest expressions of fears related to dental visits, the children fostered understanding, empathy, and, ultimately, the development of a relatable character who resonated with their shared emotions.

5.2.7 Methodological Reflections

During and after conducting workshops with children, I reflected on the most effective approach to understanding their perspectives and our responsibilities as facilitators in guaranteeing their voices are heard. The following points describe the key reflections:

- Active participation from diverse children

- Boundaries shape the outcome of the stories

The reflections from the workshops are described in detail in the next sections.

Active Participation from Diverse Children

As facilitators, we implemented various adjustments throughout the workshops to ensure equitable contributions and decision-making opportunities for all the diverse children involved. Participating in the workshops as a facilitator resulted in reflections on the implementation and measures taken to include the new children and all the other children with diverse needs in the decision-making process.

As mentioned, including new participants in the second round of workshops posed a challenge and led to several noteworthy observations. Recognizing that children who participated in both rounds were less inclined to incorporate the ideas of new participants, we found that allowing the newcomers to start a new story, where they could

actively contribute and be involved in decision-making, proved the most effective solution. These newcomers also required additional time and support from the facilitators to engage in the task.

Making the new children create new stories also led to smaller groups. Additionally, the circumstances necessitated smaller group sizes as we had a facilitator who fell ill. Reflecting on the various groups, it was noteworthy that smaller groups consisting of 2 or 3 participants fostered a more equitable distribution of participation. With fewer individuals in the group, attention could be given to each child, allowing a greater opportunity to express individual perspectives and ideas. Particularly noteworthy with some children who needed more attention to stay focused. The smaller groups created an environment where everyone found it easier to actively participate and contribute to the decision-making process, empowering each child to shape the narrative. The pride displayed by the children in their contributions further emphasized this sense of empowerment.

In addition, we encountered another obstacle wherein certain groups, even those with more autonomous children, incorporated story elements needing a more clear purpose. Encouraging children to explain their ideas throughout the workshop prompted them to reflect on their decisions and the reasons behind including specific elements. Although children varied in their descriptions of each story element's purpose, it was observed that the reflective process led to the discovery of purposes for a greater number of story elements. During the storytelling session, a participant mentioned dogs in their story. The facilitators and other participants asked questions regarding the purpose, which sparked the idea of using them as therapy dogs for anxious characters in the story. Making the children reflect on their intention behind the story elements enhanced their ability to incorporate purposeful elements in later prototyping. In some cases, children also realized that certain elements were unnecessary for their stories.

Both smaller groups and encouraging children to explain their stories throughout the workshop proved crucial in gaining deeper insights into the ideas of more reserved children and children who get easily distracted. Balancing participation among all children was essential to ensure that those who spoke the most did not dominate the conversation, allowing the perspectives of quieter or easily distracted children to be heard and have a say.

For instance, we encountered a reserved girl who had created a creative idea but had yet to collaborate extensively with the rest of the group. When encouraging her to share

her idea with the group, the other participants embraced her suggestion and seamlessly integrated it into the evolving narrative. She became actively engaged in the story-making process and significantly contributed, much like the other group members. Her feedback on the workshop further exemplified her enjoyment, expressing, *"It was a lot of fun making the story."* (ID-2.18). Additionally, after the workshops, the teacher expressed gratitude for our effort to provide easily distracted children with the necessary attention. She acknowledged that she had never seen them so absorbed in a task. Many easily distracted children also gave positive feedback to the workshop in the feedback session.

In summary, smaller groups, extra help for new participants and children struggling to focus, and encouraging all children to share their thoughts and experiences are key to involving children with diverse needs in decision-making.

Boundaries Shape the Outcome of the Stories

During the workshops, we aimed to do our best to empower all the children. However, it is crucial to acknowledge that facilitators also play a role in shaping the stories created by the children. The boundaries we established for the workshops are a clear example of our influence on the outcome of these stories.

The boundaries we establish for the stories determine the narratives' starting and ending points. It begins with a letter inviting the main character to the dental treatment and ends with the character standing outside the dentist's office door. These defined boundaries provide a framework for the children to unleash their creativity. However, how the boundaries were presented could also influence how the children created their stories and limit their creativity.

Additionally, we provided pre-made cutouts as visual aids, offering the children a range of possibilities that could influence their creative choices. The cutouts were intended to provide them with diverse options for story elements, fostering exploration and creativity while working within the established framework. Additionally, save time by not having to draw all the elements in the story. Despite having the option to draw elements, most children only utilized the pre-made cutouts we provided. As a result, the children predominantly included elements already available to them within the provided selection. Reflecting on how this unfolded, the cutouts might have given the children a limited number of choices of elements to include in their stories, further influencing their creative decisions and constraining the potential variety of story elements.

Through these boundaries, it becomes evident that our role as facilitators has had a significant impact on the stories created by the children. While the children maintain engagement and pride in their contributions, it is essential to recognize the extent to which our guidance and the available resources have shaped the overall stories.

To enhance the quality of the workshops and provide a more enriching experience for the children, I suggest expanding the range of available materials or introducing other opportunities for them to create their own elements. We can further empower the children to express their unique perspectives and ideas by allowing for more open-ended possibilities and encouraging creative input. Additionally, reflecting on our facilitation techniques and exploring ways to minimize our influence while maintaining a supportive role can contribute to a more authentic and diverse storytelling experience.

5.3   Activity 3: Prototyping

This subchapter describes the prototyping process in this project. The designers in this project were the ones participating in the prototyping. Similarly to the other activities, the chapter will describe the purpose, participants, preparations, and implementation. However, it will further elaborate on the motivation behind the design decisions in the final prototype and then the methodological reflections on the prototype process.

5.3.1   Purpose

The prototyping process aimed to transform the design concept into a tangible and interactive representation. The ultimate goal was to create a prototype of the digital interactive narrative that could be tested and evaluated by stakeholders and the intended user group.

Prototyping also served several important purposes in the design process. Firstly, it allowed designers and developers to mitigate risks by identifying and addressing potential issues early, minimizing the costs associated with failures. Through prototyping, we as designers could visually explore various ideas, content, and functionalities within the context of the digital interactive narrative.

Moreover, the prototyping phase facilitated effective communication and collaboration among designers, stakeholders, and users. By having a concrete representation of the design concept, all parties involved could develop a shared understanding of the envisioned concepts, enabling clearer and more meaningful discussions and feedback.

Overall, the prototyping process played a crucial role in refining and validating the design concept, ensuring that the concept would meet the needs and expectations of the stakeholders and the intended user group.

5.3.2   Participants

The participants involved in the prototyping activities consisted of the project's designers and developers, which included the author of this master's thesis, together with two other master's students in informatics.

5.3.3 Preparations

The preliminary semi-structured interviews with dental experts and the workshops with children were a big part of the preparations for making the prototype. They contributed to understanding the stakeholder and user groups' perspectives and priorities for a digital interactive narrative to help prevent dental anxiety in children. They also contributed to a big part of the design ideas and the decisions taken while making the prototype of the interactive narrative.

Additionally, the research conducted on already existing knowledge on preventing and treating dental anxiety and digital interactive narratives were also parts of the preparations before starting the prototype process.

The insight from stakeholders, intended users, and the research further led to defining and prioritizing requirements and learning objectives for the digital interactive narrative. The requirements and learning objectives are found in Appendix B. How these requirements and objectives are implemented in the prototype is outlined in this chapter's Section 5.3.5 Design Decisions.

5.3.4 Implementation

After the requirements for the prototype were prioritized, the prototyping started. It was an iterative process, starting with rapid prototyping to quickly get some ideas. The prototyping continued with implementing the design in Figma [36], designing and creating many elements in the story ourselves, and getting the elements suitable for the dental narrative. Additionally, some of the elements were borrowed or inspired from elements found in Figma Community [37], a community to publish and reuse other designers' components. Furthermore, the design and functionality were developed in React [38] to create a functional prototype for dental experts and children to test themselves later.

5.3.5 Design Decisions

This section shows how the final prototype of the digital interactive narrative ended up. It outlines the reasons behind the design and functionalities, mostly grounded in the dental experts' and children's insights and ideas. The prototype process consisted of finding common grounds in the perspectives and balancing the conflicting perspectives between the dental experts and the children. The following points sum up the key design decisions that found common grounds in the stakeholders' and children's perspectives:

- Real-world dental environment

- Address feelings, happy Ending, and create positive associations

Furthermore, the two next points sum up the conflicting perspectives that we attempted to balance in the design decisions for the prototype:

- Decorations, animals and toys vs. control, predictability and familiarity

- Surprise and magic vs. familiarity, control, and positive associations

The following sections will delve into each of the four mentioned points, describing how we have chosen to address them in the prototype. The first two sections will outline the common grounds, while the last two will address the conflicting perspectives.

Real World Dental Environment

The dental experts empathized to make the children feel in control during the dental treatment by making the children familiar with the dental environment to prevent children from being nervous before dental treatment. Most children also created chronological stories in the real world, a dental office, and an environment similar to an authentic dental office.

Therefore, the narrative's plot follows a chronological structure with the character entering the waiting room, entering the dental office, undergoing the cavity treatment, and finally getting a prize from the dentist for good work.

Like an authentic waiting room, the waiting room in the narrative includes seating with other patients, the door for entering the dental office, relaxing colors, and some toys to entertain the patients. The interface for the waiting room is shown in Figure 5.5.
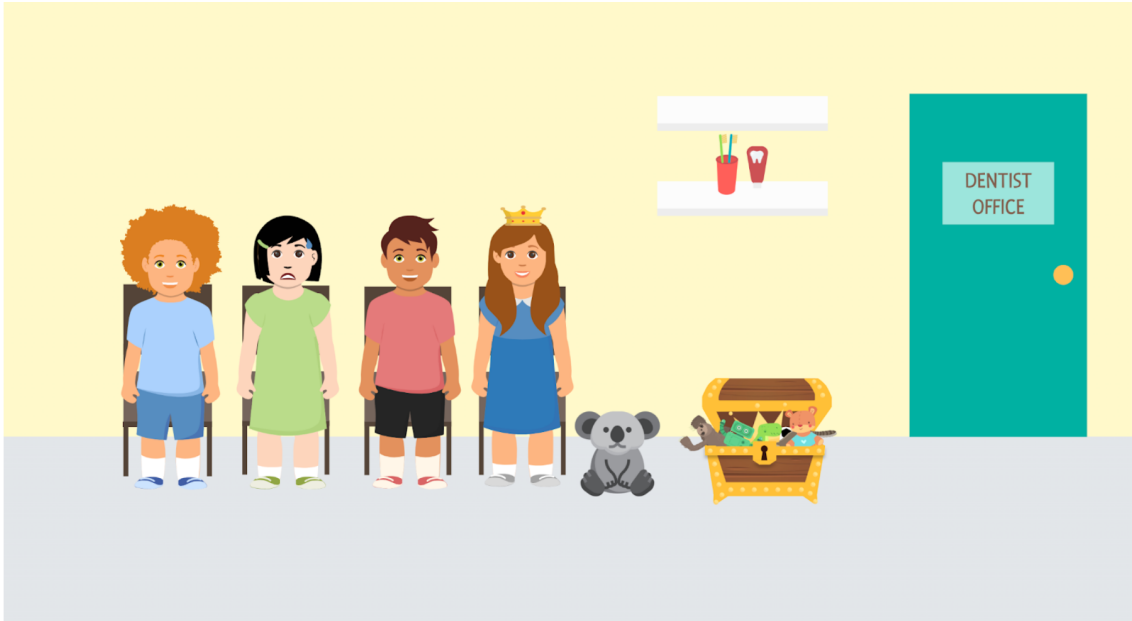
Figure 5.5: Waiting room in the prototype

There are also toothbrushes and toothpaste in the waiting room as these were elements the majority of the children included in their dental story. Clicking on the toothbrush and toothpaste allows the user to brush the character's teeth by dragging the toothbrush, shown in Figure 5.6. Showing the preventative side of dental health was also a notion some dental experts did in the preliminary interviews.
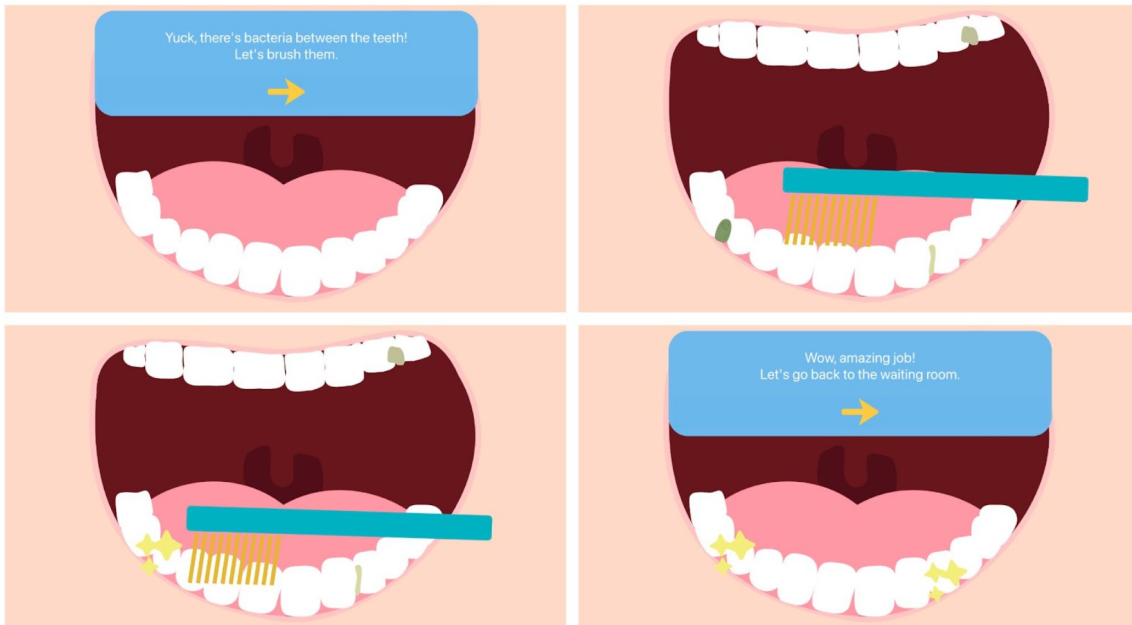
Figure 5.6: Brushing teeth by dragging the toothbrush

The dental office is additionally created to look authentic with the treatment chair, dental equipment and instruments, light, cabinets, and a dentist, as illustrated in Figure 5.7.
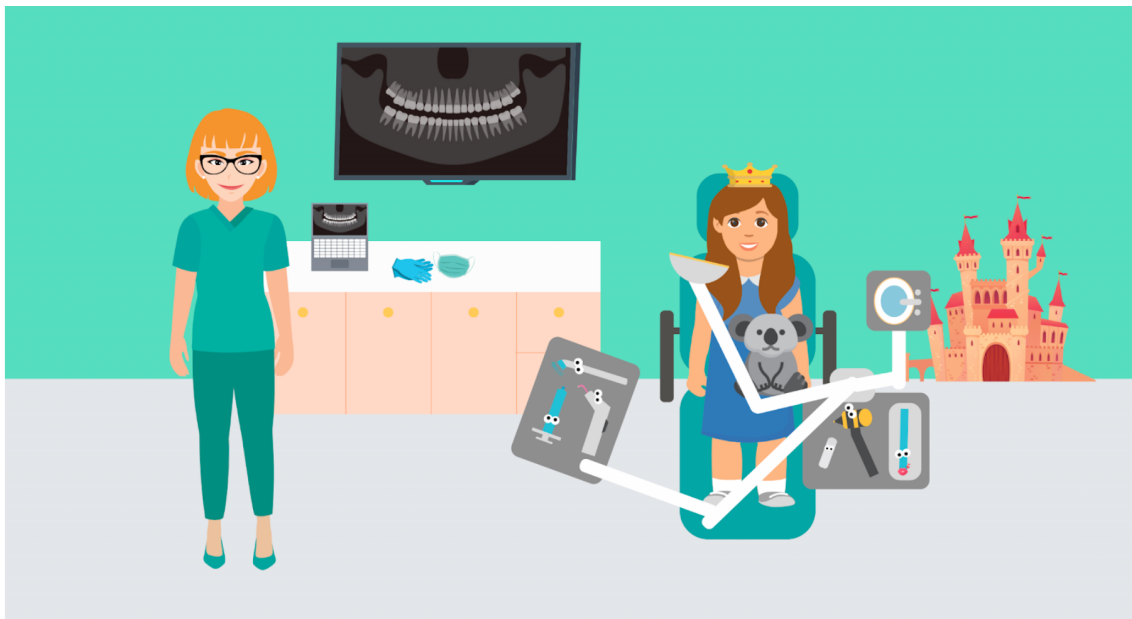
Figure 5.7: Dental office in the digital interactive narrative

Address Feelings, Happy Ending and Create Positive Associations

The children in the workshops addressed the feelings of being nervous and afraid before a dental appointment in their characters in their own stories. The dental experts additionally noted that normalizing feelings of dental anxiety could be good for showing the children that they are not the only ones afraid. Therefore, the waiting room in the narrative includes a girl showing signs of anxiousness, as seen in Figure 5.5. In addition, the user can choose if the main character is scared of the cavity treatment, whereas the main character also will show signs of nervousness. Figure 5.8 illustrates this.
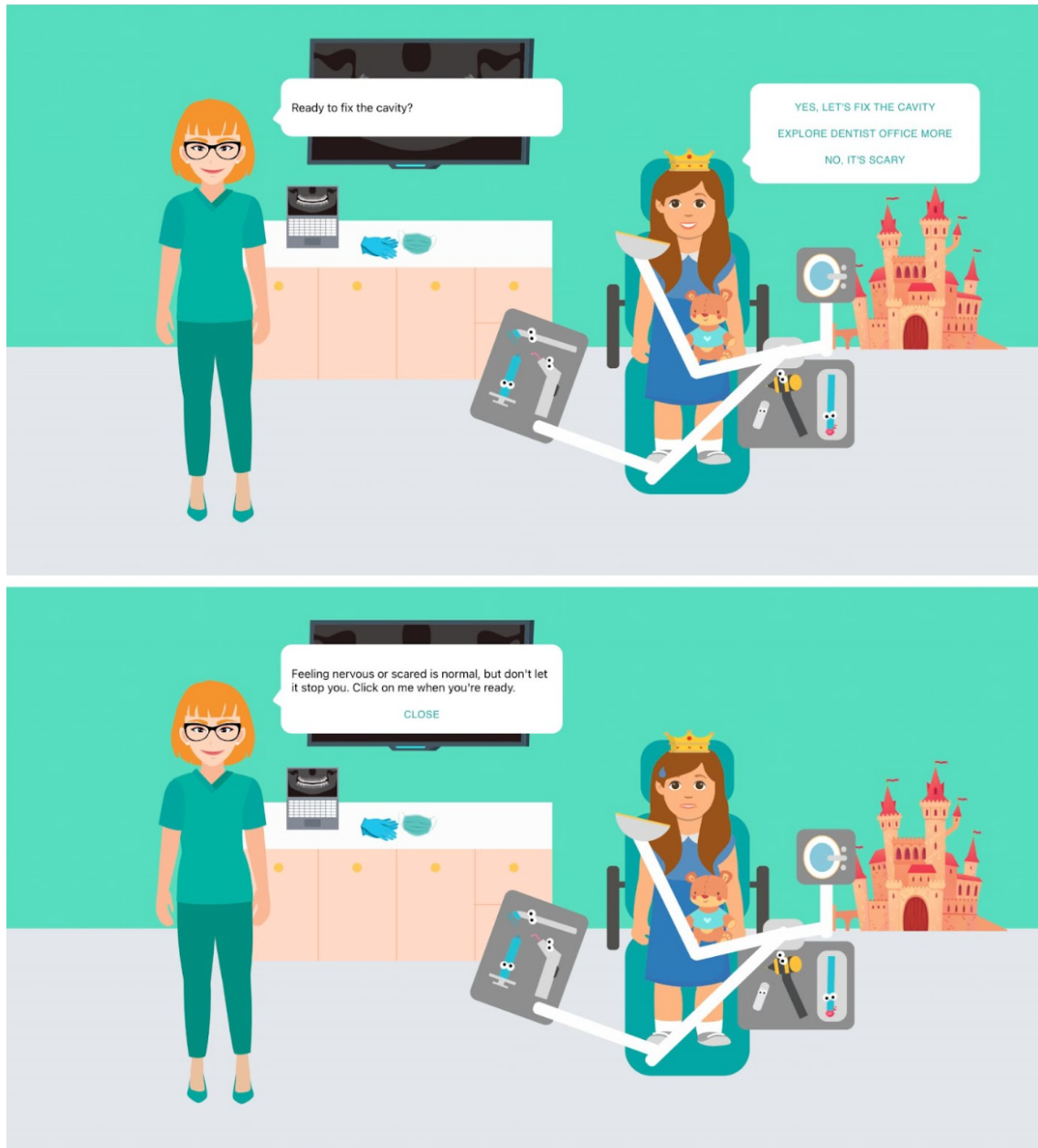
Figure 5.8: Pictures one shows that the user can choose if the character is nervous. Picture two shows the character being nervous if answered that the treatment is scary.

Additionally, most children had a happy ending in their stories. A happy ending aligns well with the dental experts' perspectives on wanting children to associate positively with the dentist. The character, therefore, always ends up happy in the end and receives a prize for the good effort. This part is further visualized in Figure 5.12.

Decorations, Animals, and Toys vs. Control, Predictability, and Familiarity

One challenge was to balance the conflicting perspectives of dental experts and children. The children included many decorations, animals, and toys, thus including many ele-

ments unrelated to the dental environment. Conversely, the dental experts emphasized familiarity with the dental environment and treatment. Therefore, The challenge was to include engaging elements for the children and not to take the focus from the exploration and familiarity with the dental environment and treatment or overwhelm the children with too many elements.

Engaging Dental Office and Instruments:

To balance the two conflicting perspectives, we tried to make the dental equipment part of the decorations, animals, and toys. We attempted to make the dental instruments look more engaging by using colors, putting on eyes, and sound effects. We could further use the metaphors the dental experts used to help us put the dental instruments to life. As a result, we allowed the instruments in the dental office to serve as "decorations, animals, and toys" that the children could freely explore. The goal was thus to make the dental instruments and treatments engaging by themselves.

Figure 5.9 illustrated how the dental office looked. The office tries to visually appeal to the children by using colors and simultaneously, using colors related to a dental office. Here we use our experiences from being in dental offices in the preliminary interviews and our own lives, further creating familiarity with an authentic dental office.
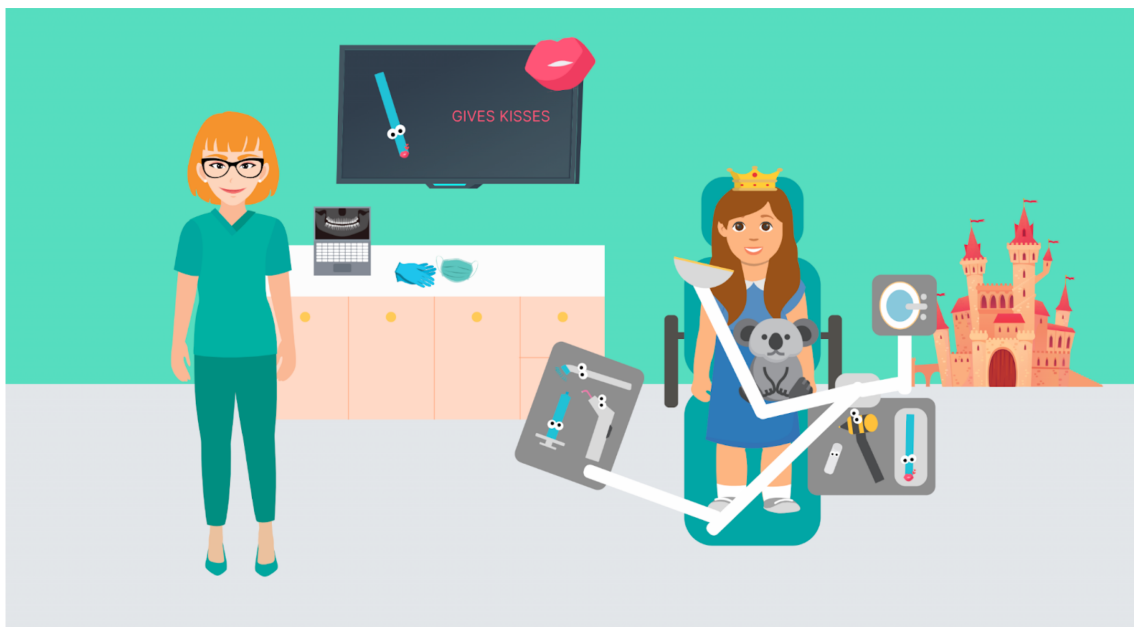
Figure 5.9: Dental office with the dental suction introducing itself

Additionally, Figure 5.9 shows the animated dental instruments with eyes and designs more colorful than real dental instruments. However, their shape is trying to be authentic.

The users also meet these dental instruments when helping perform the cavity treatment on the character, as exemplified in Figure 5.10. Here the drill is being brought to life as a bee. The personification tries to stimulate the children's fantasy, curiosity, and learning about instruments by connecting the drill to other relatable elements for the children.
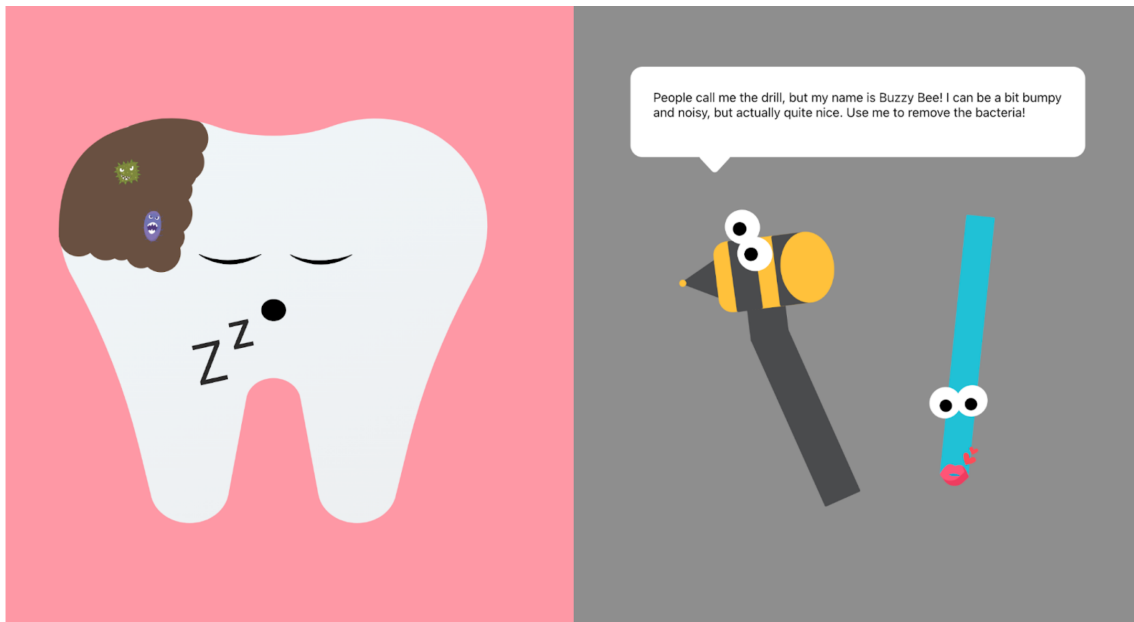
Figure 5.10: The drill with the metaphor of a bee presenting itself

The TV and computer from the dental office in Figure 5.7 were also decorations the children often included in their stories, and as a TV and computer are elements regularly found in a dental environment, these elements were included. We also found the TV to be a way the dental instruments could introduce themselves when the user interacted with the dental instruments. Figure 5.9 shows an example of the dental suction introducing itself as an instrument that gives kisses after the user has clicked on it.

Moreover, we chose to include a castle, a non-dental decoration in the dental office, which the users also can interact with. However, it leads to a story explaining to the users why it is important to fix a cavity, with a tooth castle and monster analogy for the tooth and the bacteria causing the cavity. It ends with a knight fighting the monsters and fixing the tooth castle. Figure 5.11 presents how this story is designed, with other immersive colors and bacteria that the children often included in their own stories.
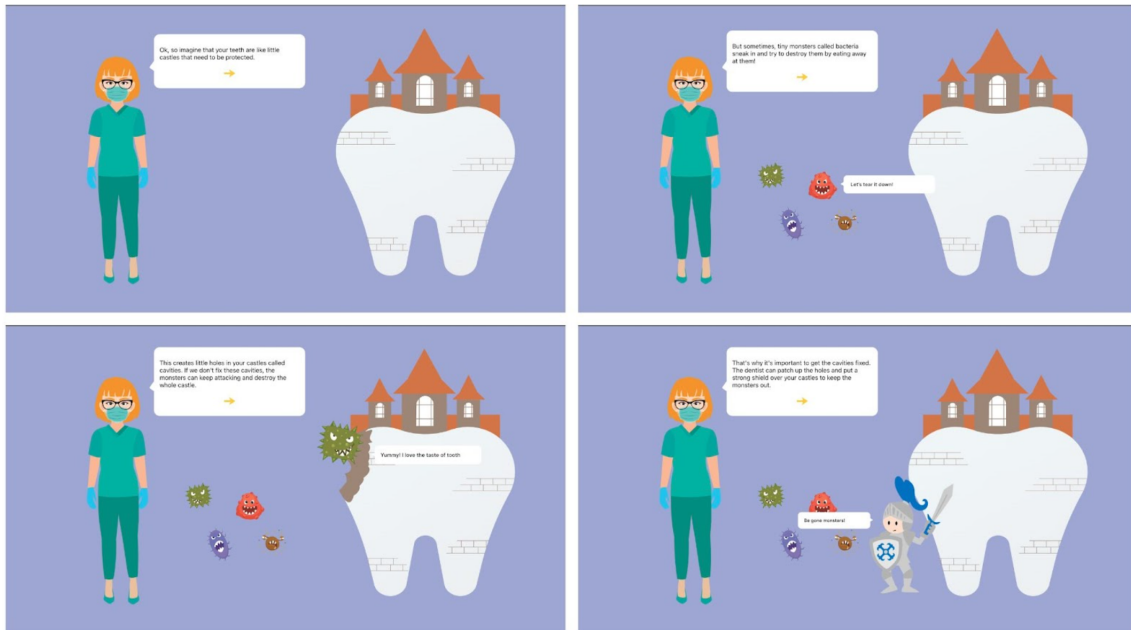
Figure 5.11: Tooth castle with bacteria as monsters

Toys in the Dental Environment:

We further wanted to engage the children by including non-dental elements similar to what they did in their stories. For this reason, we let them choose an animal or toy to bring as a supporting character to the dental treatment. Additionally, many children brought a supportive toy or character to comfort the nervous main character in their stories. The chosen supportive toy or animal is further present in the dental office, shown on the main character's lap in Figure 5.9 and Figure 5.10. To include even more toys, we additionally let the character choose a prize as a reward at the end of the treatment.

Bringing a toy or animal and receiving a prize are realistic events to include in the plot of going to the dentist since children often bring their toys and get a prize to take home after dental treatments. The toys and animals the user could choose between were based on the toys, animals, and decorations the children included in their stories. One of the toys, specifically the world cup trophy in football, was a drawing one of the children drew themselves in the workshops. In addition, several other children showed interest in football in the workshops. The inclusion of choosing a toy or animal and prize in the narrative is shown in Figure 5.12.
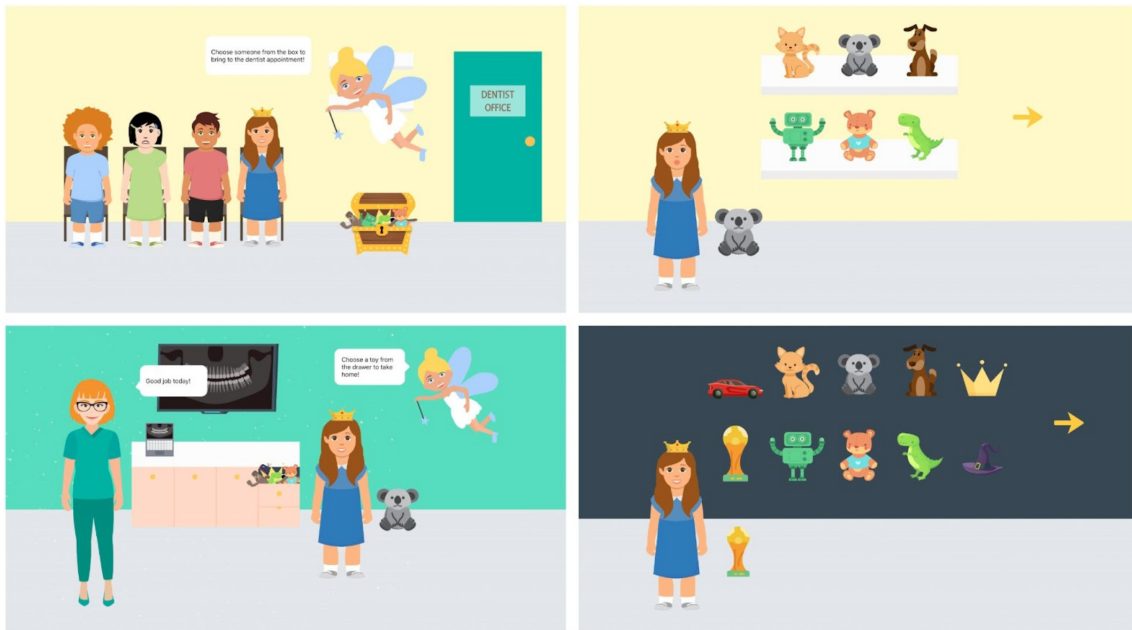
Figure 5.12: Picture one shows the waiting room with a tooth fairy telling the character to bring a toy to the dental appointment. Picture two illustrates the character choosing the toy. Picture three shows the character in the dental office after the dental appointment, with the tooth fairy telling the character to choose a prize to take home. Picture four shows the character picking a prize to take home.

Create Character Moreover, we implemented letting the children create the main character before the character went to the dental appointment. When making the character, the user can, for instance, choose the accessories they want the character to have, making us include other non-dental elements the children included in their stories, like making the character a princess or a king with a crown. Creating their character would also let the main character resemble themselves, similar to the stories from the workshops. Figure 5.13 shows the interface for creating the main character.

Figure 5.13: The interface for creating their character. The user can choose hair, hair color, skin color, eye color, type of clothes, color on clothes, and accessories to the character.

Surprise and Magic vs. Familiarity, Control, and Positive Associations

Two other contrasting perspectives identified during the prototyping process were the dental experts' emphasis on making children familiar with dental procedures and making the child feel in control during the treatment versus the children's desire to include elements of magic and surprise. For example, some children created a story in which humans and animals swapped heads, adding an element of surprise and magic that evoked much laughter. However, such a scenario would not be similar to a real-life dental appointment, presenting a negative outcome that the patient cannot control.

Tooth Fairy:
Consequently, we attempted to find elements that would introduce surprise and magic in the narrative that would not affect making the children feel in control over the dental procedure. One element that the children often included was the tooth fairy, which could be a magic element in the story that also would have relevance to dental health. The tooth fairy became a guiding narrator for the story, as seen in Figure 5.12 in the waiting room and after the dental treatment. The tooth fairy also appeared during the cavity treatment, exemplified in Figure 5.14.
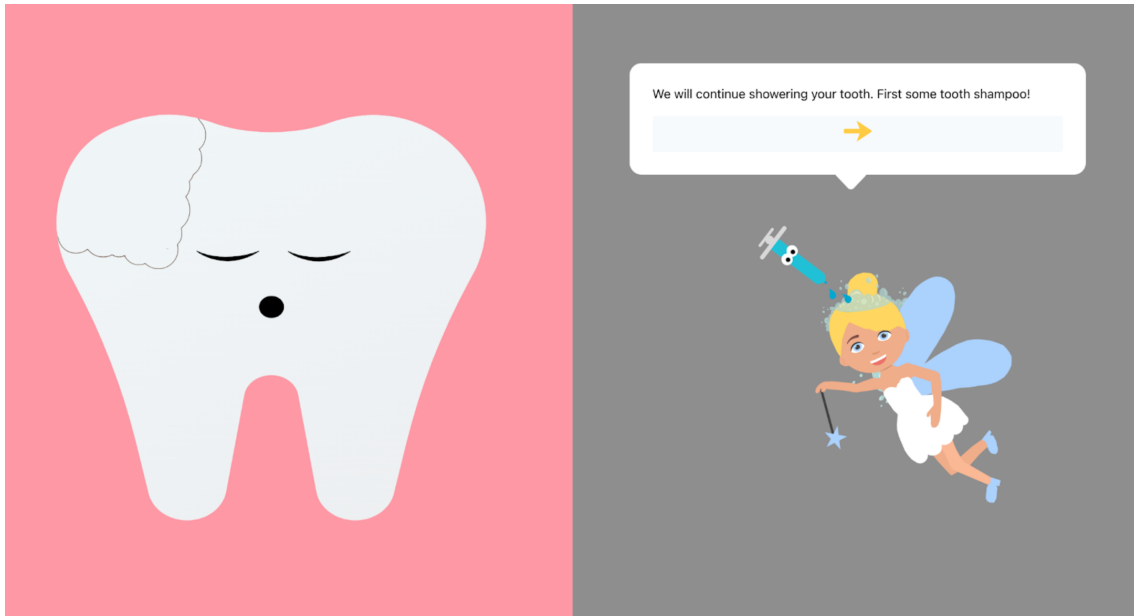
Figure 5.14: The tooth fairy guiding the user through the cavity treatment

Jokes and Unnatural Answer Alternatives:

We further tried to find other elements that could be of surprise in the narrative but not make the children lose control during the cavity treatment. We came up with including jokes and funny and unnatural choices to answer in the conversations in the narrative. Figure 5.15 exemplifies one joke in the narrative that shows up when the child interacts with the boy saying it. This joke in the waiting room is also an attempt to show the different feelings children can have before a dental appointment, as one child in the waiting room makes a joke and enjoys going there while the child next to him is anxious about the visit.
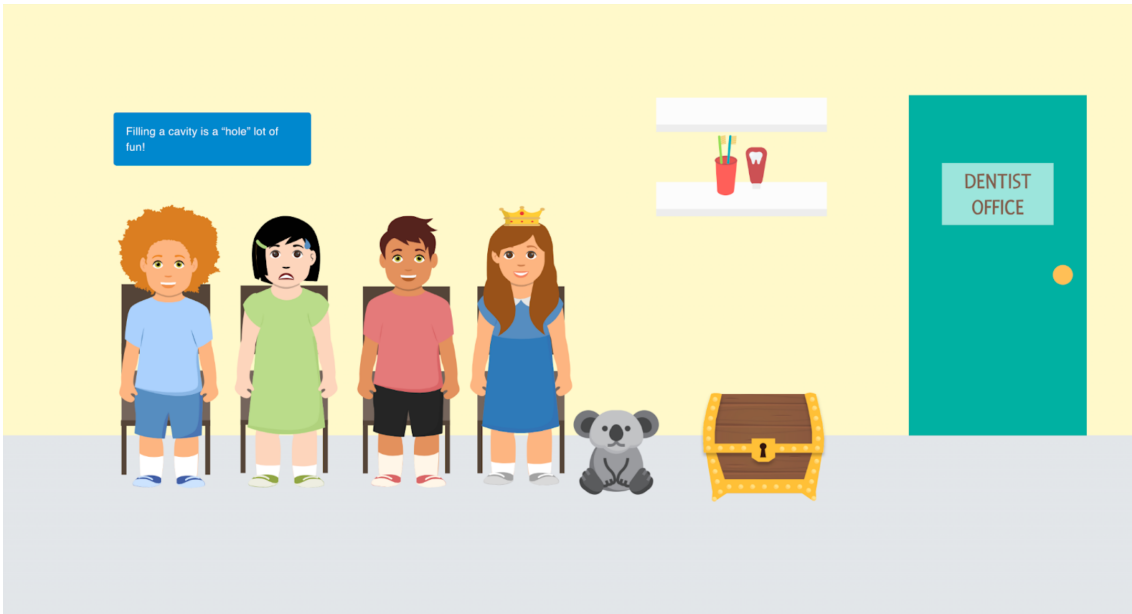
Figure 5.15: Boy character telling a joke in the waiting room

Furthermore, Figure 5.16 illustrates an example of an attempt of funny and unnatural choices to answer in the conversations with the dentist in the interactive narrative. These answer alternatives were also chosen based on the children's input in their stories, as candy and toys were something they related to the dentist.
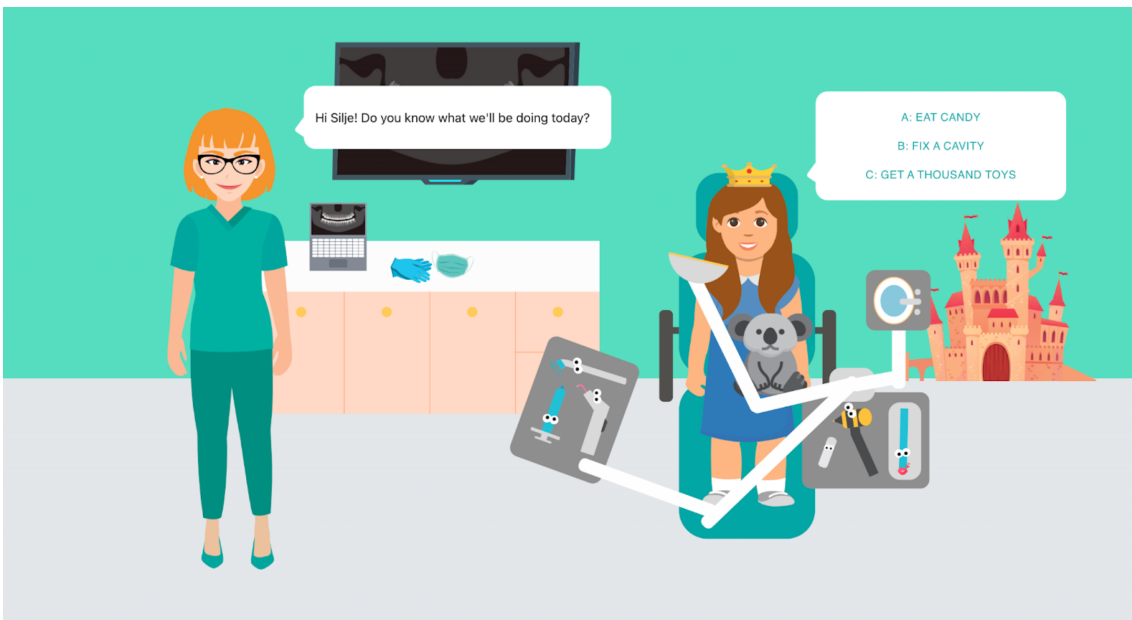
Figure 5.16: user can choose between answer alternatives to answer the dentist with

Surprising Outcomes from Interactions with Dental Instruments
Additionally, we added some unexpected outcomes from interacting with the dental in-

struments. Several dental instruments that do not make any distinct noises were given a sound relevant to the metaphors for the instrument. The sounds would then reinforce the metaphor and enhance learning by providing dual coding through several multimedia. For example, when the character is given the anesthetic with the syringe, called the sleepy juice in the narrative, it plays a lullaby to make the tooth sleep. The interface for this part of the narrative is visualized in Figure 5.17.

Figure 5.17: interface of the character getting the sleepy juice

Another example is when the user interacts with the curing light in the dental office. The characteristic of the curing light instrument is the blue light. Therefore, blue light from the TV and a glowing blue disco ball appears in the dental office's darker version, as illustrated in Figure 5.18. At the same time, the app plays groovy disco music. This whole event aims to create a joyful element of surprise yet make children feel in control of what is happening as they interact with the instrument.
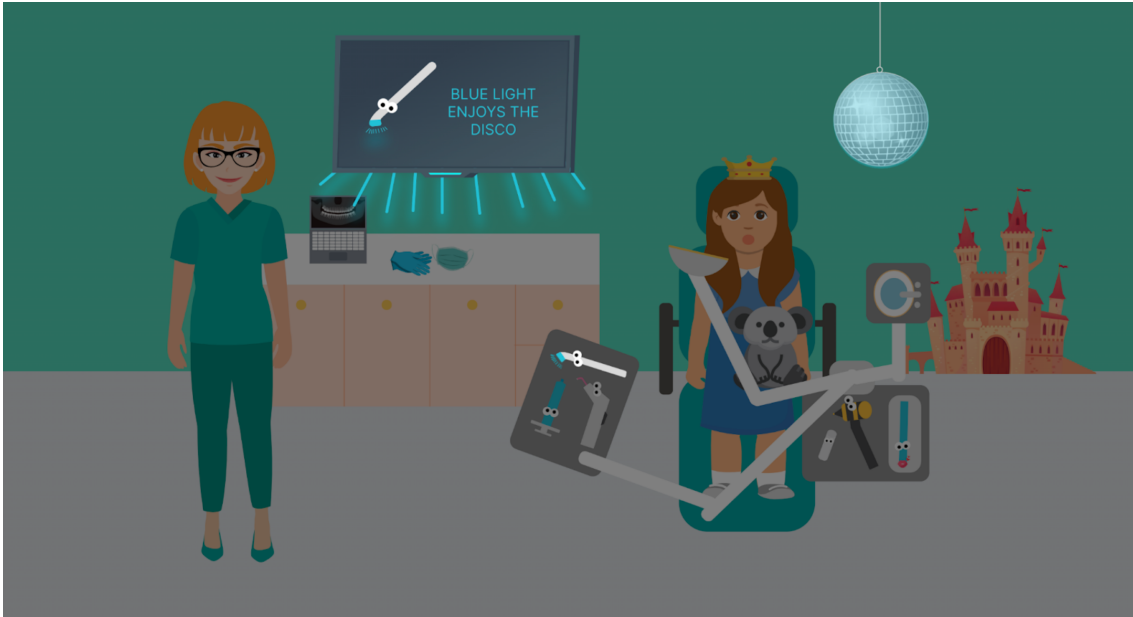
Figure 5.18: Disco in the dental office

5.3.6 Methodological Reflections

The following section reflects on how the stakeholders, intended end users, and designers have influenced the decisions taken in the prototyping process.

Decision Making Process

The decisions in the prototyping process show that the resulting design was only possible with the valuable insights gained from preliminary semi-structured interviews involving dental experts and workshops with children.

By considering the perspectives of dental experts on how positive associations, explanations, and learning, establishing control, and familiarizing children with dental treatment and instruments can reduce anxiousness, the content and plot were thoughtfully designed. Additionally, metaphors provided by dental experts were utilized to explain sensory experiences associated with dental instruments.

However, while the dental experts offered insightful measures and metaphors, they contributed with a limited amount of visual and tangible ideas. Therefore, the responsibility primarily fell on the designers to visualize and bring their perspectives and ideas to life.

In contrast, the children's workshop participation contributed to visual and tangible ideas. They actively created plots, characters, and story elements for the narrative.

Their creative inputs were vital in influencing decisions regarding the plot, characters, and story elements during the prototyping process. The decisions made by the children in the workshops were thus an integral part of the overall decision-making process for the prototype. However, their input primarily centered on the content, plot, and characters. Resulting in all decisions for interaction and functionality were only taken by the designers.

Moreover, the dental experts' and children's influence was limited, as they did not directly participate in the prototyping process. Thus, the final decision-making authority rested with the designers, who were responsible for selecting and implementing ideas generated by the dental experts and the children.

Ultimately, the stakeholders' and users' perspectives had a significant value and influence on the decisions taken in the prototyping but did not hold any power or authority in the process.

5.4 Activity 4: Evaluation with Dental Experts

This subchapter describes the execution and results of the prototype evaluation conducted with dental experts.

5.4.1 Purpose

The purpose of evaluating the digital interactive narrative with dental experts was primarily to get insight into three key elements of the concept:

- Whether the digital interactive narrative is a tool that could supplement the prevention of dental anxiety.

- If the content and plot are realistic and in line with authentic cavity treatments.

- What the dental experts recognize of their input and perspectives from the preliminary semi-structured interviews.

The aim of testing if the digital interactive narrative is a tool that can supplement the prevention of dental anxiety is to evaluate to what degree the concept has acceptance and reaches its primary objective. It includes getting insight into whether it is a tool the dental experts would recommend their patients to use before a cavity treatment.

In addition, the evaluation of the prototype aims to assess the realism and alignment of the content and plot with actual cavity treatments. Testing the authenticity ensures that the children learn the correct curriculum and creates familiarity. It also includes getting feedback on the metaphors and explanations of the dental procedure and instruments and if they are creating familiarity with the actual treatment and sensory experiences the patients' experience. Furthermore, the evaluations aim to examine the views of dental experts regarding the balance between dental and non-dental content.

Finally, the evaluation aims to gain insights into the degree of influence the dental experts felt they had on the design of the prototype, primarily based on the preliminary semi-structured interviews conducted with them. This includes exploring what perspectives, ideas, and decisions they recognize from their input. The intention is to evaluate the level of user involvement in the prototype and determine the extent to which the dental experts felt like active participants in shaping the digital interactive narrative.

5.4.2 Participants

The participants in this evaluation were done with four dental experts. All the participants from the preliminary semi-structured interviews were contacted and asked if they wanted to participate in the evaluation. However, several dental experts from the interviews were unavailable due to understandable personal reasons and changes in life circumstances.

Consequently, only two of the participants from the preliminary semi-structured interviews could participate in the prototype evaluation. The other participants were new dental experts, contacted with the help of contacts from Norway. Hence, all the new participants were Norwegian dental experts. Additionally, all the participants were women. Table 5.3 shows the overview of the participating dental experts.

Profession	Work experience in dentistry	Country
Dentist, special interests in making young patients overcome their dental anxiety	10 years	Australia
Dentist and Research advisor, works at a Competence Center for Dental Health Services	15 years	Norway
Leader and Clinical Psychologist, works at a Competence Center for Dental Health Services and with Safe Children in Dental Treatment.	9 years	Norway
Psychologist, works at a Competence Center for Dental Health Services and with Safe Children in Dental Treatment.	5 years	Norway

Table 5.3: Dental experts participating in the evaluation

5.4.3 Preparations

To prepare for the evaluation, we first found the objectives for the prototype test, outlined in Sections 5.4.1 Purpose. The test's purpose was grounded in the requirements and learning objectives for the digital interactive narrative. Subsequently, we decided on

specific elements within the prototype for which we sought feedback. The elements were primarily connected to the cavity treatment content, the dental instruments' appearance, and the balance between the dental content, metaphors, and non-dental content.

Furthermore, we prepared a guiding script for the evaluation, containing what we would say before, during, and after the test. It, for instance, included guiding questions to guide the conversations after testing the prototype. The questions posed were closely aligned with the purpose of the evaluation and specifically targeted the elements on which we sought feedback.

5.4.4   Implementation

The initial plan was to let all the dental experts try the prototype themselves. However, the evaluations with the Norwegian dental experts were conducted over a digital meeting, and unexpected technical issues led to them needing help interacting with the prototype. Consequently, they had to watch the designers demonstrate the prototype. On the other hand, the evaluation with the Australian dental expert did have a physical meeting, and she could try out the prototype herself. Besides this, the evaluations were conducted guided by the prepared guiding script, mentioned in Section 5.4.3 Preparations.

5.4.5   Key Findings: Design Considerations

The evaluation yielded three key findings regarding the design, aligning with the purpose of the evaluation, which primarily aimed to assess the concept and content of the prototype. The findings are summarized in the three following points:

- Supplementing tool to prevent dental anxiety

- Realistic content and plot

- Balance between dental and non-dental elements

The following sections describe each finding.

Supplementing Tool to Prevent Dental Anxiety
All of the dental experts agreed that a tool to supplement the prevention of dental anxiety is a great idea, with one dentist stating, *"[...] First and foremost, I just want to say that it's great that you have created such a preventive tool because we know that a lot of dental treatment anxiety in adults actually starts when they are young. So, focusing on prevention is really excellent."* (ID-3.3).

The dental experts further highlighted the importance of creating familiarity and control in the children to make them feel less nervous, like the digital interactive narratives attempt. One expressed, *"What we see is that information helps. Knowing what one is doing before the appointment, so I think it (the prototype) will help."* (Participant ID-3.2). Another dental expert provided a more detailed comment emphasizing the importance the control and predictability;

"And the more they know, the more control and predictability they have. It's often a bit underestimated, both in children and adults, the fact that we provide information about what is going to happen. So, they actually tolerate that information much better than one might think, as one might assume that withholding the information would spare them from fear. But it's actually the opposite that happens. So, the more knowledge they have, the better it is. I think that's really nice." (ID-3.3).

Furthermore, a dentist stated that it would be a good supplement to recommend for preparing the children for cavity treatments, stating, *"[...] I think, like, if patients need to get a filling, you want them to, like, cuz sometimes you just want 'em to prepare them for the next visit. And you just be like, let them play the game."* (ID-3.1). Later continuing with that the tool would help children get less nervous; *"It's great what you guys have done. Yeah, it would be really fun for kids to be able to use that. Yeah, I think it would definitely help."* (ID-3.1).

Moreover, one dental expert commented that many are nervous because they fear the unknown and that the prototype would help create familiarity, stating, *"[...] I believe that for the vast majority, this would be great. It's nice to know a little bit about what to expect. What they're usually afraid of is encountering the unknown and new. So, in that sense, it's excellent."* (ID-3.2). Another further stated that since the children might not have any associations to a cavity treatment yet, this narrative could create other, perhaps positive associations, expressing, *"Yeah, the drill sounds like it (in reality). But we're all accustomed to thinking that that drill is like a horrible noise. But maybe as a kid, like you don't have any reference right. Perhaps it's not that bad. Whereas like the mom in the corners, they're going, 'eww'. The kids, like, it doesn't bother them. It's okay."* (ID-3.1).

The dentist later highlighted it as a good tool to use as a reference while explaining what she will do in the cavity treatment, expressing, *"Nice. That's really cool. Yeah,*

I love it. That's really, yeah, it's awesome. Well done. I think it would be really good because yeah, as we talked before, like kids are so visual as well and you're just like, I don't know. I feel like you talk to 'em sometimes they're like, 'Yeah, sure.' Um, but yeah, if we can then reference that as well, like remember in the story, the cotton rolls. Yeah, that's good. That's really good." (ID-3.1).

Finally, one also pointed out the importance of interactivity and choices in the narrative, stating, *"Children often want to choose for themselves how much information they want, and they have the opportunity to do so here. They don't have to click on what they don't want. But they can do it if they want to, and that's great."* (ID-3.2).

Realistic Content and Plot

The dental professionals found the narrative's storyline realistic. One dental expert specifically mentioned, *"It is realistic compared to a regular appointment"* (ID-3.2). Another dentist humorously remarked that the portrayal resembled an actual cavity treatment, going so far as to say, *"It's pretty good. Teach dental students."* (ID-3.1).

One of the dental experts additionally clarified the resemblance to an authentic cavity treatment, further elaborated, *"I don't think it was too scary or too gentle. But it will be interesting to see what the kids say. I think there was a nice balance between being realistic and gentle at the same time. And that's how it should be."* (ID-3.2). The dental expert continues commenting on how the instruments are presented, *"The metaphors make sense."* (ID-3.2). Another dental expert noted that the explanations and metaphors were suitable for the children, *"And it's very nice that you have used explanations that are in the language suitable for that age group."* (ID-3.3).

Additionally, one dentist acknowledged that the prototype is honest and represents what happens. It also portrays the instruments and treatment as positive and suitable for children, with the dentist expressing, *"I think it's good. I think it's best not to shy away from what actually happens. Because like otherwise kids get like, 'you're lying to me'. Like you need to be honest. Like we can, you know, say it for certain, cuz like, it's a needle. So, I like that it looked like a needle, but it had stars and that was nice. But that's like; 'look, this is what's gonna happen, but it's not a bad thing.' Yeah. I think that's good."* (ID-3.1)

The dental experts also brought attention to the sounds utilized in the prototype, noting the importance of representing them realistically yet familiarly for children. Other dental experts also emphasized this aspect, as children often react negatively to the sounds of

dental instruments, which they may need to be adequately prepared for. One expert stated, *"It's good that there are sounds, as some children react to certain sounds. Many are prepared for the drill, but not the suction. It makes quite a bit of noise. So, some react negatively to the suction because they were not actually aware of it."* (ID-3.2). Another also commented, *"Very clever to use a bee, for example, because it reminds a bit of the sound"* (ID-3.3), continuing with *"The sound of the suction too, it can be very loud"* (ID-3.3).

Balance Between Dental and Non-Dental Elements

The integration of non-dental elements within the educational cavity treatment was found to strike a balance that did not overshadow the learning experience. One dental expert stated, *"I definitely believe that the game elements do not overshadow the learning here."* (ID-3.2). Another expert expressed satisfaction with the balance achieved, stating, *"I think it's a good mix. I think it is more educational than just a game. It's really nice to have like the little bits, like choose your toy or, you know, that kind of stuff like that it's just like not towards just learning. Yeah. I think that's good."* (ID-3.1).

Moreover, the dental experts themselves emphasized the importance of incorporating engaging elements. While creating a character, one dentist expressed enthusiasm by saying, *"Cool. Alright. Okay. So, it's like you're making yourself. That's cool. Oh my God. It's gonna be like Avatar! (referring to the movie Avatar because she makes the character blue)"* (ID-3.1). Another dental expert agreed that the balance was well-suited for the target age group of 5 to 10 years, remarking, *"I think you've hit the mark very well in terms of the age group, from the youngest children up to perhaps 10 years old. I have sons myself, both younger and slightly older, but my eleven-year-old might find it lacking action. However, the younger children would surely find it very enjoyable. The inclusion of a teddy bear and the ability to choose different items are highly popular among the youngest age group, and I find that to be very nice."* (ID-3.3).

The experts further commended the design aspects, expressing their appreciation. One dental expert commented: *"Nice and cute design. It's fun that you can choose colors, clothes, and accessories. I believe children will also like that"* (ID-3.2). Another added, *"Cool. I really like the design and stuff. It's so nice and simple, and yeah, it's really good"* (ID-3.1). She also highlighted her admiration for the eyes on the instruments, stating, *"That's cool. I like these eyes."* (ID-3.1).

Lastly, the experts remarked that the instruments were engaging, with one expressing,

"Funny comparisons, like kissing and such." (ID-3.2). She also mentioned her experience that children enjoy learning and finding value in acquiring new knowledge, stating, *"I have experienced that children also enjoy learning. They like to acquire useful things. So, I believe you will receive positive feedback."* (ID-3.2). She emphasized that the learning by itself was engaging and enjoyable.

5.4.6 Key Findings: Methodological Discoveries

The purpose of the evaluation was additionally to identify perspectives and elements that the dental experts recognized from the preliminary semi-structured interviews. Additionally, there were two other interesting methodological discoveries from the evaluation. The following three points summarize the discoveries:

- Recognition from preliminary semi-structured interviews

- Curious about children's perspectives

- Interest in previous and future development

This section further presents each point.

Recognition from Preliminary Semi-Structured Interviews
Only two dental experts participated in the preliminary semi-structured interviews and the evaluation of the digital interactive narrative. However, the specified dental experts showed recognition of their perspectives and ideas from the preliminary semi-structured interviews.

One recognition was the already mentioned semblance with a real dental environment, revealed in Section 5.4.5. All the dental experts observed the authenticity of the cavity treatment in the narrative, further fostering familiarity and control in the patients. These elements were priorities in their perspective found initially in the project, also highlighted in the evaluation. One stated, *"It is realistic compared to a regular appointment"* (ID-3.2), continuing with, *"What we see is that information helps. Knowing what one is doing before the appointment, so I think it (the prototype) will help."* (ID-3.2).

In the evaluation, the experts further pointed out that it would be a good tool to create familiarity and control in the children before dental treatments. This perspective was also prioritized in the preliminary semi-structured interviews. One expert commented, *"[...] I think, like, if patients need to get a filling, you want them to, like, cuz sometimes*

you just want 'em to prepare them for the next visit. And you just be like, let them play the game." (ID-3.1).

Although authenticity and familiarity were important, the preliminary interviews also revealed that honesty with reality and positive associations with the dentist was also important to make the children less nervous. The dental experts also pointed out this perspective in the prototype, pointing out, *"So, I like that it looked like a needle, but it had stars and that was nice. But that's like; 'look, this is what's gonna happen, but it's not a bad thing.' Yeah. I think that's good."* (ID-3.1).

Finally, the dental experts also came up with concrete ideas and metaphors that could be used in the narrative. While testing out the prototype, it was observable that they recognized the ideas and metaphors. One especially commented on the metaphors she suggested under the interviews, expressing, *"The sleepy juice! That's good"* (ID-3.1), continuing with, *"Oh, that's the Buzzy Bee!"* (ID-3.1), and *"[...] and the light"* (ID-3.1).

The other dental expert participating in interviews and evaluation had previously worked on movies to teach children about cavity treatments, bringing us several ideas from the project. She did not remember every idea she brought us, but recognized them, asking *"So did you watch, did I send you those videos?"* (ID-3.2) while testing out the prototype, continuing with highlighting that it's good that those ideas also can be used through the children being interactive, stating, *"It looks great. Children like to be a little interactive and not just watch movies, so that's wonderful"* (ID-3.2).

Curious about Children's Perspectives

During the project, the dental experts actively sought the input and perspectives of children, particularly those who had undergone fillings in the past. Their curiosity was evident as one expert inquired, *"Yeah. Did you talk to kids who had filling?"* (ID-3.1).

In response, the designers shared their insight from the workshop with the children, presenting that some children had mentioned feeling ticklish during the dental experience. The dentist then drew from her own encounters, sharing an anecdote/episode, *"Yeah. But I've had kids before. Oh yeah. They say it feels tickly. I've had like a four-year-old before I cleaned their tooth, and they're just giggling, and then the mom's like, what is going on? You should be screaming."* (ID-3.1).

Another expert also displayed curiosity regarding the children's perspectives, asking,

"What have the children themselves said when they've tried the prototype? What have they said?" (ID-3.3). This demonstrated their interest in capturing the authentic experiences and feedback of the target users.

Additionally, one dental expert shared her own viewpoint on the prototype, expressing, "I don't think it was too scary or mean." (ID-3.2). However, she acknowledged the significance of the children's perspectives and eagerly anticipated their feedback, remarking, "But it will be interesting to see what the children say." (ID-3.2).

Interest in Previous and Future Development

The dental experts displayed curiosity regarding the design process and further development of the prototype. One expert expressed her curiosity about the future plans for the project, asking, "What, what is the plan? I'm so curious if there's someone who will continue working on it, or if there are other plans going forward?" (ID-3.3). Her curiosity demonstrated an interest in the project's potential for further development.

Furthermore, she expressed her hopes for the future, emphasizing the importance of incorporating elements such as examinations and injections, as they are common fears encountered during dental visits. Her curiosity and suggestions reflected a desire to build the prototype to address several aspects of children's fears with dental treatments.

Another expert expressed her appreciation for being able to contribute, "It was great to see it." (ID-3.1). Further asking, "How long was that? Doesn't it take you guys long, like how many months?" (ID-3.1), demonstrating an interest in the development of the prototype. She additionally questioned, "Are you finishing this while you're here or do you go home and then?" (ID-3.1). Her inquiries indicate a curiosity about the digital interactive narrative's future and further development.

Lastly, another expert expressed her hopes for the completion of the project, stating, "I hope you get it finished. It was fun to see." (ID-3.2). Her comment demonstrated a genuine interest in the progress and eventual outcome of the project.

5.4.7 Methodological Reflections

By taking part in the evaluation of the prototype with dental experts, I have further reflected on the influence and bias of dental experts in the evaluation. The forthcoming section will delve into these aspects and shed light on their influence during the evaluation process.

Dental Experts' Bias in Evaluation

The prototype evaluation involved a mix of dental experts, as mentioned, including participants from the preliminary semi-structured interviews and new participants. The participants in both activities expressed that they recognized perspectives and ideas from the initial phase in the evaluation process that can further contribute to creating a sense of ownership. The already existing engagement among participants can also contribute to fostering higher satisfaction with the design. The recognition empowered them, acknowledging their valuable contributions to the design. However, an important drawback of not involving all participants from the initial phase in the evaluation was the need for insight into whether other participants recognized their input from the preliminary interviews.

Nevertheless, participating in both activities introduced the potential for biases as participants developed attachments to the project and the designers involved. This attachment can limit their perspective when providing feedback, making it challenging to offer constructive criticism due to their personal investment.

Involving new dental experts in the evaluation proved valuable as they brought a fresh and unbiased perspective. Their involvement allowed fresh insights and perspectives that may have otherwise been overlooked. Furthermore, their feedback tended to be more objective, as they did not have prior attachments to the project. Including new participants from the stakeholder group also helped assess whether other representatives from the stakeholder group valued similar perspectives as the participants from the initial phase.

By considering the initial and new participants' perspectives, the evaluation aimed to achieve a balanced and comprehensive assessment of the prototype's design.

5.5 Activity 5: Evaluation with Children

This subchapter describes the execution and results of evaluating the digital interactive narrative conducted with children from a primary school.

5.5.1 Purpose

The purpose of evaluating the digital interactive narrative with children was primarily to test three key elements: assessing the learning impact, evaluating engagement, and evaluating the influence of children on the design.

The aim of testing the learning impact was to assess how much the children remembered about cavity treatment, the importance of addressing them, and their understanding of dental instruments and their purposes after using the prototype.

Additionally, the evaluation of the prototype targeted to assess the engagement and interest levels the children showed in the digital interactive narrative. This included understanding the children's perception of the narrative and determining whether they found it enjoyable, interesting, or boring. Furthermore, it aimed to identify the elements within the narrative that captured the children's engagement the most.

Finally, the evaluation aimed to gain insights into the degree of influence the children felt they had on the design of the prototype, primarily based on the workshops conducted with them. This included exploring what perspectives, ideas, and decisions they recognize from their stories. The intention was to evaluate the level of user involvement in the app and determine the extent to which children felt like active participants in shaping the digital interactive narrative.

5.5.2 Participants

The participants to evaluate the prototype were the same children that participated in the workshops. Our contact from the primary school set up 22 children to test the digital interactive narrative. 2 of these children were absent from school. Thus 20 children ended up testing the prototype. The children were aged 7 to 9 years old. Of the participants, 13 were girls, while 7 were boys.

5.5.3   Preparations

To prepare for the evaluation, we first found the objectives for the prototype test. The test's purpose was grounded in the requirements and learning objectives for the digital interactive narrative. We then decided on specific elements with the prototype we wanted feedback on. The elements were primarily connected to the exploration and interaction with the elements in the dental office in the digital interactive narrative, the learning outcome from the interactions, and their experienced influence on the plot and story elements in the digital interactive narrative.

Furthermore, it was important to prepare for how to perform a user test involving children. We found research on how to interact with the children regarding what language to use, what to say, how to encourage them to give honest feedback, and what body language to observe.

We learned that we should prepare a script for introducing the test situation for the children [39][40]. As recommended, the script explained to the children that they were not the ones who were being tested but rather the prototype. Furthermore, it was crucial to emphasize the significance of their role by explaining to the children that they are the true experts at being children. We emphasized that they possess unique insights into what children enjoy, while we, as adults, have forgotten what it feels like to be a child. Therefore, we relied on their valuable input to guide us and inform our understanding. We also highlighted that the prototype was not a finished product and had mistakes, so the children had to help us find them. The full script for the test of the prototype with children can be found in Appendix E. The script also includes the prepared questions for the semi-structured interview after the children had tried out the prototype.

Additionally, the scripts include what elements to look for during the testing observation. For instance, to notice situations when they smiled, laughed, or leaned against the screen, as these body languages often indicated their enjoyment [39]. Similarly, we paid attention to any parts they skipped or rushed through, as these could be indications of disinterest or being bored [39]. By prompting the children to provide further details and expand upon these specific moments, we sought to gain deeper insights into their thoughts and feelings about the experience.

5.5.4 Implementation

The test of the prototype was guided by the testing script recently summarized in Section 5.5.3, about the test preparations. Moreover, the testing sessions took place in the school library, and each test was allocated a 30-minute time frame. Individual laptops were provided for each child, allowing them to explore the prototype on their own freely. In the test session, one dedicated test leader closely observed the children's interactions and offered assistance if necessary. Furthermore, the sessions were both screen- and voice-recorded, allowing for a thorough review of the results at a later stage.

5.5.5 Key Findings: Design Considerations

This subchapter presents the key findings from the evaluation with the children regarding the children's views on the prototype's design and content, especially regarding the learning outcome and engaging elements. The following points summarize the key finding:

- Learning outcome: Remembers the metaphors

- Engagement: Create character and toy selection

- Engagement: More interactivity

Each subsequent section will delve deeper into each key finding.

Learning Outcome: Remembers the Metaphors

Most of the children could recall some dental instruments that were introduced with metaphors or pet names. Many children remembered the names of the Buzzy Bee and referred to the "[...] disco light" (ID-4.6) when describing the drill and the blue light. They also associated the water suction instrument with "[...] giving kisses" (ID-4.4), and the fan that provided both air and water as the "[...] one that gives a shower" (ID-4.3).

Furthermore, some children expressed surprise at the number of instruments involved in cavity treatment. One participant commented, *"I did not know that there were that many instruments to fix a cavity! I had only heard about the toothbrush"* (ID-4.1).

However, when asked to provide further details about the purpose of the instruments, the accuracy of their responses could have been improved. Only a few children could recall the exact purpose, and none could provide a comprehensive account of the cavity treatment process. The results from the test suggest that the information presented may have

been too passive or text-heavy, considering it was the primary source of their knowledge acquisition. While one child expressed satisfaction with the amount of text, stating, *"I thought the amount of text was all right. Not too much or too little. I Like to get things explained."* (ID.4-1), it seemed that more children found it to be too text-heavy, where one expressed, *"There was kind of too much text"* (ID-4.18). Another also stated that it was boring, potentially due to an overwhelming amount of text or a lengthy sequence of steps. As one child remarked, *"It was sort of boring [...] I had to wait a long time. Like there were a lot of steps"* (ID-4.12).

In conclusion, the learning objectives to familiarize the children with the instruments in cavity treatment were achieved. However, there were challenges in ensuring an accurate understanding of the information for their purpose. Therefore, the learning objective to teach the children about the dental instruments in a cavity treatment was partly met. The results suggest that the use of metaphors and engaging elements helped capture their attention and create memorable associations. However, further considerations may be needed to balance providing sufficient information and maintaining their interest through the steps in the cavity treatment.

Engagement: Create Character and Toy Selection

One aspect of the digital interactive narrative that engaged the children was the ability to customize the character to resemble themselves. They could choose gender, clothes, hair, and skin color, with one child explaining their preference for the color blue on the clothes because they were wearing it themselves. The option to create the character was the favorite part for several children, with one child expressing enthusiasm to do it every time (ID-4.10).

Furthermore, when allowed to go through the narrative again, the children expressed interest in creating a different version of the main character, opting for a more imaginative and playful approach. This desire for creative exploration demonstrates their enjoyment in actively participating and shaping the story according to their preferences.

Additionally, some children particularly enjoyed choosing a toy for their character. One child identified the toy selection as their favorite part (ID-4.9). Another specifically expressed excitement for the World Cup trophy in the toy selection, as he had a big interest in football (ID-4.12).

Engagement: Elements of Magic and Surprise

The workshops revealed that the children enjoy elements of magic and surprise. When they tested out the digital interactive narrative, these elements stood out as engaging for the children.

One dental instrument that stood out in engaging the children compared to the rest of the instruments was the blue light. Where many of the other instruments have a distinct sound in reality, this did not have any particular sound in actual dental treatments but was recognized with its light. In the narrative, it created a disco in the dental office. The children did not expect the outcome with the disco and groovy music; many showed engagement with laughter and smiles. Some children also started dancing, and several clicked it multiple times to see the disco again. The children's verbal feedback also expressed enjoyment with the blue light, stating, *"I really liked the sound of the blue light"* (ID-4.6).

Another source of engagement emerged from the children's different answer options when responding to the dentist. Two of the alternative answers surprised them, leading to bursts of laughter. Most of the children also expressed curiosity about the possible outcomes if they had chosen different responses, motivating them to go through the narrative again.

Additionally, several children enjoyed the enchantment of bringing the other instruments to life. This magical element in the narrative sparked their engagement as they personified and interacted with the instruments. One child burst into laughter when the Glue and Filling introduced themselves, while another engaged by enthusiastically greeting them, saying, *"Hello, Glue! And hello, Filling!"* (ID-4.17). In the feedback, one child expressed amusement with the instruments' names, stating, *"I think the instruments' names are funny"* (ID-4.X). This child further demonstrated their amusement by reading the names aloud in a funny voice. Furthermore, the cotton rolls, referred to as tooth pillows in the narrative, created enjoyment for the children. One child described it as *"[...] funny, like, you know, in a toothy way"* (ID-4.15), while another expressed delight in the tooth fairy sleeping on those pillows (ID-4.6).

In conclusion, the workshops revealed that elements of magic and surprise, such as unexpected outcomes, engaged the children. The alternative answer options and the enchantment of personifying the dental instruments also contributed to their enjoyment.

Engagement: More Interactivity

The evaluation of the digital interactive narrative uncovered the children's desire for increased interaction within the story. While the earlier workshops had demonstrated the children's enjoyment of stories with lots of decorations and toys, the results from the prototype's evaluation revealed that there needed to be more interactive elements in the narrative that could capture their attention.

One child expressed the wish to have more decorations by stating, *"I would like to have more decorations on the walls, like we had in our story (from the workshop)"* (ID-4.7). Another child suggested including more toys by making toys fall down to the dental office when they chose to answer the alternative "get a thousand toys" as an answer to what will happen at the dental appointment.

Although the prototype aimed to make the dental equipment engaging and part of the decorations and toys in the narrative, most children suggested additional enhancements to make the dental instruments more engaging. The prototype only allowed for clicking on the dental instruments, but the children preferred to drag the instruments instead. They found dragging the toothbrush particularly exciting, providing a sense of control and engagement. One child expressed enthusiasm for dragging the toothbrush when brushing the character's teeth by stating, *"Oh, this one you can drag!"* (ID-4.1). In their feedback, nearly every child recommended enabling dragging for the rest of the instruments, emphasizing that *"Then you feel like you do even more in the story, like in the part when you brush the teeth"* (ID-4.16).

Moreover, some children would recommend the interactive narrative to everyone, while most would specifically recommend it to children younger than themselves. This observation indicates that the level of interaction the narrative provides might be insufficient for children their age, possibly contributing to a perceived sense of boredom.

5.5.6   Key Findings: Methodological Discoveries

This subchapter presents the key findings from the evaluation with the children regarding the children's recognition of the workshops in the prototype.

Recognition from Workshops

The feedback from the workshops highlighted the significant impact of recognizing elements from their own stories in the prototype, leading to a sense of engagement and

ownership among the children.

The option to create the character, choose accessories, select a companion, and decide on a toy or prize at the end allowed nearly every child to find elements that resonated with their workshop story. This personalized touch generated a sense of excitement and engagement. Many children exclaimed, *"Oh, that was what I made!"* (ID-4.16). For instance, when presented with the chance to adorn their character with a crown, participants who had previously designed a king or princess character during the workshop exhibited a surge of familiarity and enthusiasm. They could vividly recall their story and were thrilled to see their ideas reflected in the prototype. One child joyfully recalled, *"I remember the crown, the character, and the fairy from our story!"* (ID-4.7).

Another child expressed delight with the World Cup trophy, exclaiming, "I made this!" (ID-4.9). He eagerly expressed their desire to show it to all their friends, indicating that this was his favorite story part.

Overall, the workshop recognition in the prototype proved to be a key factor in capturing the children's interest and enthusiasm.

5.5.7 Methodological Reflections

The following section will reflect on how the workshops affected the evaluation and address any potential biases from the children.

Children's Bias in Evaluation

The active involvement of children in the design process, where they contribute their ideas and recognize them in the narrative, can create an emotional connection and a sense of ownership over the story. Their recognition and engagement suggest that the prototype has successfully fulfilled some of the children's wishes. However, it is important to acknowledge that this emotional connection can introduce bias during testing.

Due to their investment and attachment to the narrative, children may overlook flaws or issues in the prototype. Their recognition from the workshops might drive their engagement and positive reactions. This bias could affect the feedback's accuracy and the prototype's overall evaluation.

Furthermore, the children's relation to us as designers may influence their willingness

to provide critical feedback. Despite implementing measures to encourage constructive criticism, completely eliminating this bias can be challenging. Children often tend to please others, which may inhibit them from expressing negative opinions or pointing out areas for improvement [39].

On the other hand, the bond and trust established between the children and the designers can create a safe environment for some children. This safe space enables them to express their voice and opinions more freely. They may feel less afraid to provide honest feedback, knowing their thoughts will be valued and respected.

In summary, while the attachment to the narrative can introduce bias during testing, it also creates an environment where they feel more comfortable expressing their opinions. It is important to be aware of these factors and consider them when interpreting the results.

5.6 Summary of Main Methodological Concerns

In summary of all research and design activities, this project encountered various methodological challenges and yielded significant discoveries throughout the research and design activities.

The initial hurdle was recruiting participants due to limited time availability. Despite this constraint, the preliminary interviews provided valuable insights into participants' knowledge, objectives, and priorities for the digital interactive narrative aimed at preventing dental anxiety. However, the time limitation resulted in design ideas primarily being expressed verbally, leading to limited tangible design concepts from dental experts.

Conversely, the workshops with children yielded numerous concrete design ideas, where the children demonstrated engagement and pride in contributing. The children also demonstrated an interest in developing an app. However, there were variations in the descriptions of story elements where the children needed encouragement to articulate the purpose of some story elements. Additionally, incorporating new participants in the second round of workshops proved challenging. To address these challenges, we implemented smaller groups and encouraged them to present their stories throughout the workshops. These measures empowered them to have a voice, actively contribute to decision-making, and share their personal experiences in the character and story development process.

Furthermore, insights and ideas gathered from the preliminary semi-structured interviews and workshops strongly influenced the prototyping decisions. However, the absence of stakeholders and users during the decision-making process left the designers with ultimate authority in making final decisions.

During the evaluation phase with dental experts, their perspectives were acknowledged and incorporated into the prototype, where they could emphasize and recognize their perspectives. The dental experts also expressed interest in the children's input and the past and future development of the prototype. Similarly, in the evaluation with children, many recognized elements from their own stories, further enhancing their engagement.

Finally, it is important to acknowledge the presence of biases in all activities throughout the project. Designers can influence interviews and workshops through the asked questions and the set boundaries. Additionally, participants who have already contributed to the interviews or workshops may exhibit biases, resulting in recognizing their contribu-

tions or increased chances of success for the product. However, this connection may also hinder their ability to identify flaws in the product. Awareness of these biases is crucial in interpreting and analyzing the research findings. The next chapter will now use the findings and methodological discoveries and reflections to discuss and answer the research questions.

Chapter 6

Discussion

This chapter aims to address the research questions for the project, focusing on methodological challenges encountered during the participatory approach to designing a digital narrative for preventing dental anxiety among children. This chapter delves into the intricate aspects of stakeholder perspectives, negotiation processes, participant learning, and the extent to which the resulting design solution can be considered participatory. Each section will attempt to reflect on and answer each research question, concluding with a recommendation learned from the challenges met during this project.

6.1 RQ1: In what way do the stakeholder groups' perspectives differ, and how can they be negotiated?

When examining the project of developing a digital interactive narrative to prevent dental anxiety in children, there are two key areas where differences emerge between the stakeholder and user groups. These differences primarily arise from variations in their expertise and knowledge and objectives and priorities concerning the narrative. The subsequent sections will shed light on the contrasting perspectives between these groups and outline the negotiation process employed within this project to address these differences. Lastly, an evaluation of the negotiation outcomes is presented.

6.1.1 Expertise and Knowledge

This project has gathered valuable insights to create a digital interactive narrative that effectively prevents dental anxiety by acknowledging and embracing the disparity in knowledge and expertise between dental experts and children. The dental experts have con-

tributed their extensive knowledge of dental treatments, preventive measures, and the typical age at which signs of dental anxiety manifest. They have also shared strategies to help children feel secure and in control during dental visits and offered metaphors and explanations to aid children's understanding of cavity treatments.

On the other hand, the children participated by sharing their unique perspectives and desires for the narrative. They have emphasized including real-world elements, characters that resemble themselves, and addressing feelings of nervousness before dental treatments. Their input has also highlighted the importance of a happy ending and the incorporation of decorations, animals, toys, magic, and surprises to enhance engagement.

Throughout the decision-making process, both sets of expertise have been carefully considered, with their knowledge influencing the narrative in areas most closely aligned with their respective domains. The dental experts' insights have guided the narrative's purpose as a pre-treatment tool and determined the target age group. Meanwhile, the children's input strongly influenced the characters' appearance and the story's setting.

However, it is important to note that conflicts may arise due to differing expertise and knowledge among stakeholders and user groups [8][10][11]. As experiences in this project, the expertise and knowledge can influence each group's objectives and priorities for the design. The subsequent sections will describe how these conflicting objectives were negotiated in this project.

6.1.2 Objectives: Educational vs. Decorations, Animals and Toys

To help prevent children's anxiety before a dental appointment, dental experts highlighted the importance of providing knowledge and explanations about dental treatments. By educating the children about what the treatment entails, they can develop a sense of familiarity with the dental environment and establish a sense of predictability and control. These factors are crucial in reducing fear of the unknown and creating a more reassuring experience for young patients.

On the other hand, the children engaged and incorporated numerous elements of decorations, animals, and toys into their stories. However, there is a potential challenge related to cognitive overload if children have to constantly switch their attention between different elements and fail to integrate them [21]. Consequently, including the numerous

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elements from the children's stories may conflict with educating them about dental treatments. It can result in a cognitive overload that impairs the children's comprehension of the dental narrative.

Examining previous participatory design projects, Bratteteig and Wagner [3] describe two approaches for handling diverse perspectives: taking sides with the primary users, typically the weaker party, or addressing conflicts by negotiating and balancing the perspectives [3]. In this project, one could argue that the designers took the side of the children, granting them more influence over the narrative's content and design through active participation in workshops, which the dental experts did not attend.

However, considering the prototyping process, it is important to recognize that only the designers were present. If the designers had exclusively favored the children's perspective as primary users during the prototyping phase, it would have deviated from the project's core objective of preventing dental anxiety in children. The "taking side" approach would have overlooked the crucial aspect of incorporating evidence-based measures for dental anxiety prevention provided by dental experts. The narrative would then rather contain much non-dental content and an incorrect story on how the children would conduct cavity treatments. Consequently, the primary goal during the prototyping process was to strike a balance between the perspectives of the children and the dental experts.

This challenge was addressed by still incorporating toys and decorations but more moderately to avoid overwhelming the narrative with a lot of elements and information. In the narrative, children were given choices such as selecting accessories and toys for their characters, choosing an animal or toy to bring to the dental appointment, and selecting a toy afterward.

The cavity treatment was necessary to enhance the learning experience within the narrative. However, striking a balance with the children's perspective of including even more decorations, animals, and toys posed a more significant challenge. It was balanced by making the dental instruments more similar to toys or animals. They got eyes, vibrant colors, and names or personalities. In this context, the metaphors and explanations provided by dental experts played an important role in transforming dental instruments into objects that resembled toys or animals.

6.1.3 Objectives: Control and Positive Associations vs. Surprise and Magic

The dental experts furthermore emphasized the importance of granting children a sense of control during dental appointments as a means to prevent the development of dental anxiety. Control involves fostering predictability and familiarity, where children feel in control because they know what will happen. In addition to providing opportunities for the children to make choices during the appointment. Moreover, the dental experts aimed to foster positive associations with the dentist while maintaining honesty about upcoming dental procedures.

Conversely, children incorporated unexpected and surprising elements into their stories that evoked laughter and increased engagement. Therefore, the challenge within the narrative was to maintain engagement by incorporating surprising elements while also considering the primary goal of the project and incorporating the evident measures the dental experts provided.

Again, one option was to take sides with the children's desires and include the surprising events they created, such as swapping heads between humans and animals. However, doing so would contradict the project's objective and teach children that adverse outcomes could occur during dental treatments. During the prototyping process, we thus aimed to balance the dental experts' emphasis on control and positive associations and the children's desire for unexpected and surprising elements in the narrative. We focused on creating unexpected events with positive outcomes rather than negative ones, aligning with both groups' perspectives.

One strategy we designed was to allow the user to make small decisions during the dental appointment, for instance, choosing the answer alternatives to respond to the dentist and when to initiate the cavity treatment. The small decisions attempted to empower the children and provide a sense of control. Additionally, we incorporated unexpected and fun answer alternatives in the responses to accommodate the children's desire for surprises within the narrative.

Furthermore, we introduced controlled and playful surprises with the dental instruments to engage the children. We encouraged interaction with dental instruments, allowing children to explore and control their own experiences. Simultaneously, we incorporated surprises, however, with positive outcomes. For instance, clicking on the "blue light"

unexpectedly transformed the dental office into a disco, offering a joyful and unexpected experience.

6.1.4 Was the Negotiation Successful?

Since the designers were responsible for balancing the perspectives of the stakeholders and users, the prototype's evaluation with both groups provided an opportunity to assess the effectiveness of the negotiation and balance achieved.

The findings from the evaluation with the dental experts revealed that they regarded the prototype as a valuable complement to existing strategies for preventing dental anxiety in children. They appreciated that the narrative maintained a realistic depiction of cavity treatment and dental instruments, which they believed would foster familiarity and authenticity. The experts also emphasized that this familiarity, combined with predictability prior to the treatment, would enhance children's sense of control and confidence during dental appointments. They praised the user's ability to choose what to explore, granting them control over the information they received. Additionally, they found the integration of dental and non-dental elements, such as toys, to be well-balanced, ensuring that the dental treatment remained prominent. Overall, the dental experts expressed satisfaction with the balance achieved in incorporating their perspectives.

In the children's prototype evaluation, they found the character creation and toy selection engaging, with many considering it their favorite part of the narrative. The design of dental instruments using colors and making them more toy-like and interactive contributed to the children's engagement as they interacted and communicated with the instruments. The intentional elements of surprise, unexpected answer alternatives, and outcomes when interacting with the dental instruments elicited laughter and received positive feedback from the children.

However, some children displayed signs of boredom and expressed a desire for more interaction or interactive elements. The boredom may indicate that their perspectives, which included incorporating decorations, animals, toys, magic, and surprises, were somewhat overshadowed or implemented to a lesser extent. Thus, the balance of perspectives is only partially successful.

Reflecting on how the perspectives have been balanced, conducting a collaborative session where children and dental experts negotiate their perspectives would empower the children in the balancing. Such a session would allow them to actively contribute ideas

on incorporating their desired elements while considering the constraints imposed by the dental experts to ensure the narrative remains a preventative tool. This approach would enable the children to play a more active role in shaping the narrative and creating a sense of alignment between their desires and the overall goal of preventing dental anxiety.

Nevertheless, the initial separation of the dental experts and children provided designers with a clear understanding of the perspectives and objectives of both the stakeholders and users without the influence of each other. Since the dental experts naturally hold more power as adults, the separation allowed the children to freely express their perspectives without the influence of the experts' viewpoints. This approach enabled the designers to identify the differing perspectives and understand where they diverged. Therefore, the decision to split the groups in the project's initial phase proved effective in identifying conflicting perspectives, which could be addressed and balanced in a potential future collaborative session with the stakeholders and users. As a result, the following recommendation is proposed:

Recommendation: Split the stakeholders and users in the initial phase to understand their perspectives and differences and engage in collaborative sessions to address and balance these conflicting perspectives.

6.2 RQ2: What do participants learn from participating in a design process?

The participation of diverse groups in a design process can yield various learning outcomes [4]. However, due to the separation of the groups, the opportunities for learning between them were limited. As a result of dental experts' lack of available time, the initial challenges in recruiting dental experts lead to the absence of collaborative workshop sessions involving both the dental experts and children. As mentioned, the responsibility of negotiating and balancing the diverse perspectives of the groups fell solely on the designers, further limiting mutual learning between the parties.

Despite limited stakeholder and user collaboration, participants exhibited learning outcomes by participating in the design process. Both the activities conducted with the designers and the collaborative sessions with the children fostered mutual learning. The subsequent sections will explore the specific learning outcomes observed among dental experts and children.

6.2.1 Children

Mutual learning between the designers and participants is another important aspect of participatory design [4]. The users can learn methods and be introduced to ways of expressing themselves and their creativity [4]. Through the workshops, some of the children exhibited to have learned from their participation. The workshops' findings revealed that the children engaged with the storytelling process, and some specifically associated their engagement with experiencing something novel and discovering new ways to express themselves. For instance, one child expressed surprise over their ability to tell a story effectively. Another child found it enjoyable to be part of a design process for an app, having previously only experienced app usage rather than involvement in the design process itself. Some children also showed curiosity about the app's further development and sought answers to how we would use their stories in the app development.

However, during the workshops, we also experienced some obstacles with getting the children to share their experiences and ideas and promote mutual learning among the children. First, there was a problem with including participants in the second round of workshops that did not participate in the first round. The children from the first workshop had already started a story and had a connection to it, making it difficult for new participants to be part of the decision-making.

However, throughout the workshops, we actively engaged in "reflection in action" and "reflection on action" as Schön empahtized[29] to address our challenges. By reflecting in action, we remained aware of our actions, made conscious choices, and adapted based on ongoing reflection and situation. The reflections we did in the workshops led to the measure of letting the new participants start their own stories and, additionally, resulting in smaller groups than the initial plan.

Furthermore, through reflection on action, we looked back on the workshops and identified areas for improvement. We noticed that smaller groups proved more effective, providing an environment where more children could contribute their ideas and be more active in decision-making. Simultaneously, we encountered the additional challenge of one facilitator falling ill during the last workshops, leading to more groups than facilitators. Consequently, we facilitated that the existing groups could work together in looser and smaller groups, typically 2 to 3 people, and we, facilitators, would go between them.

As a result, we continuously experienced that working in smaller groups made it easier for several children to speak up and have a stronger say in the decisions. As a result

of the children sharing more of their experiences and ideas, there was also a higher level of mutual learning between the participants.

Another area for improvement during the workshops was the varied descriptions of story elements, where children could not consistently articulate the purpose behind each element. Consequently, fully comprehending the children's perspectives posed a challenge for us as designers and other participating children.

Nevertheless, by actively involving the children in presenting their stories or specific parts of the story during their work, we found that many of them began contemplating the purpose of the elements or choosing to exclude them. This approach facilitated our understanding and provided valuable insights into the children's perspectives. Furthermore, we observed that encouraging them to present their ideas throughout the process prompted them to think more deeply about the stories they were creating rather than simply combining random elements. As a result, the children engaged in discussions, sharing their experiences, and exchanging ideas, fostering mutual learning.

During the workshops, the children actively shared personal experiences related to dental visits. Despite their limited knowledge of the technical aspects of dental procedures, we facilitators emphasized that learning about dental visits could help alleviate fear and anxiety. Therefore, we sought their collaboration in creating an engaging story with a character going to the dentist. Telling the children the dental experts' perspective that knowledge prevents anxiety resulted in several children drawing upon their own experiences and sharing stories about dental visits, particularly when making the character.

For instance, they discussed their feelings and nervousness before dental appointments, which directly impacted the characters they developed. They also shared their interests and hobbies, leading to characters that assembled themselves. In this way, the children gained insights into each other's perspectives and learned from each other's experiences and emotions.

6.2.2 Dental Experts

Due to the limited availability of dental experts, who often participated only during their lunch breaks, collaborative sessions with the children and among themselves were not feasible. The mutual learning within the stakeholder group was limited compared to the children. Consequently, the designers were the only ones they could learn directly from.

However, the participants already had much experience working, interacting, and explaining dental treatments to children. Recognizing their knowledge, we encouraged the dental experts to consider the children's perspectives and delve deeper into their interactions. We aimed to raise their awareness of how young patients behave and how their practices could better accommodate them. They demonstrated awareness by understanding the significance of simplifying explanations and using metaphors that resonate with children when discussing dental health.

Furthermore, during the prototype evaluation, the dental experts displayed an interest in the prototype's development and the input provided by the children. They directly sought feedback from the children and even compared the children's experiences and perceptions of dental fillings with what was shared during the sessions. This indirect learning about the children through the designers and their own experiences working with children showcased the dental experts' learning within the design process.

6.2.3   Summary

The knowledge exchange between children and dental experts during the design process was limited. However, both groups gained knowledge and insights through their participation. Despite limited collaboration, dental experts became more aware of children's perspectives and interactions with young patients, thanks to the guidance of the designers. They also expressed interest in the development of the prototype and appreciated the input from the children.

On the other hand, the children actively collaborated and experienced a higher level of mutual learning. They displayed engagement and acquired new skills in creative self-expression and storytelling. By sharing their personal experiences with dental visits, they learned from each other's perspectives and emotions.

Using smaller groups and encouraging children to share their ongoing stories while creating them proved effective in promoting mutual learning among the participating children. Based on this experience, the following recommendation emerges:

Recommendation: Encourage children to share their story ideas within small group settings during the ideation process to facilitate enhanced mutual learning.

6.3 RQ3: To what extent can the emerging design solution be considered a participatory result?

In this project, we took inspiration from a participatory design approach to involve users and stakeholders in the design process and incorporate their perspectives and ideas. However, there are different ways to achieve a participatory result [3]. Therefore, I will assess whether the design solution that emerged from this project can be considered participatory. Bratteteig and Wagner[3] conducted a study titled "What is a Participatory Design Result?" where they explored multiple aspects to consider in such evaluations. Following their evaluation framework, the subsequent section will assess and determine the degree to which it can be categorized as a participatory result.

6.3.1 Potential for Change

The first aspect highlighted by Bratteteig and Wagner [3] is how to assess the tool's potential for change, aiming to create a better tool for the users that improves, for example, quality of life [3]. The main objective of the tool in this project was to develop a digital interactive narrative that can help prevent children, as the primary users, from developing dental anxiety. Consequently, also improve children's quality of life. Additionally, it can also serve as help for dentists, as stakeholders, to be a tool they can reference before a child's dental appointment and during the appointment to explain the procedures. Therefore, the first aspect to consider is whether the tool contributes to these objectives.

The results from the evaluation with the dental experts found the prototype to be a tool they would think supplement to prevent dental anxiety in children. They highlighted that it was a tool they would like to have to refer to patients that would undergo a cavity treatment, which they could reference when explaining to children how the cavity treatment is conducted.

However, the primary focus should be on the children, who are the intended end-users of the narrative. Since the prototype is not a finished product and requires further testing to determine its effectiveness in preventing dental anxiety in children, the most suitable approach to evaluate its goal is examining the learning outcomes after the children have had the opportunity to test the tool. The prototype aims to provide information about cavity treatment and help children feel more familiar with and in control of the process. The evaluation found that the children primarily remembered the metaphors or dental instruments used in the cavity treatment. However, many children needed help articulat-

ing the dental instruments' deeper purpose. Thus, the digital interactive narrative only partially achieves its learning objectives.

Another crucial aspect of the digital interactive narrative's effectiveness in preventing dental anxiety is getting the children to want to use it by engaging and captivating children's interest. The children's feedback on the engagement in the prototype was varied. Adding decorations, animals, toys, magic, and other unexpected elements to the prototype, we captured the children's attention and received positive feedback. However, there were also instances where children found certain parts of the story to have too little interaction, too many steps, or excessive text, potentially leading to boredom.

Considering that dental experts view the prototype as a valuable supplement in combating dental anxiety and acknowledging that children have partially achieved their learning objectives while finding certain elements engaging, it can be concluded that the prototype has only partly fulfilled its intended objective. Nevertheless, it is important to recognize that the current iteration is only a prototype, not a final product. However, it can become a valuable tool for supplementing dental anxiety prevention in children. Additionally, it can serve as a narrative reference for dentists when explaining cavity treatments to young patients.

6.3.2 Participation

Another aspect of evaluating as a participatory result is to consider the users' participation in the process. A participatory result is only possible with users having contributed to creating choices [3][41].

In this process, the users have created stories for the digital interactive narrative. During the workshops, we faced some challenges with including the new participants and getting the children to describe the purpose of each element in their stories. Upon reviewing the outcome of the digital interactive narrative, it is evident that the valuable contributions from the children impacted the final result. Without their unique perspectives and ideas, the result would not have ended as it did. Their decisions regarding a realistic dental environment, characters, decorations, animals, toys, elements of magic and surprise, and development of plot and narrative were carefully considered and emphasized when prototyping the digital interactive narrative. Additionally, almost every child participating in the second round of workshops gave positive feedback and showed engagement in the workshop. Moreover, they had pride in the story they presented, suggesting the children were active participants in creating the stories.

However, the prototyping process only included the designers. We designers had the ultimate responsibility for selecting and implementing ideas. Therefore, they did not have any authority in the final decisions. Nevertheless, letting the children make the final decisions would be challenging. Even though participatory design empathizes with letting users participate without speaking the language of a designer [4], the final decisions require some insight and expertise the children do not have, similarly experience in the Sisom project[42]. For instance, in this project, the children included many pre-made cutouts. They struggled to articulate their purpose, suggesting that the children have some limitations in the role they can play by being fully designers and decision-makers.

The same challenge applies to the many decorations, animals, and toys the kids incorporated into their stories. Numerous elements that the children desired to incorporate in their narratives would likely lead to an overwhelming amount of elements at one time, not allowing the children to follow along on the story [21].

Furthermore, the children also had certain boundaries in the workshops. To reduce the time spent creating story elements, the children got pre-made cutouts they could use in their stories. However, they were allowed to draw as much as they wanted for the story. Still, most children did not draw and seemingly took most of the inspiration from the cutouts when making the stories. Using the cutouts had some positive aspects, as the children could quickly begin creating the storyline without them using most of the time drawing similar story elements. On the contrary, this probably limited the creative thinking and use of other elements than provided to them.

Additionally, the project had some frames, with the primary goal of being a preventative tool for developing dental anxiety. As discussed in RQ1 in the conflicting perspective, the digital interactive narrative was also grounded in the stakeholders' perspectives and the evident measures to prevent dental anxiety. This led to not all decisions in the children's stories being feasible, such as swapping heads between humans and animals.

Together, the boundaries for the project and the children not participating in the prototyping process lead to the final decision-making authority resting with the designers and the primary users only partially participating.

6.3.3 Recognize Contributions in Design Result

Another aspect Bratteteig and Wagner [3] examine when evaluating what a participatory result is, is by looking at if the users can recognize their contributions in the design result [3]. In evaluating the prototype, we asked the children if they recognized elements from their stories created in the workshops. The results found that, as the digital interactive narrative allowed the children to make several choices to adapt the story, almost every child recognized elements from their own stories. They could create the character to look like the ones they created and include some of the toys or decorations they used when choosing a toy to bring to the dental appointment and as a prize afterward.

Nonetheless, upon examining the evaluation results, it becomes evident that the children have only recognized certain aspects of the prototype. As mentioned earlier, the children were not involved in the prototyping process, which could be one of the reasons for this outcome. Additionally, the workshops primarily focused on developing the prototype's plot, content, and characters, while the designers predominantly determined the interactive elements with little input from the children. Not involving the children in the interactivity became apparent during the prototype evaluation, as the interactive aspects received the most constructive feedback from the children. Nearly every child commented that the prototype would have been more engaging if it had incorporated more interactivity, allowing them to drag the dental instruments instead of solely clicking on them.

6.3.4 Collaboration and Mutual Learning

Collaboration is also a significant part of the participatory design process [2][28], and the process also evaluates to what extent the result is participatory [3]. As reviewed in RQ2, the children participating in the design process shared personal experiences and learned from each other. The children and dental experts also demonstrated curiosity and learning from being part of the design process.

However, collaboration and mutual learning between the users and stakeholders of a participatory design process is one of the guiding principles of the process [28]. Since the collaboration to make ideas and share perspectives never took place, the mutual learning between the participants could have been improved. One can therefore conclude that this important part is not achieved in this project.

6.3.5 A Participatory Result?

To summarize, the prototype has the potential to be a tool that can complement the existing measures to prevent dental anxiety in children, even though the existing prototype still has some improvement to achieve complete success. Like Bratteteig and Wagner [3] mentioned, the optimal way to decide whether a tool is a participatory result is to evaluate its success also in use. However, as that is impossible, the resulting artifact from the process can be evaluated [3].

Further, the participants only participated in parts of the process and only recognized parts of the prototype. However, the collaboration and mutual learning between the users and stakeholders in the project could have been improved. In total, the emerging design is a participatory design to a limited extent. The prototype's limited participatory outcome was a result much a result of restricted collaboration among participants during the design process.

However, with the experience of having children participating in the design process, some lessons are learned for future projects. Particularly, children are engaged in creating stories but take in elements with various extensive descriptions. Together making it difficult for children to make the final decisions in the prototyping, leading to the recommendation:

Recommendation: The designers should be responsible for making final decisions on which ideas from children to implement.

6.4 Limitations

The findings, reflections, and discussion presented in the previous chapters should be interpreted with consideration of certain limitations. It is important to acknowledge that this study is a case study, and therefore its findings may not be easily generalized to other contexts or populations. The specific nature of the case being studied, including its unique circumstances and limited sample size, can limit the applicability of the results to broader settings.

The study focusing on a specific case also means that the insights obtained may have a restricted scope, potentially limiting the breadth and depth of understanding. Additionally, it is essential to recognize that methodological challenges experienced in other contexts or situations may not be fully captured in a single case study. These limitations should be considered when interpreting and applying the findings to other scenarios.

Chapter 7

Summary and Conclusion

This thesis explored the methodological challenges that can arise when attempting an approach inspired by participatory design to design a digital interactive narrative for preventing dental anxiety among children. In order to accomplish this, dental experts participated in semi-structured interviews bringing their valuable knowledge. During workshops, the children contributed ideas for the story. The designers negotiated and balanced the group's insight in a prototyping process. Both dental experts and kids evaluated the resulting prototype. Through participating and reflecting the author of this thesis has attempted to discuss challenges though the design process.

In this project, the perspectives of the users and stakeholders differed in terms of expertise, knowledge, objectives, and priorities for the narrative's content. The designers aimed to negotiate and balance these various perspectives and considered the approach a good starting point for mapping out the differing perspectives.

Furthermore, the participants, including the dental experts and children, showed interest in the project and gained knowledge about app development and design. The children also shared and learned from each other's personal experiences. However, there was a lack of mutual learning between the dental experts and the children. In the end, the emerging design solution is to a limited extend a participatory result.

In conclusion, the thesis addresses the main research question: What methodological challenges can arise when attempting a participatory approach to designing a digital narrative for reducing dental anxiety among children?

The limited collaboration is considered one of the main aspects missing for reaching higher success in balancing the different perspectives of dental experts and children, facilitating

mutual learning, and achieving a fully participatory result. However, collaboration became difficult due to time limitations for the project and challenges in recruiting dental experts who needed more availability to participate. As a result, the process only drew inspiration from a participatory design approach rather than yielding a fully participatory outcome. Bringing participants to a research project like this without having dedicated time within working hours has been one main challenge in making collaboration possible in this project.

Additionally, including children in the design process contributed to some difficulties in the design process. That children have various explanations for the elements they included in their stories was the main challenge leading to difficulties in bringing all their elements into the final decisions of the prototype. Furthermore, contributing to that understanding and balancing the children's perspectives with the dental experts' perspectives was challenging. Especially as neither the stakeholders nor users were directly involved in the collaboration, it was challenging to know where the balance between the perspectives should be.

However, both groups' perspectives and ideas were valuable for the process and result. Even though the challenges have led to the project not achieving a participatory design result, there are elements of the process that can contribute to knowledge for future projects, summarized in the following three recommendations:

- Split the stakeholders and users in the initial phase to understand their perspectives and differences and engage in collaborative sessions to address and balance these conflicting perspectives

- Encourage children to share their story ideas within small group settings during the ideation process to facilitate enhanced mutual learning

- The designers should be responsible for making final decisions on which ideas from children to implement

Finally, this thesis concludes that there have been practical challenges with available time to promote collaboration and methodological challenges with including children. However, the approach and the prototype could be a good starting point for future development, including collaboration and several iterations. Continuing the process with more collaboration and iterations could lead to a successful and participatory result where the stakeholders and users have learned from each other and balanced the different perspectives together.

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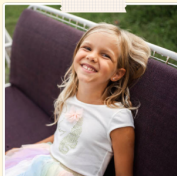
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Appendix A

Personas and Scenarios

Persona 1: Olivia

Interests

- Arts and crafts
- Playing with friends
- Playing tablet games on her own tablet

Influences

- Her older brother
- Friends
- Football coach

Goals

- Win the upcoming football match
- Be good at drawing
- Becoming as cool as her older brother
- Never get a cavity

GOALs

UX needs and expectations

- Simple language and a small amount of text
- A lot of colors and visuals
- Fun and engaging

Motivations

- Make her teammates good and have fun at football practice
- People thinking that she is tough
- Learn in a fun way

Pain points and frustrations

- Reading textbooks
- Complicated language
- Adults not taking her seriously and not answering her "why and what is" questions

Scenario 1

Olivia was told at her last dentist appointment that she had a pre-cavity.

She had heard from her brother that cavities and cavity treatments are painful. This made her a bit nervous for actually getting a cavity later.

Olivia also got curious on what cavities are, and asked her friends if they ever have had cavities and knew how to avoid them or how the dentist treats them. One of her friend had had a cavity in the past.

On their way home Olivias friend showed Olivia an storytelling app where Olivia could find out more about cavities.

Olivia downloaded the app when she came home. Olivia used the app to find more about cavities, how to avoid them, and how the dentist treats them.

She now understood that the treatment did not seem as scary as her brother told her, but that she still should avoid getting a cavity.

Persona 2: Sophie
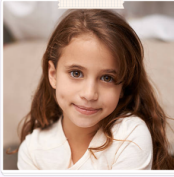
Sophie

"Sage"

- 8 years old
- Primary School
- Sydney

Bio

Sophie loves learning new things and has a passion for books. She loves exploring fictional characters and the universes they inhabit. She is an imaginative child who sometimes has a bit overactive mind causing her to create her own stories and fantasies. She loves sharing these stories and her interests with friends and family. She sets high goals for herself, and likes to prove both to herself, her familiy and friends that she is good at what she does. At the same time she likes being challenged and can easily become bored if it is not engaging enough.

Relation to dentist

Sophie has been going regularly to the dentist since she was two years old. Her parents have always encouraged her to brush her teeth and not eat too many sweets (although she has a sweet tooth and loves candy). Over the past years she has never had the need for any special treatments until recently when her dentist found a cavity in one of her teeth and thus must have her to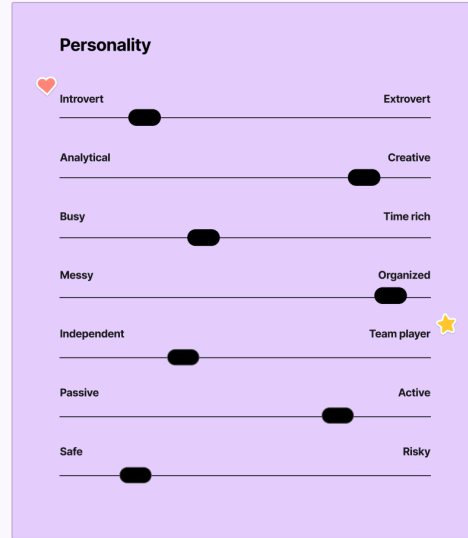oth drilled at her next appointment. This has made Sophie a bit anxious for her next visit at the dentist's as she has never had such a treatment. She does not know what to expect and does not feel in control of the situation.

Personality

Introvert	Extrovert
Analytical	Creative
Busy	Time rich
Messy	Organized
Independent	Team player
Passive	Active
Safe	Risky

Interests

- Reading books
- Watching YouTube on her mom's tablet
- Playing with dolls and roleplaying with her friends
- Dancing

Influences

- Parents
- Classmates
- Teacher

Goals

- Get a high score on the next english test at school
- Finish her favorite book series
- Receive cavity treatment without holding her mother's hand
- Not do anything wrong at the upcoming dance performance

UX needs and expectations

- Colorful
- Entertaining
- Engaging characters and language
- Allow for exploration, trial and error

Motivations

- Making her parents proud
- Explore the lives of fictional characters and their universe through books
- Share and discuss different topics/books she is passionate about with her friends

Pain points and frustrations

- Activities get boring if they are not challenging enough
- An unengaging book
- Not being able to make own decisions and not being in control

Scenario 2

At Sophie´s last dentist appointment the dentist found a cavity in her tooth. She is therefore scheduled for a cavity treatment in two weeks.

Sophie gets a bit nervous before the next appointment as she has never had such a treatment before. She does not know what to expect and does not feel in control over the situation.
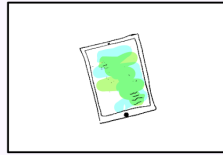
Sophie downloads the game as she want to learn and know more about what that will happen during her cavity treatment.
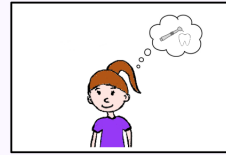
After using the app she feels that she knows more about the treatment and the instruments that the dentist will use during the appointment. She now feels a bit more in control and believes that the treatment will go well.

Persona 3: William

Basic information

William

"Jester"

- 9 years old
- Primary School
- Sydney

Bio

William is an active 9-year old. He loves using his body and according to his parents he never runs out of energy. He enjoys spending time outside with friends climbing trees and running around exploring the woods. He rarely stands still and there is always something happening. His current goal is to make a tree house with his friends from the hockey team he is on.

He is easily bored and can get quite impatient if things are going too slow. He is not particularly fond of school as he finds passive learning dull. He likes practical learning where he gets to interact with the learning material.

Relation to dentist

William has been going regularly to the dentist since he was four years old. His parents try to keep him still during dentist appointments which results in him not getting the necessary treatment he needs. His previous dentist didn't listen to William, and he is not looking forward to his next appointment because of this. Recently he broke off part of his tooth when falling down from a tree in the school yard. He needs to have part of his tooth replaced and is not looking forward to sitting still for so long.

Personality

Introvert		Extrovert
Analytical		Creative
Busy		Time rich
Messy		Organized
Independent		Team player
Passive		Active
Safe		Risky

Interests

Hockey

Being active and exploring outside with friends

Gaming online with friends

Add text

Influences

Friends

Hockey coach

His older cousin

Goals

Win the upcoming hockey match

Climb the highest tree in the school yard

Build a tree house for him and his friends

Fixing his crooked smile

UX needs and expectations

Gameplay elements

Interactive

Animations

Motivations

Impressing his friends

Get a tool box from his parents to build tree house

Making people around him laugh

Pain points and frustrations

Sitting still for longer periods of time

Gets bored easily at school

Passive learning

Being ignored when asking questions

Scenario 3

William struggles to sit still when he has to learn new material in a passive way. He thinks it is boring to hear his parents talk to him about the dentist and why dental hygiene is important.
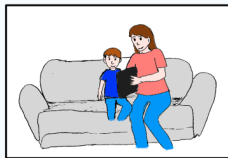
William's parents find an app that can teach him about the dentist and dental hygiene. They show it to him after school.
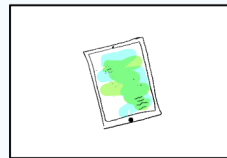
William loves using the iPad and gaming and spends the evening using the app.
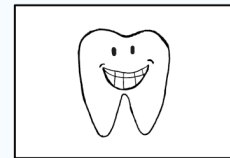
William has now learned about the dentist and dental hygiene in a fun way, and will remember to brush his teeth extra good tonight.

Persona 4: David

David

"Caregiver"

- 44 years old
- Pilot
- Sydney

Bio

David is a pilot, and father of three kids ages 7, 11, and 14. He shares the responsibility of his children with his wife, Lisa. When he is not working he enjoys spending time with his kids, working out and playing football.

It is important for David to lead a healthy lifestyle, which includes healthy eating and spending time outdoors. It is important to him that his kids take part in this lifestyle, and he is therefore rather strict with their dental health. But because of his busy schedule he does not always have time to follow up on the teeth brushing.

Relation to dentist

David goes to the dentist for yearly check-ups, and is always making sure his teeth are clean. He has had some cavities throughout the years and does not want to get any more.

He has attended most of his children's dentist appointments and always encourage them to take good care of their teeth.

Personality

Introvert		Extrovert
Analytical		Creative
Busy		Time rich
Messy		Organized
Independent		Team player
Passive		Active
Safe		Risky
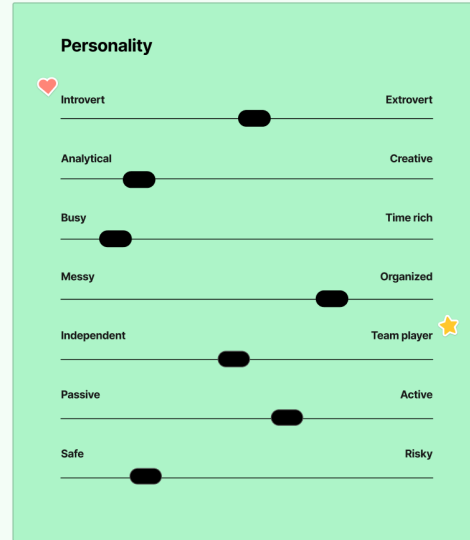
More about David

Interests

Airplanes
Working out
Spending quality time with his children
Add text

Influences

Colleagues
Friends
Wife

Goals

Gather the whole family for dinner everyday
Bringing his family with him on his next work flight
Make sure his children attend college
Add text

UX needs and expectations

Educational
Easy to follow
Available

Motivations

Seeing his children thrive
Being considered for a promotion at work
His children receiving positive feedback at the dentist

Pain points and frustrations

Difficulty to find balance for work and family
Not knowing enough on how to educate and motivate his children on dental health
Complicated

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Scenario 4

After David's youngest son's previous dental check-up two years ago, the son was not particularly happy afterwards. The dentist had done something sudden and unexpected that hurt. Therefore his son was not too pleased when he now had to go back for a check-up with the dentist.

David told his colleague about his son's feelings for the next dental checkup. Then a colleague told him about the storytelling dentist app. When David came home, he downloaded the app.

One week before his son's next check-up at the dentist, David wanted to prepare his son better to the appointment, so he knew what to expect. He sat down with his son after dinner and showed the app to him. They started using it together.

At the next check-up appointment David's son knew what instruments the dentist would use and how they would feel like. This made both David and his son more calm both before and during the check-up.

Persona 5: Rebecca

Rebecca

"Sage"

- 35 years old
- Dentist
- Sydney

Bio
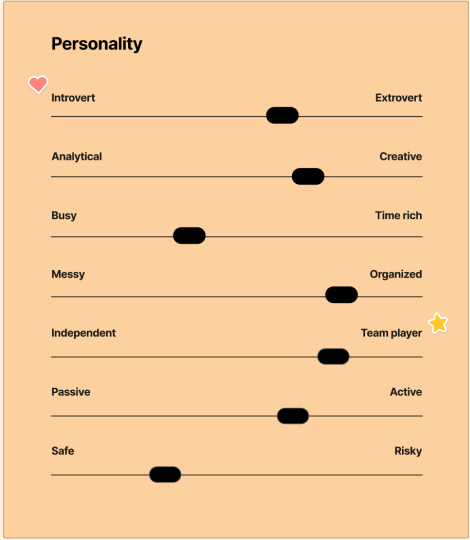
Sarah works as a dentist in Sydney and loves working with people. Throughout her work day she treats many children and loves introducing her tiny patients to healthy habits. She enjoys explaining what she is doing in simple terms and wants to make every appointment a fun experience and help her patients look forward their next appointment. She finds it very fulfilling to help nervous patients feel safe and overcome their dental anxieties. She finds it important to involve children in decisions about their dental health, and likes to involve them the same way she involves adults.

In her spare time she cultivates a healthy lifestyle and spends most of her time outdoors or in her local yoga studio.

Relation to dentist

Growing up with two parents who are dentists, Rebecca knew from an early age how important it is to take good care of one's teeth. As she later grew up to become a dentist herself, she now enjoys talking to her patients about the importance of brushing and flossing one's teeth from an early age. She believes that learning about preventative dental care is very important to avoid big treatments/interventions later. She always try to set aside time to explain why and answer any questions about dental care during her appointments.

Personality

Introvert		Extrovert
Analytical		Creative
Busy		Time rich
Messy		Organized
Independent		Team player
Passive		Active
Safe		Risky

125

Interests

Yoga

Hiking

Spending time with her friends

Add text

Influences

Friends

Co-workers

Her fiancé

Goals

Make every appointment a fun experience

Make her patients feel good about themselves after visiting

Go on a new hike

Master a new yoga position

UX needs and expectations

Informative

Familiarity: use aspects that children can recognize during their appointment

Explorative and playful

Motivations

Seeing her patients smile

Making nervous patients feel safe

Having children be happy to / look forward to come/ coming back to her later

Pain points and frustrations

Not having enough time/ resources to help/properly prepare/inform her patients

Parents telling scary stories from the dentist and not thinking about how it will impact their children

Not involving the children in decisions regarding their health / Seeing children be addressed to in an avoidant and childish way

Scenario 5

Rebecca discoved a cavity in a 8 year old patient's teeth. The patient has never had a cavity before, and Rebecca knows that many patients are nervous before such a treatment.

To prepare the patient to the next appointment she recommends the app to the patient and her parents.

When the patient comes back to do her cavity treatment, she has used the app and knows a little about the cavity treatment Rebecca will do.

Before and during the cavity treatment, Rebecca shows the patient the instruments that she will use and refer to the relevant elements in the story. The patient recognizes and tie the instruments and actions to the story she knows from the app.

The patient seems happy after the cavity treatment, and Rebecca is happy should could help another child and at the same time make it a fun experience.

Appendix B

Requirements and Learning Objectives

Requirements and Learning Objectives

Requirements

- The solution must present information suitable for children aged 6-10

- The solution must be engaging

- The solution must encourage an exploratory user experience

- The solution must encourage an exploratory user experience

- The solution must be available on tablet/PC

- The solution must provide information about relevant and common concepts encountered at the dentist

- The solution must contribute as a preventative measure to avoid dental anxiety

- The solution must provide the user the opportunity to customize their main character

Following is the user stories and requirements for the user stories. Red is high prioritization, yellow is medium prioritization and green is low prioritization.

Requirements

Prioritized version

1

Name: Cavity treatment and instruments
User Story: As a user, I want to go through a cavity treatment, so I can learn about the instruments and understand what happens
Requirement: The app must in a friendly manner show how a cavity is treated, what instruments are used, why they are used, how the instruments feel/sound, in what order they are used, and why the treatment is necessary. This must be shown through metaphors, visuals, sound and text
Priority: High

2

Name: Dentist
User Story: As a user, I want the dentist to be friendly and guide me through the appointment and explain concepts in a recognizable manner suitable for children
Requirement: The app must provide the user with understandable information and utilize metaphors, jokes, visuals, sounds, animations and
Priority: High

3

Name: Main character's emotions
User Story: As a user, I want the main character to go from nervous about the dentist to happy after, to convey that it can be a positive experience
Requirement: The app must present the main character with nervous emotions in the beginning, and gradually progress these to happy emotions through dialogues and positive reinforcements

Character show usual emotions related to the different situations
Priority: High

4

Name: Customize Character
User Story: As a user, I want to be able to customize the appearance of my character, to make my character relatable and personable
Requirement: The app must allow customization of name, gender, skin color, hair color, clothes and accessories
Priority: High

5

Name: Tooth fairy
User Story: As a user, I want the tooth fairy to be a narrator through the story, so that I am met with someone magical and recognizable
Requirement: The app must guide the user through the story and its choices. It must also have a common thread and provide funny remarks from start to end
Priority: Medium

1

Name: Learn stop signal
User Story: As a user, I want to learn the stop signal, so I can be in control during the treatment
Requirement: The app must allow the user to pause the story momentarily during the treatment, and give the user reassuring information about the treatment.
Priority: Medium

2

Name: Supporting characters with emotions
User Story: As a user, I want the story to include supporting characters in the waiting room showing other emotions children have before going to the dentist
Requirement: The app must give the user a overview over emotions children feel before going to the dentist, by letting the user interact with other child characters in the waiting room. The characters should show their emotions through facial expression and dialog.
Priority: Medium

3

Name: Brush teeth
User Story: As a user, I want to be able to brush the main character's teeth so they have a clean mouth during the treatment
Requirement: The app must inform the user about the importance of brushing one's teeth
Priority: Medium

4

Name: Choose Companion
User Story: As a user, I want to be able to choose a companion to bring to the dentist, to be a comfort for the character
Requirement: The app must allow the user to choose an animal, a toy, or an object that will follow the character through the story.
Priority: Medium

5

Name: Companion
User Story: As a user, I want my companion to react to my choices, and be a conversation partner when needed.
Requirement: The app must give positive feedback during the story.
Priority: Medium

7

Name: Objects in waiting room
User Story: As a user, I want the story to include objects to interact with in the waiting room, so I can make my own choices in the story and to be able to explore in story
Requirement: The app must provide different objects in the waiting room for the user to interact with. The objects should provide useful dental information, funny jokes or minigames.
Priority: Medium

1
Name: Reward after treatment
User Story: As a user, I want an achievement or an award after the cavity treatment, as a positive reinforcement.
Requirement: The app must display the tooth fairy at the of end of the story, presenting the achievement shelf. (and her fairy dust in the story)
Priority: Low

2
Name: Accessories, impact on story
User Story: As a user, I want my accessories to have an impact on the story, to get a more personalized experience.
Requirement: The app must display different backgrounds and surroundings, and change the character dialogues, depending on the chosen accessory.
Priority: Low

3
Name: Parent
User Story: As a user, I want to be able to bring the main character's parent(s) to the dentist office, to make the story more realistic.
Requirement: The app must have at least one grown-up character that enters the dentist office with the child.
Priority: Low

4
Name: Brush teeth
User Story: As a user, I want to choose if I want to brush my teeth or not
Requirement: The app must be a tooth brush to click on to brush my teeth
Priority: Low

5
Name: Tooth paste flavor
User Story: As a user, I want to choose which flavor of the tooth paste to use
Requirement: The app must
Priority: Low

6
Name: Drink soda
User Story: As a user, I want to choose if I can drink soda
Requirement: The app must have soda in the waiting room that the user can choose to drink from and learn why sugar is bad for you teeth (?)
Priority: Low

7
Name: Color of bib and glasses
User Story: As a user, I want to choose the color of the bib and glasses
Requirement: The app must
Priority: Low

Learning Objectives

- Children should learn about the elements of the dentist office through a digital reconstruction of it.

- Children should learn about the different instruments used during a cavity treatment, and understand the role of each of them.

- Children should learn that they are in control of the dental treatment through the usage of a stop signal.

- Children should be taught the importance of brushing their teeth, and the consequences of neglecting oral hygiene.

- Children should be able to express thoughts and feelings regarding the dentist with other virtual children/characters, and learn that being nervous is normal.

Appendix C

Semi-Structured Interview Guide for Dental Experts

Semi-structured interview with experts

Introduction
- Introduce ourselves and ask the interviewee to introduce themself
- Briefly present what the conversation is about
  - We are concerned with their interaction with children,
- Brief presentation of our task and preliminary concept
  - Children
  - Safe children going to the dentist, Prevent dental treatment anxiety
  - Digital interactive narrative

Information about the interviewee (remember that the person must sign a consent form).
- Position and possible specialization
- How long experience in position
- Email
- Phone no.

How much experience do they have with general treatment of children?
- Certifications or experiences gained during the career (specific to the interviewee)?
- Interact differently with children compared to adults? How?
- What do they do to make children feel safe in the chair? (behavior, giving toys, etc.)
- Measures they usually recommend outside the dentist's office, which you can do prior to an appointment?

To what extent have they treated children with dental anxiety?
- Do they interact differently with these children? How?
- If the same measures that are used on children with dental anxiety are used on children without - do they also work preventively?

What makes children afraid?
- Objects/tools, treatment, process (specific parts?, waiting room?)
- Behavior and age of children 131

- How do children/children with anxiety experience different treatments and objects (such as chairs and tools).
  - What objects/instruments are children most afraid of?
  - When one starts developing cavities? If you have to extract a tooth? Do a little more than a regular dental health check?

- - Does the dentist notice that the child has dental anxiety, or is it usually the parents or the child who inform about this?
    - How does the child behave?
    - Is the child scared during the entire process (e.g. from the waiting room until they are out of the dentist's office or only during certain parts)
  - At what age do you notice that children start to show signs of dental anxiety?
    - Aren't children scared until they are 8-12 years old (bearing in mind that this is the age group for TkMidt)?
  - (What differentiates children with dental anxiety from children who just find it uncomfortable?)

Demonstration of the measures they take/what is a normal dental appointment like?

Explain our concept, and hear what they think about it.
- Is this something they think can be preventive for dental fear or nervousness before a dental appointment?
- Is it possible to implement some of your methods/measures in our solution?
- Do they have any specific ideas (things/concepts/treatments/tools) that should have been included in such a narrative, which could have a preventive effect?
- Could this concept help in other ways than just preventing dental anxiety?
- Any other ideas/thoughts?

If time: How does the dental system work in Australia? In short.
- How often do children visit the dentist?
- When do children start going to the dentist?
- Do they get any information before they have a dental appointment?
- What differentiates a pediatric dentist from a regular dentist in terms of knowledge about children and dental anxiety?
- Are there big differences between private and public/school dentists? Both in general and in relation to children and dental anxiety.
- Do they offer any special treatment for children with dental anxiety in Australia (eg something a la tbit)?

Appendix D

Workshops Guide

Plan for workshops

Dates: week 6 and 7

Objectives

- Identify how insights from the workshops can be transferred to a digital interactive narrative

- Gain insight into story concepts / plot ideas that can be further developed and used in a digital interactive narrative
    - Identify the main ideas of the narrative structure
    - Identify the narrative's underlying themes and message
    - Gain insight into which story elements the children choose to include in their narrative and how they are put to use.
    - Identify how the story elements contribute to narrative progression
    - Gain insight into what the children think would make the story an interesting one.

- Gain insight into children's preferences in characters and potential supporting characters

- Gain an understanding of children's feelings and thoughts associated with dentistry

- Gain insight into children's existing knowledge about dentistry and oral health

Participants per workshop

6-8 participants. Groups of 3-4 people.

Equipment/Resources

- Character template
- Storyboard template
- A4 paper, get from the school
- Pencils, get from the school
- Glue/tape, get from the school
- Scissor, get from the school

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Things we have to bring:
- Character template
- Cut outs

Spørsmål til lærer før workshopen:
- Går barna i samme klasse? hvilket klassetrinn?
- Få tak i utstyr (ark, fargeblyanter)
- Om noen har sagt nei til opptak
- Elever med spesielle behov?

Structure

Tid	Workshop = 55 min	
Intro		
10 min	Oss: -Navn, hvorfor vi er her, hvor vi kommer fra, reist halve jorden -Våre fritidsinteresser -Rollene våre under workshopen Barna: -Navnerunde på barna -Deres fritidsinteresser -Alder Dele ut navnelapper til barna, som de selv kan skrive og fest på seg selv.	Us: - Name, (**SV**:) from Norway, students, working on a project where we need your help to create a story for an app for children your age and thus we need your help etc. Our roles. **K**: We would love to hear more about you guys. tell us a bit about yourselves (name, age, interests) We can start by telling you about our interests! → we tell them about our interests → their turn: The children: - Names - Age - Interests and hobbies Q&A: Have any of you been to the dentist? (Yes) Good! Because we are going to create an app that is a mix of a game and a digital story about going to the dentist. The goal for the app is to teach children about the dentist, and help prevent children from being nervous before going there. That is why we need expert help from you guys and we would really love to hear what you have to say about this. Q: What do you think about when you

		hear the work dentist? The plan for today is creating characters and their story at the dentist (this is a change made after first workshop)
Hoveddel		
10 min	Samarbeid: Tenk deg at du skal til tannlegen og kan se ut akkurat slik du vil og ha akkurat de kreftene og egenskapene du vil? Lag den karakteren. Får utdelt karakter templates de kan bruke. (Vise eks. templates av oss selv hvis de sliter). (Ikke felles gjennomgang av karakterer).	Work individually : Imagine that you are going to the dentist. You can look exactly how you want to and you can have any powers or abilities. Make that character. If your character wants something of someone with them to the dentist you can draw that too. Ask the children while they are drawing what and why they are drawing it. What does the character feel about going to the dentist? etc.
15 min	Samarbeid: Tenk deg at du skal følge historien til denne karakteren som skal til tannlegen. Vi har starten og slutten på historien, men trenger deres hjelp til å lage hva som skal skje i mellom. Her må dere fortsette å bruke kreativiteten og fantasien deres for å lage en morsom og spennende historie. Bruk gjerne også egne erfaringer, morsomme elementer fra spill eller andre apper dere liker, som dere for eksempel har brukt hjemme eller på skolen. Vi vil gjerne at dere skal fokusere på å være kreative når det kommer til fortellingen, og det kan skje noe morsomt og/eller uventet. I tillegg kan dere lage eller velge flere karakterer, og vi vil at dere har fokus på følelsene til karakterene og dialogene mellom karakterene. Klipp ut karakteren deres, og bruk det dere ønsker (av nye tegninger og utklipp) til å fortelle historien deres.	Cont. Work in groups: Story. Imagine your character has a cavity in one of their teeth and needs to go to the dentist to fix it. We have created a beginning and an end to a story, but we need your help to create the rest of it. Be creative and make a fun story you would like to follow in an app. (show the storyboard) We will give you some paper cutouts of people and objects that you might use to tell your story. Say this while the are doing the task: Continue using your creativity and imagination to create a fun and exciting story. Feel free to also use your own experiences. You could also use some fun elements from games or other apps you like. Maybe apps you have used at home or at school, for example.

	Forhåndsbestemte deler av historien: - Starten på historien: Får melding/brev med beskjed om at de skal fikse et hull (fix a cavity). - Blank rute - Går inn på venterommet - X antall blanke ruter - Slutten på historien: går ut fra tannlegekontoret Får utdelt storyboard templates de kan bruke. En del er et helt A4-ark. La hver gruppe få hver sin del av rommet, der de kan sitte hvor de vil. Gi ut utklipp til hver gruppe. Legge utklippene litt på utsiden av barna. Utklippene ligger spredt og noe sortert.	We would like you to focus on being creative when it comes to the narrative/story. Something funny and/or unexpected may happen. We don't know, you decide. In addition, you can create or choose several characters from the cut outs we will hand out to you. When creating your stories we want you to focus on the feelings of the characters and the dialogues between the characters. Cut out your character and use what you want (of new drawings and cutouts) to tell your story. ***SV will let us know when there is only 3 minutes left on the exercise.*** *Tell each group they may sit and work wherever they want to. Make sure they are separated.* *Predetermined parts of the story:* *- The start of the story: Receives a letter telling them to fix a cavity.* *- Blank route ("what do you feel")* *- Goes into the waiting room* *- X number of blank squares* *- The end of the story: leaves the dentist's office* *They are given storyboard templates that they can use. One part is an entire A4 sheet. Let each group have their own part of the room, where they can sit wherever they want.* *Give out clippings to each group. Place the cutouts slightly on the outside of the children. The clippings are scattered and somewhat sorted.*	
5 min	Vi tar opptak av historiene deres, ev. lydopptak. Hvis ikke de har huket av på at opptak er ok, må det bare huskes og noteres kjapt ned etterpå + ta bilder av historien.	**In each group:** Ok, time's up! Now I would love to see what you have come up with. **** video recording in each group***	

	ALLE ark skal samles inn på slutten.	* *We record their stories, possibly sound recording. If they haven't ticked off that recording is ok, it just has to be remembered and written down immediately afterwards + take pictures of the story.* *ALL sheets must be collected at the end.*
Outro		
5 min	Få alle til å vise følelser gjennom å vise tommel opp/ned eller til siden: - Hvor fornøyd er du med workshopen? Deretter stille spørsmål, hvor barna kan utdype: Er det noen som har lyst til å utdype det? Føler du at du har fått bidratt til historien/karakteren? Hvordan synes de det var å være med? Hva har de fått ut av det? Hvordan var de ulike aktivitetene? Hva var mest gøy? Har de lært noe om design/app eller tannleger? Sett på video/lydopptak igjen. Lov til å peke ut barn her, interessant å vite hva de mer stille barna også tenker/føler. Takke for at de ble med.	** video recording in each group** *Get everyone to show their feelings by showing thumbs up/down or to the side*: - How satisfied are you with the workshops? *Then ask questions, where the children can elaborate:* Does anyone care to elaborate on that? Do you feel that you have contributed to the story/character? What did they think it was like to participate? What did they get out of it? How were the various activities? What was the most fun? Have they learned anything about design/app or dentists? *Turn on video/audio recording again. Here you can pick out children to speak, interesting to know what the more quiet children also think/feel.* *Thanks for joining*

Changes we want to make after first workshop:
- Add more of the same characters with different facial expressions to better understand the feelings of the characters.
- Added waiting room with chairs and dentist office with chair etc.
- Made some cutouts a bit bigger

Appendix E

Evaluation Children Script

Evaluation Children

Objectives:

What do the children learn/remember after using the app?

Do the children find the digital interactive narrative fun/interesting/boring?

To what extent do they feel they have influenced the final design?

Observe their body language. Look for smiles, laughter, leaning towards the screen. Take note of the number of questions they ask.

Introduction
We have created this app based on what you taught us the last time we were here, in addition to things we have learned from dentists. It is meant to be a digital story where you can explore a dental office and learn how to fix a cavity at the dentist.

We call this a test, but I'm not testing you at all. We're asking you to help us test our application. You are the experts on being kids, and we want you to teach us how kids use applications and what you think about them. We need to see what's fun, too easy or what's too hard for children your age so we can fix it and make it better. We'll ask you to figure out things on your own most of the time, but we're here if you get stuck.

There ARE some issues we need you to find out, that's why you are testing it!

Questions to ask while going through the application:

What did you like *about this*? What did you not like?

Maybe we need better language here, what do you think is best for kids like you to understand this?

Questions to ask after going through the application:

Education

If I were to go to the dentist to fix a cavity for the first time. What would you tell me about a cavity treatment?

Can you retell what you remember from the story?

What type of dental instruments do you remember? Do you remember their name? Do you remember what they are used for?

Why is it important to fix cavities?

Influence on design/application

Do you recognize some parts/elements from the story you made the last time we were here?
> What do you recognize?
> Is there something that you are really missing?
> Something you recognize a lot?

Engaging

Would you recommend this app to a friend or a sibling?

Do you think your friends would have liked to play through the app?

Would you like to play this in the future/some other time/ before going to the dentist?

Did you like that you could click on different parts of the application, was there too much to click on? Is there something you expected or wished would have happened?
- Was it easy or difficult to understand what was clickable?

What do you think of the story, if you could change anything about the story, what would you have done?

We haven't finished all the stories, are you particularly interested in learning about any of the others?

Do you recognize things from one of your own dentist appointments? Any tools or rooms?