Helping Children Becoming Digital Creators Through Design

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Abstract

In 2022, acting in the digital world has become a large part of children's culture in the west. There are plenty of big companies that approach children as customers and consumers by producing digital entertainment content to tie them to their brands. There is nothing wrong with a moderate level of consumption, but it should not be the only activity that children are engaged in. To give children alternatives to consumption I have done research and design for children's digital maker's culture. My focus was on digital game making and engaging the children in that process through them drawing. I developed a digital game making workshop and two products for workshops called the Analog Game Engine and Draw Your Avatar. During my workshops and play-testings, children got to see their crafting process as a digital end result. This experience has shown to be empowering to the children I worked with and goes along with the deeper message that I wanted to communicate to children as digital citizens, the message that anyone can be a digital maker and shape internet culture through digital art.

Artwork: A digital maker brain

Introduction

“You can run but you can’t hide from the digital age. It is here to stay!“ writes Jodi Gold in her parenting-guide book, (Gold, 2014, p.11). Little of that statement has changed since then, in fact, it is even more relevant.

The ongoing Corona pandemic has accelerated the digitisation process in all areas of both the parents' and their children’s lives. According to Jodi Gold, we live in a world where almost everybody has double citizenship, one from the country they were born in and one from a digital global society that resides in cyberspace.

According to a Swedish study from 2017 (Davidsson & Thoresson, 2017), by the age of 7, a third of all children in Sweden own their first phone, by the age of 8 it is over 40% and by the age of 9, it is over 70%. It can be assumed that these numbers are higher today and that internet culture has become an even more significant part of child culture.

Many social media platforms that are central meeting points for digital citizens, such as Facebook, Instagram, Youtube and TikTok, are based on capitalistic principles. As described by former employees in the heavily discussed Netflix documentary “The social dilemma“ (Orlowski, 2020), Google and Facebook are designed to be addictive and manipulative to keep their users in a consuming state. This approach comes at a high price for all societies. Fake news, filter bubbles and targeted advertising are supported and sometimes preferred by algorithms running on these platforms.

In order to give addictive, algorithm-chosen, one-sided content that distracts and manipulates people less attention it is important to engage people in heterogeneous communities with discussions, exchange and the making of a more diverse digital culture.

I have found such communities through my practice as a digital designer, where I have experienced diversity, support, encouragement, inspiration and exchange of ideas. The maker communities around me have made me a technology enthusiast who loves to experiment and create with all kinds of digital tools.

As a child-culture designer, I want to pass on my own experience as a digital maker to children and help them with their journey of becoming and being responsible, happy and healthy digital citizens. Through research and my design practise I want to explore how digital making currently is integrated into child culture and how it could be in the future.

Digital and Analog

In this report I will use the words “digital“ and “analog“ to describe both the theoretical aspects as well as my design practice for this project. Since there is confusion around these two words in daily language, I will provide a short definition.

Peter Kinget, a Professor of Electronic Engineering at Columbia University, defines the word “analog“ in the following way: “The world we live in is analog. We are analog. Any inputs we can perceive are analog. For example, sounds are analog signals; they are continuous time and continuous value. Our ears listen to analog signals and we speak with analog signals. Images, pictures, and video are all analog at the source and our eyes are analog sensors.“ (Kinget, 2014).

Peter Kinget explains what the word digital means by using the computer as an example. Computers use a binary system containing ones and zeros to process and store data. Nevertheless, computers are also capable of producing and receiving analog data. To communicate with human users, and sometimes even other computers, computers need to translate their digital data onto an analog interface such as a screen or speaker that the human sensory organs can perceive (Kinget, 2014).

Designing for Digital Citizens

Designing for children as digital citizens comes with its challenges and requirements. During my initial research phase, I defined 4 goals that every digital citizen needs to work on to be an included, responsible and happy part of the digital society. In the following I will explain each of my goals closer and why I believe that it is important to children. I want to support children in reaching all of these goals, but especially the first one, through design.

Artwork: Turning dreams into goals

1: Learning how to be a digital creator

In the book “Transformationsdesign - Wege in eine zukunftsfähige Moderne“ (Sommer & Welzer, 2017, p.15) Harald Welzer and Bernd Sommer describe how design and culture need to fundamentally change from a capitalistic approach to a more sustainable and less consumption-oriented approach to keep earth and the societies living on it healthy. I believe that there is a lot to learn from digital open source communities that can transform the capitalistic mindsets of western societies. The values of sharing, teamwork, curiosity and work appreciation that I have found in open source communities on the internet are what I wanted to encourage through my design project.

To give children an alternative to consuming in a mainly capitalistic online environment, my primary goal for this thesis is to help children become digital creators.

Being creators is a part of what makes us humans. I believe that the capacity to imagine and dream as well as to solve problems both alone and collectively is crucial for all democratic and sustainable societies, both analog and digital.

2: Learning digital literacy

I have watched my 76-year-old aunt discover the digital world in the last 5 years. I taught her how to use a computer mouse, how to make a What’s App call and how to find a train connection in the “Deutsche Bahn App". This is just one example from my personal experience that proves the fact that digital literacy is nothing that humans were born with.

Even before, but especially during, the Corona pandemic it became more difficult to navigate through the physical world without also having to navigate through the digital world. These two worlds are merging and will continue to do so. To give both children and adults a chance to participate in modern societies you need to teach them digital literacy, which includes

skills to navigate through the digital world. Donell J. Holloway uses the term “Digitods“ to describe the current generation of children in his article “Digitods: Toddlers, Touch Screens and Australian Family Life“ (Holloway et al., 2015). According to Holloway “Digitods“ are the generation that was born after the 2007 release of the first iPhone and thus the touchscreen revolution. This generation has had the chance to learn digital literacy through play and exploration during early childhood if they had access to age-appropriate digital technology and child-minded design.

I want to introduce more digital tools to children, through my design practice, to enlarge their way of self-expression in digital environments. Learning digital literacy is crucial for becoming a digital maker and therefore my second goal.

3: Learning how to protect your own and others’ well-being

Many parents that I talked to said that they were concerned about their children’s development and well-being when using digital devices. Sara, the mother of two girls, 11 and 14 years old, told me that she is worried that without supervision her children would replace outdoor activities, sports and handcrafting with sitting in front of their phones or computers.

My friend Lea, the mother of a 6-year-old, told me that her son is already too interested in her phone and that she would prefer him to have more “real world“ experiences.

Jodi Gold is describing a similar experience with parents coming to her for parental advice in her book “screen-smart parenting“ (Gold, 2014). She brings up the importance of developing what she calls a “healthy digital diet“, which is learned through real-life examples from parents and other role models.

As described by the authors of “Digital Childhoods - Technologies and Children’s Everyday Lives“ (Davidson et al., 2018) technology itself is neither just good nor just bad for children - it depends. To judge how technology affects children’s development and well-being, the amount of time and the activities related to individual children’s usage of technology needs to be analysed.

Cyberbullying, oversharing, negative body image through social media and internet porn as well as addiction to video games are just some of the dangers that can affect children's well-being in the digital world. However, the authors of “Digital Childhoods“ are saying that the development and learning of children can be supported by technology, especially when used interactively and collaboratively (Davidson et al., 2018).

Protecting health and wellbeing always have to be considered when designing for children. In this context, I have purposely kept a broad definition of the term ”health” to include both physical and mental health as well as the child’s health and the health of those around it. I want to engage in forming empowering online communities for children and therefore need to prioritise their safety and wellbeing.

4: Lifelong Learning

Most children have the privilege to learn their country's language, culture and social codes at school or at home where they have contact with older members of their culture that can guide them. Learning the same about the digital society is a bit more challenging, partly because it is continuously and rapidly changing. Children, parents and pedagogues are all, at the same time, trying to learn to navigate in an ever-changing digital environment. This is why it is hard to educate in digital citizenship conservatively with course books or standardised tests because they quickly get outdated.

Education in digital citizenship has to be flexible so that it can adapt to its fast-changing environment. Because that type of education has to be flexible it cannot focus only on knowledge, but must also include the teaching of adaptive skills. In her book "Equipped for the Future Content Standards What Adults Need to Know and Be Able to Do in the 21st Century" S.G. Stein describes 4 skills that are necessary to have to keep learning through all phases of life (Stein, 2000, p.26). These skills are the ability to …

- … reflect and evaluate
- … learn through research
- … use information and communication technology
- … take responsibility for learning

I believe these skills are central for all digital citizens. Solving problems, learning new software and technology and researching questions all play a big part in being a digital maker. This is the reason why digital making helps practise lifelong learning and this is what I want to pass on to children with my 4th goal.

Design questions

Based on the 4 goals I defined for digital citizenship education I formulated two design questions that I wanted to answer in my final design project.

The primary question that was leading my design process was:

- How can children be creators in and for a digital environment and how can I, through design, help children to do so?

Parallel to this question I wanted to explore a secondary design question which was:

- How can children be a part of a creative digital community and share their creations with others?

Both questions were targeted to reach my primary goal, which was to help children become digital creators. All of my 4 goals are interconnected. Children can only become digital creators if they learn digital literacy, are healthy, safe and have good learning strategies.

Finding partners in the field

I started looking for partners in the field of digital products for children. I had a meeting with Lindsay Bal4 who works with Strawbees' "Digital Classroom". Lindsay and I discussed my topic and Lindsay gave me some good input regarding design inspiration. I analysed the art installation Future Park (teamLab, n.d.) that she recommended to me, see Appendix B, and it turned out to be an inspiring project for my design.

During this Master's project, I also worked as an intern for the company Albert. Albert provides a digital learning platform for children that teaches school subjects like maths, English, Swedish and geography, playfully and interactively. They were interested in supporting my research during my internship by giving me access to their design material and research. During my internship at Albert, I developed my first design project for this thesis called "The Analog Game Engine".

The Analog Game Engine

> *"Someone once suggested to me that kids should only be allowed to use computers in school that they have built themselves. It's a brilliant idea that is very doable from the point of view of the students' capabilities. But who could teach it?"* - Marc Prensky (Prensky, 2001, p.4)

In his article "Digital Natives, Digital Immigrants", Prensky claimed that the full potential of technology can only be reached if the younger generation shapes the development process (Prensky, 2001, p.4). He says that children and young adults are natives when it comes to the latest technology and therefore have a deeper understanding of internet culture and digital tools.

Prensky's article inspired me to further investigate the possibilities of digital tool-making.

One product that got recommended to me by different Albert employees regarding DIY computer building with children was the Nintendo Labo series (*Nintendo Labo*, n.d.).

I managed to get a hold of one of the sets in the series even though it was out of stock in most stores in Sweden. 7-year-old Silas and 9-year-old Levis, two experts in the game console Nintendo Switch, were excited about testing Nintendo Labo together with me, see Figure 1.

Figure 1: Building and playing with Nintendo Labo set

Each Nintendo “Labo" product contains multiple cardboard pieces that you can assemble to a tool that later on can be used in digital video games. Each set takes around two hours to build. The two boys were engaged in the building and had good spatial understanding when it came to understanding the 3D-video instructions. I noticed that the Nintendo Labo assembling process was unforgiving when it came to making mistakes and overall non-creative. At the end of our session, they told me that they preferred using the assembled products more than doing the assembling because it took too much time.

What I took from this Nintendo Labo playtest was that cardboard is a great material to craft together with children.

Prototyping

I researched about people building their own computers and found a variety of different DIY cardboard computers. These cardboard computers fascinated me because they created an imaginary digital world that anyone could build. I wanted to build my own DIY cardboard computer and started to experiment. I used cardboard, paper, rubber bands, toilet paper rolls and plastic foil for my experiments. After spending a lot of time cutting out cardboard pieces by hand I started to design my DIY computers in illustrator and cut them out with a laser cutter instead, see Figures 2 and 3.

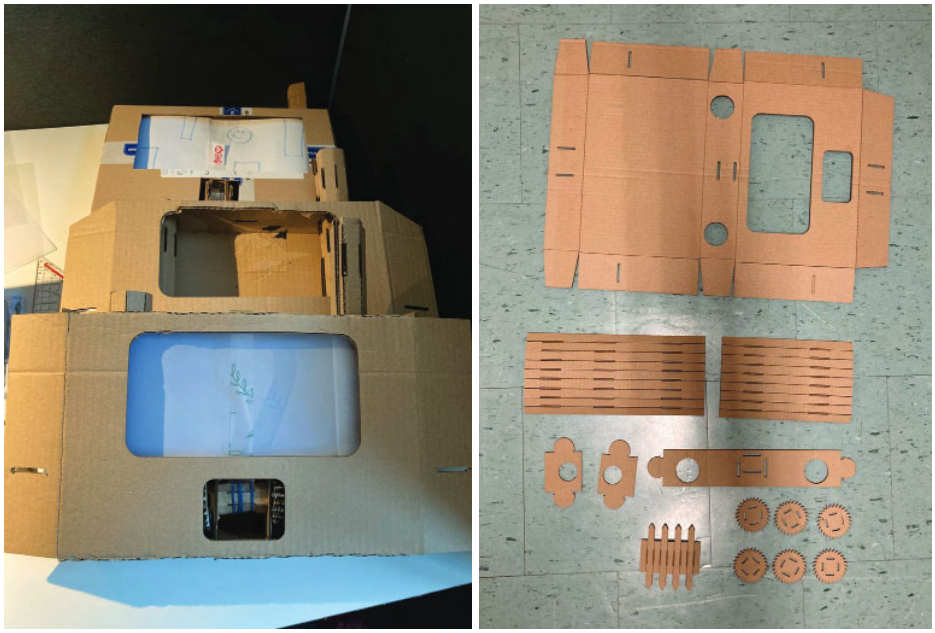

Figure 2: My DIY cardboard computer experiments

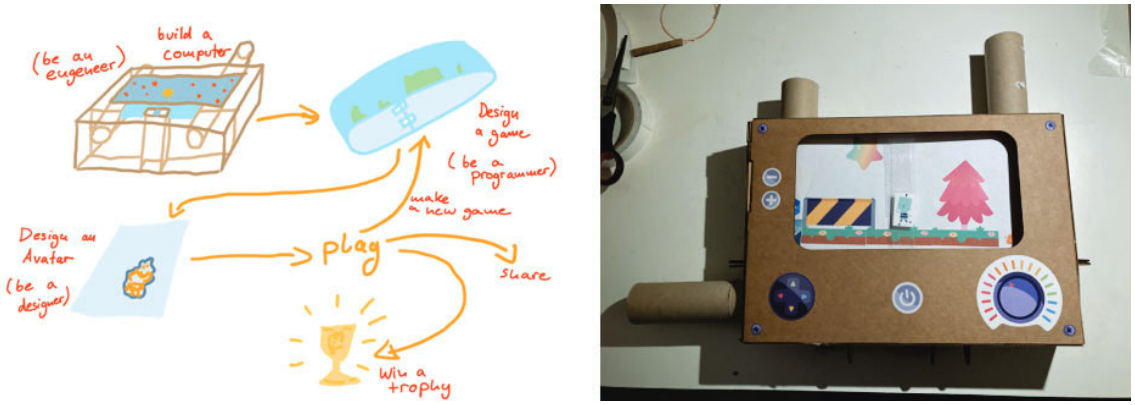

Figure 3: DIY Gaming Computer instructions and my final DIY cardboard gaming computer

My cardboard computers were made for playing self-designed video games. It was fun building them and I improved the construction each time I made a new model. I also showed my final model of this series to three children that were impressed by its functionalities. These computers had one major downside, and that was that the games that could be played on them were very short and got boring quite fast. The project was fun to build for me but quite difficult to build for children, and since the games had low replayability I decided to change my focus towards the gameplay design.

I simplified the building process to give me, and the potential users of this product, more creative freedom in terms of gameplay design - and so the idea of the Analog Game Engine was born, see Figure 4. Together with the company Albert, I decided to make an analog game crafting tool for children between 4 to 6 years old.

Figure 4: First prototype of the Analog Game Engine

I designed my next model more iPad looking to create a connection to the digital world that children in Sweden are familiar with and to encourage imaginary digital play. I also added some pre-designed game background templates and stickers of common video game objects from the Albert games to this tool.

The final tool/toy incorporates three different activities, see Figure 5. The first activity is that children can decorate a long sheet of paper with different game objects and the background of their game. This game background can then be pulled through the paper iPad.

In a second step, an avatar can be drawn and decorated with assessors-stickers onto a strip of paper. This paper strip can be pulled and pushed into the long side of the paper iPad to create the illusion that the avatar is walking in front of the slowly pulled through background.

In the third step, children can play their game with the help of another person pulling the game background while the children are moving the avatar-paper strip up and down.

Figure 5: Analog Game Engine instructions

Playtest

To find out if children would like the Analog Game Engine and what they would do with it I organised playtesting together with 6 children. The children that joined the playtests all came together with an adult that supported them, if needed, during the playtest. I also had two siblings in the group that wanted to do the playtest together, see Figure 6.

Figure 6: Siblings seeing the Analog Game Engine for the first time

At the beginning of each workshop the children got to choose between different coloured paper iPads, see Figure 7. I gave them the option between a dark grey, light grey, green, blue and pink iPad. They also got coloured pencils, glue, white paper, game background templates, different stickers and a paper with instructions. All children had around 20 minutes for the playtest.

Figure 7: Different coloured paper iPads for the children to choose from

The complete playtest is documented in Appendix A.

Design changes after playtesting

I got a lot of feedback from the children and their families during and after the playtest. Some details had to be improved. Changing the design of the instruction sheet made it more clear to the children and their parents how to assemble the different background pages, see Figure 9. The children also had problems with keeping an overview of all the different stickers and activities they belong to, so I grouped the stickers thematically on 4 big sheets, see Figure 8.

Figure 8: Three gameplay design sticker sheets and one avatar design sticker sheet

I changed the whole avatar making process because I got the feedback that the children wanted a transparent background for their avatars instead of the paper strip. Therefore I decided to have the avatar templates completely as stickers that could stick to a transparent foil strip. The children can draw on these avatar stickers and decorate them with assessors that are also printed on stickers.

Figure 9: Improved instructions for the new avatar making process

I also added an extra layer to the thickness of the iPad so that the avatar would not get stuck behind the background paper when pushed into the paper iPad, see Figure 10

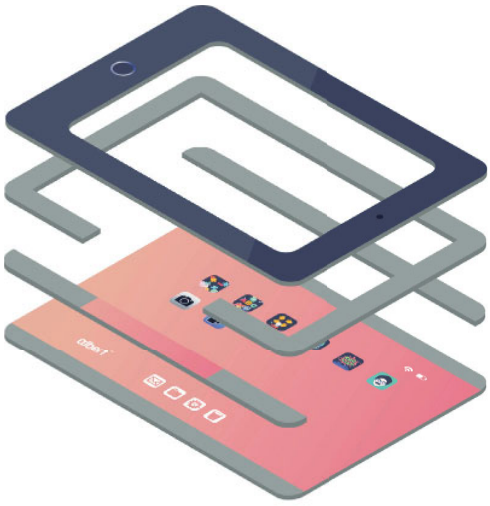

Figure 10: Final paper iPad construction that prevents the avatar from getting stuck underneath the background

Conclusion

Figure 11: Analog video games created by the children during the playtest

The children from my playtests enjoyed crafting and playing with the Analog Game Engine and I got as feedback that those children that got to take a paper iPad home played with it for multiple days.

The first design question I chose to guide my process was: How can children be creators in and for a digital environment and how can I, through design, help children to do so?

I concluded that the Analog Game Engine was a finished and usable tool that inspires children, through design, to be creators in and for an imaginary digital environment, see

Figure 11. Considering my target age group of 4 to 6-year-olds, I think using imagination is an appropriate method to start one's journey to becoming a digital maker. However, it was not where I wanted to stop with my design process for this thesis project. In the following chapters, I will present my exploration of crafting methods in and for a real digital environment. The playtests with the children inspired me to keep working with drawings as a method to create games and stories.

From analog to digital

Even though the Analog Game Engine worked great in its analog way, I wanted to explore more artistic methods that use both analog and digital tools.

I experimented with the possibilities of scanning. Scanning is a method to digitise analog images. During the process of scanning the computer translates an analog image into binary code. Any digital image can be manipulated with digital tools such as Photoshop or Paint. These programs are using interfaces that are often supposed to simulate physical tools such as brushes or scissors, but what they really do is change the binary code that makes up the digital image.

Analog and digital tools manipulate and create art in totally different ways. Therefore using tools of both types can enhance an artist's way of expression. The question I explored through experimenting was:

How could digitisation and digital crafting methods add value to analog drawings?

I wanted to turn the analog games that the children and I had created with the Analog Game Engine, into digital video games. Therefore I created a scanner made from cardboard and my iPhone. I built a little table from cardboard with a hole in the tabletop and placed my iPhone screen on top of it so that the camera could film through the hole, see Figure 12. Then I placed the Analog Game Engine underneath the table and took pictures and videos of me playing the different games.

Figure 12: My cardboard scanner

My next step was to try to turn these pictures and videos I made with my scanner into an actual video game. I did some research on how to program video games from scratch and found a big online community of people creating web browser games with simple code editors. A code editor is a program that supports its users in coding. Code editors can check code for spelling and grammar and can format code in a more readable way. There are many different code editors and most of them are free. I combined the coding knowledge I got from a couple of different coding tutorials and created my first web browser game.

My first Video Game

This game is based on a simple code that lets an avatar jump in front of a background video, which creates the illusion of movement. The avatar is a hand-drawn image that was photographed with my phone and then added to the game. Since the code cannot react to the drawn obstacles that are in the video, it doesn't matter if the player jumps or not. Even though the player could not interact with other game objects, the people I showed this little experiment to were fascinated that something hand-crafted could be used in a game.

I answered my question about what value digital tools could bring to analog drawings with the word “Interactiveness“. Interactiveness can also happen during play with analog drawings as it happened for the children that used the Analog Game Engine.

Analysis of digital game making tools

During my experimentation phase with both analog and digital games I explored the digital game making market and found a variety of different game making tools, workshops and games that inspired me in my design process.

These tools are either very popular among children or have a new approach to digital game making that I had not seen before. I will analyse these tools systematically with the following method.

Analysis method

To analyse and compare different tools that are supporting their users in making games I have formulated 8 questions. The questions are formulated so that they provide answers regarding the usability and the pedagogical approach of each tool. My answers to these questions are based on the app-store and play-store reviews, other online user reviews, the websites of the individual tools, user tutorials and (if possible) my own testing.

Questions that rate the pedagogical approach of a tool:

- Who is the target group of this tool?
- How popular is this tool?
- How easy is this tool to learn?
- How much does this tool support their users’ learning process in digital game making?

Questions that rate how useful this tool is for digital game making:

- To what degree does this tool allow its users to write their own code?
- How much freedom do the users have when it comes to using and making their own artwork?
- How much freedom do the users have when designing the gameplay?
- How diverse can the games created with this tool be?

I analysed the digital rafting tools Roblox Studio, Toca Builders, Super Mario Maker, Scratch, Minecraft, the Sims 4, Unity, Draw Your Game, Future Park and Draw your Monster, and more details about the analysis can be found in Appendix B.

Digital game making tools analysis findings

All tools that I have reviewed for this project are helping their users in different ways to be and become digital makers. Some of the tools including Unity (Unity Technologies, 2005), Scratch (*Scratch*, n.d.), Minecraft (Persson & Bergensten, n.d.) and Roblox (*Roblox Studio*, n.d.) are very powerful and would be better described as toolboxes that can be used for many different tasks. On the other side tools like Draw your Monster (Zero One SAS, n.d.), Toka Builders (Toca Boca, n.d.) and Super Mario Maker (*Super Mario Maker*, n.d.) are specialised tools that focus just on one part of game making. These tools are compromising the freedom of creativity so that they become easier to learn and so that the user will have less frustrating technical issues. I want to explore this balancing act between total freedom and simplification through my workshops and user testings.

The Future Park Installation, The Draw your Monster App and The draw your Game App were especially inspiring to the design methods I developed for this project since I wanted to work with drawing as a method to create digital games.

Scratch and Unity impressed me with their philosophy of making their product free and accessible for hobby game developers. Scratch also impressed me with its child-minded platform design, where children can get started with game making without registering themself or having to install anything. I want to have this approach for my final design as well.

Unity on the other side does require registration from its users and has adults as its main target group. Researching in the Unity community motivated me to learn and to use this tool myself for my design practice since it is very powerful with a great online support community.

The app Toca builder inspired me through its visual design. I like what the whole brand, including their logo and all the UI screens that I have seen, looks like. Toca Builders has a pedagogic philosophy without looking like a product designed for schools. They are very colourful without making their design look overloaded or annoying. I would like my final design to go visually into their design direction.

Unity and Blender

My research in the digital game making scene motivated me to step away from the “coding from scratch“-approach that I used to create my first web-browser game. In theory computer games can be created without using a game engine, but in reality, most game developers

choose to use one. The benefits of using a game engine are that code is already implemented and that you can do many things without knowing how to code. It is also much easier to export games from the game engine to different devices, like Xbox, Playstation, iPhones, Android phones or PCs.

I chose to learn the game engine Unity for multiple reasons. First of all, Unity is free for most users and extremely popular among both professional and hobby game makers. It is also easy to use in combination with Blender, the 3D-art making software I am already using.

Getting started with Unity takes a lot of dedication to the process. It is nothing you can master in a couple of hours. Unity is a powerful and extensive program that uses Visual Studio Code, a software that also comes with its challenges, as a code editor. Countless plug-ins can be used. Learning how to search for answers to specific problems and how to evaluate different advice was most time-consuming.

The program I used to create game art for my Unity games was Blender (*Blender*, n.d.). Blender is like Unity, an extensive program, it is also for free and it comes with a very large online community. Blender is a toolbox that can be used for many different parts of 3D-art making. With Blender you can do, next to many other things, 3D modelling, animation, UV mapping and texturing, rigging, physics simulations and rendering. Blender is great for organic-looking shapes and is most commonly used for artwork used in movies and games. However, Blender is only ok for engineering or any projects that require exact measurements.

Every Blender model is made of vertices, edges and faces. Vertices are points that can be connected with lines called edges. Three or more edges can frame a face. A 3D model made in Blender is never solid but just a skin made from multiple faces.

UV maps as a bridge between analog and digital

Experimenting with Unity and Blender in combination with my research about the Future Park art installation brought me to the idea of using UV maps for analog and digital crafting.

Figure 13: Photo of old post car at Clarion Post Hotel, Göteborg

A “UV map“ is a two-dimensional image that is wrapped around a digital 3D model. They are commonly used to give 3D models a more realistic looking surface. 3D artists are often taking pictures of real-world materials such as wood, skin, wallpaper or similar and turning them into UV maps. UV maps are 2D versions of three-dimensional objects that have been flattened, just like this old post car hanging in the Clarion Post Hotel in Gothenburg, see Figure 13.

Every vertex of a 3D model is represented in its UV map. There are different ways to generate UV maps. Blender can create a UV map from the current screen view of the 3D model, see Figure 15. With that method the silhouette of the model is recognisable but a lot of vertices lie on top of each other. This will result in repetition and stretching of the image that is used for the UV map and wraps around a 3D model. To reduce stretching and repetition Blender can create UV maps by spreading out all vertices of a model so they don’t overlap. With this second method, the original shape of the model cannot be recognised anymore. UV maps that are generated in this second way are quite hard to work with. UV maps can also be created manually, where the artist can cut into the skin of the 3D model and decide how it should unfold into two dimensions.

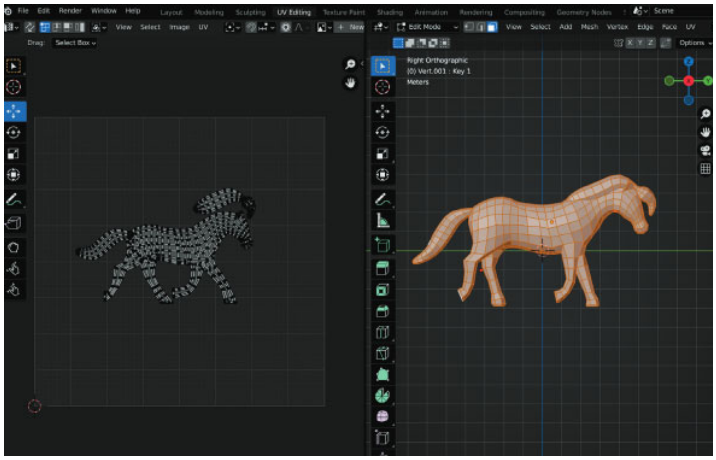

Figure 14: This is a UV map where a lot of vertices lie on top of each other. It is easier to recognise as a horse. When painted on this map the Image will always be mirrored on both sides of the horse.

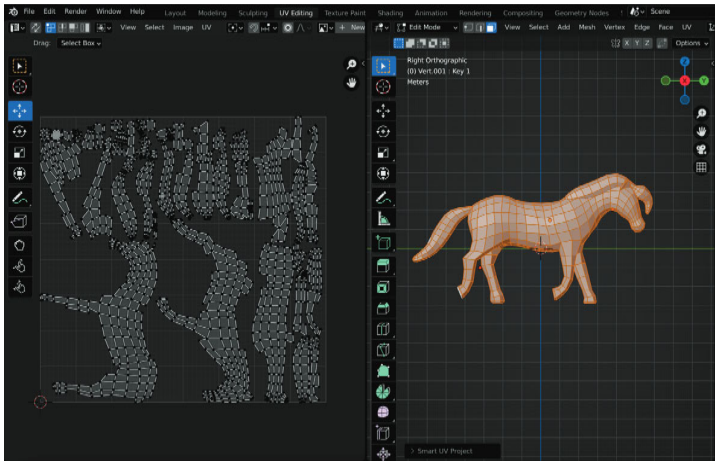

Figure 15: This is a UV map where all vertices are shown. It is harder to recognise than the original model but it can be used for very detailed work since every vertex can be painted individually.

Since I wanted to work with UV maps for children I decided to use the first and the third method in combination. Using this option I can rotate my model in a way that it gets the most recognisable silhouette and then make a UV map out of that. I created a basic human, horse and car model to try this technique with children, see Figure 16.

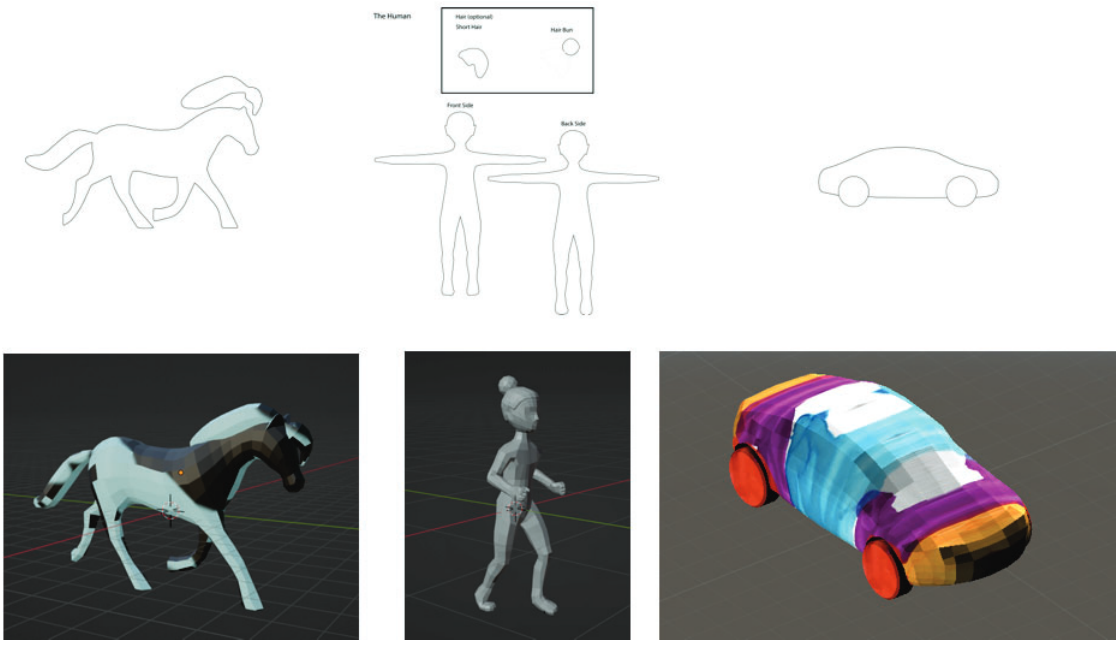

Figure 16: Horse, human and car 3D models with their UV maps

The digital game-making workshops

A big part of my research came from a series of game making workshops that I had together with 7 children between the age of 4 to 11. I did these workshops in groups of two or three children. My questions for these workshops were:

- Does the UV map method for avatar creation work for children?
- Do they understand my concept of a game map?
- Can they play the video games created during the workshop?
- In what ways can the children be a part of the digital making process?
- Are the children interested in working together or being a part of a digital community?
- Do the children like their final result?
- What ideas do the children have for future games?

Workshop preparation

After learning Unity for a couple of weeks I felt ready to create the game I wanted to use during my digital game-making workshop.

Since I am primarily a designer and not a programmer I had to make a game that had simple code logic. I wanted to prepare the code for the children and therefore had to choose a game genre for the workshops. Multiplayer games are much more complex to code than single-player games, therefore I decided to go for single player. I also wanted the game to contain a 3D avatar and a world that could be created with children's drawings.

Because of all these reasons, I decided to make a racing game code template for the workshops, where the children could draw the track of their race on paper, design their

avatar and race with it against time. Single-player racing games are pretty simple from a coding perspective. The player is walking or driving through a world, following a path of invisible checkpoints. The code of the game contains a script called the game manager. This game manager keeps track of all the checkpoints that the player has triggered. When the player has reached all checkpoints, the game manager will automatically end the game. There is a possibility of adding more challenges to a single-player racing game by adding a countdown or deadly areas to the game that will automatically make the player lose.

The template for this simple racing game could be filled with different Blender models and artwork from the children. To let the children test the game, I created a first game called “The Boring Cube Game“. The avatar in The Boring Cube Game is represented by a cube, and the race track is circular, see Figure 17. You win the game when you have completed a lap around the race track.

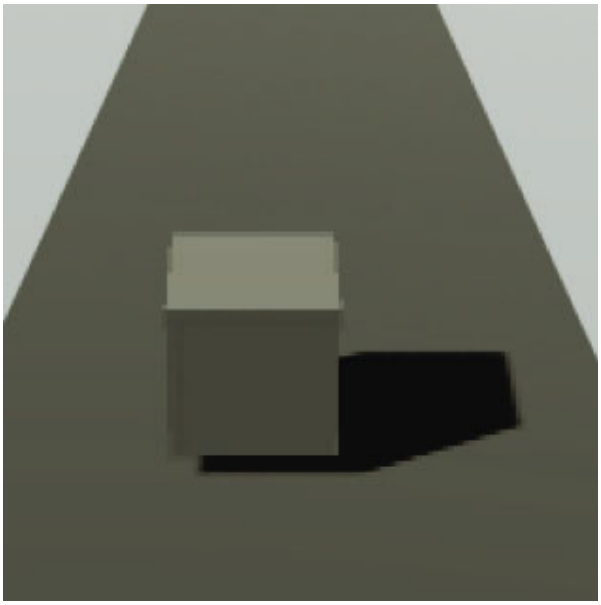

Figure 17: Screenshot of the Boring Cube Game

The Boring Cube Game is designed so that children can test the game mechanics without being too influenced by the look of the game. It is supposed to look unfinished so the children are motivated to finish it with their own artwork.

Workshop structure

The structure of each workshop in the series changed a bit after my experience with the previous workshop. I also adapted each workshop to the individual interests and skills of each child. I took some of the ideas from the children and added them to later workshops. I describe these changes and the reasons behind them in the following workshop documentation. But first I want to describe the final workshop structure that I decided on based on experiences from my entire workshop series.

First I showed the Boring Cube Game on my computer to the children and let them play it. I then asked them for their help to make the Boring Cube Game more fun. When the children

agreed on helping me I gave them my printed map template, see Figure 18, and told them that they could draw a fun and challenging track for the player to go on. I also give them the option to draw a map on plain white paper if they prefer that.

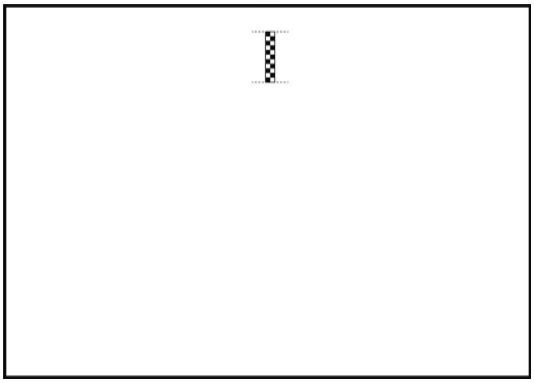

Figure 18: This is the game map template that I prepared for the workshop series

If a child did not understand the Boring Cube Game and had no ideas on how to start, I showed games that the other children have made as a source of inspiration and for the child to get examples of what is possible during the workshop.

When the children were finished with their maps, I showed them my iPad and how to take photos with it and how to send them to my computer via AirDrop. I gave the children the option to do more digital editing to their drawn map in either Photoshop or Procreate. This map was added to a new Unity project that already contained the coding template from the Boring Cube Game. I showed the children the transparent boxes that trigger the code when the player walks through them and I asked them to place the boxes on their maps.

After that, I showed the three printed UV maps, the human, the car and the horse, to the children and asked them to choose one of them for them to colour. I also showed them the 3D models of each UV map on my computer to give them a better idea of the final result. Afterwards, they would photograph and edit that UV map as they did with their game map. The final step was to upload that UV map to their game project in Unity.

At this point I let the children play their games for the first time. I asked them how much time the player should have to complete the race and add the time that the children chose as a countdown clock to the game, and test it once more. After that, the children got a list of different songs they could choose from as background music. They also got to choose the colour of the sky in their game.

I told them that I could create a 3D model of any character or game object of their choice and add it to their game. If they had an idea for a 3D model, they could draw it on regular white paper. Converting a child's drawing into a 3D model takes a lot of time, therefore I did this part after the workshop. To show the children how their drawings became 3D models I send them a sped-up timeline of my modelling process as a video.

In the last activity, I asked the children to draw a game icon and choose a name for their game. This information was presented on the Unity Play website where their games were uploaded.

After the workshop, I turned the children's drawings into 3D models and added them, if the children wanted it, to their games. I then uploaded the games to Unity Play and sent the link to the parents that could show their children the final result by playing the game in a web browser.

I asked the parents to record or tell me about their children’s reactions when playing their online games.

Workshop execution

I have met 7 children during 5 digital game-making workshops. In the following, I will describe the events of each workshop, since they were central to my further process.

First workshop

I had my first digital game-making workshop with two sisters, ages 4 and 6, that could only speak Mongolian. Their father joined the workshop and translated the activities for the children. We met in an empty room at the university that I prepared with the workshop materials, coloured pencils, markers, and watercolours.

First, we played the Boring Cube Game together. The two girls had a lot of fun trying out the game but it was difficult for them to coordinate between the different keys on the keyboard. I could see that they had very little to no experience in using a laptop. Their father showed me the games they would usually play on his phone and said that the two girls were good at playing racing games on a touch screen.

After that, I gave the girls the map template and asked them to draw a road for the Boring Cube Game. The 6-year-old eventually understood the task and started to draw a circular road that looked very similar to the road that I had made for the Boring Cube Game, see Figure 19. She spent much time colouring it in rainbow colours. The younger sister did not understand the task of creating a track. She tried to copy her sister but was unsatisfied with her result. She instead started to experiment with the watercolours on a white sheet of paper and made two more abstract looking maps, see Figure 20.

Figure 19: Game map from 6-year-old

Figure 20: Game maps from 4-year-old girl

While the younger sister was still painting the map I showed my iPad to the older sister and let her press the button to take a photo of her map while I was holding the iPad. She was not so interested in the computer part of the workshop and wanted to draw more instead. I showed her the UV maps and their 3D models and asked her if she wanted to colour one of them. I also gave her the option to draw her avatar that I could turn into a 3D model. She took the printed horse UV map and painted it with watercolours, see Figure 21. We took a picture of the UV map and I showed her what it looked like in the game. She got to test the game for the first time and was very excited about it. After that, she started to draw a unicorn with wings that she wanted me to turn into a 3D avatar, see Figure 22. She also drew a cover for her game and used her own name as the game name, see Figure 23.

Figure 21: Horse UV map coloured by 6-year-old girl and horse 3D model using that UV map.

Figure 22: Unicorn avatar design by 6-year-old girl

Figure 23: Game cover from a 6-year-old girl and 3D model of a hand-drawn butterfly

The younger sister chose to colour the car UV map. In addition, she also made a drawing of what I believed was a car, that she wanted me to turn into a 3D model, see Figure 24.

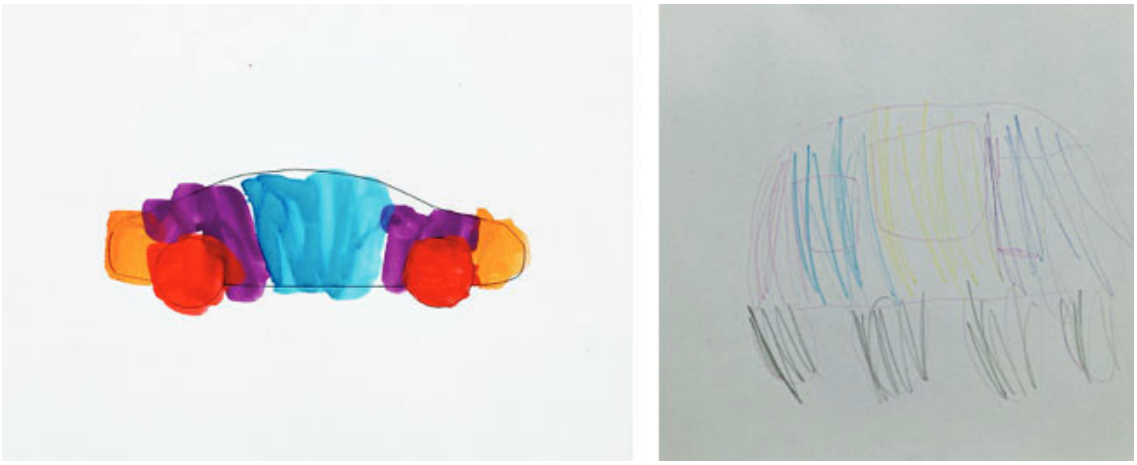

Figure 24: Car UV map and car drawing from 4-year-old girl

After that the girls had to leave. I told them I would send them their games later.

During my whole time with the girls, I was impressed by how passionate they were about drawing. It seemed like they had a lot of practice at drawing and they were much more advanced than the 4 to 6-year-olds I had met during my first workshop series with the Analog Game Engine.

After this workshop, I created models from the children's drawings. I turned the older sister's unicorn into an animated avatar that I put into her game instead of the 3D-horse model that she made earlier. The younger sister's game required me to make some changes to the game to make it playable. I decided to place copies of the car drawing, which I had turned into a 3D model, randomly on her map and to place the transparent checkboxes inside of her cars. To win her game the player needed to drive through all game objects in a certain amount of time.

I exported the game from Unity as a ZIP file and sent it to the parents via email. However, I got feedback that the mother was not able to run the game. I researched online and found a better solution to send the games. I uploaded the girls' games to the Unity Play website and sent them the link via email, see Figure 25.

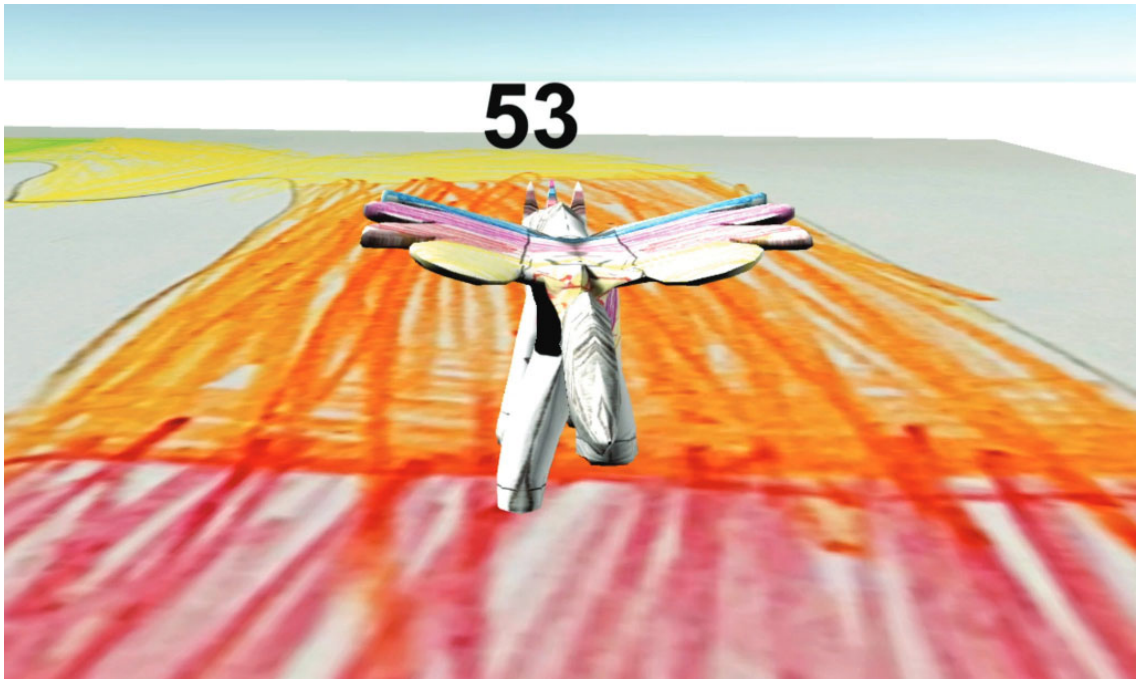

Figure 25: Screenshot of the 6-year-old girls' final game

The next week I met the girls' mother to get some feedback. She told me that the girls, herself, her husband and the extended family were amazed by the games that came out of the workshop. She said that the girls would like to do the workshop again because this time they would have even more ideas. She also told me that the girls would like to have music in the background of their games and that they wished that they could play the games on their iPads.

After this first workshop and the feedback I got from the family, I changed some parts of my workshop. Adding background music to the game was a simple task from a technical perspective. To simplify the musical side of the project I decided to use free background music that I found in an online music library. The children would choose music from this library, which I then added to the game.

I also tried making the games playable on touchscreens by changing the code of the game. When I tested this new code on Unity Play I noticed that it worked fine when I opened the website on my iPad, but not on my iPhone. When I opened a game with the new code on my iPhone the website switched to its mobile view and cut the game window in half which made it impossible to play on a smartphone. I decided to keep the touch option in the code, even though Unity Play did not work well on smartphones.

The 4-year-old girl's game can be tested by following this link:
https://play.unity.com/mg/other/oyus-game

The 6-year-old girl's game can be tested by following this link:
https://play.unity.com/mg/other/ausgame-3

Second workshop

For the second workshop I met three brothers at the age of 4, 7 and 9. I visited them at their home. We started with some doughnuts and tea and I explained to them that I am working with video games at university and that I needed their help. I showed them the Boring Cube Game. They were excited about it and wanted to win the game. The 7 and 9-year-old quickly understood how the keyboard controllers worked and managed to complete the game. The 4-year-old had difficulties coordinating his fingers on the keyboard, so he often pressed the wrong keys. From previous talks with these children, I knew that they all have daily practice in playing video games and that they have multiple playing devices around the house.

The boys gave me feedback that turning the cube left or right, like a car, was too slow and that it would be better if it could turn quicker.

After showing them the Boring Cube Game I gave them the option to work together on one game or to do a game each, to see if they preferred collaborating or not. They all wanted to do their own game. I showed them the map template but also gave them the option to draw a map on white paper. They all chose the template and they immediately recognised the racing starting line. The 9-year-old had the idea to make a game about water skiing, where a person on water skis needed to go around an island. After his second attempt to draw the map he came to me and said: “This part should be blue and this part should be yellow-greenish. Can we just do that on the computer?“ I showed him how he could take a photo of his map on my iPad. Then I sent the image to my computer and opened it in Photoshop. I showed him the select and the brush tool and he finished his map design in Photoshop on my computer, see Figure 26.

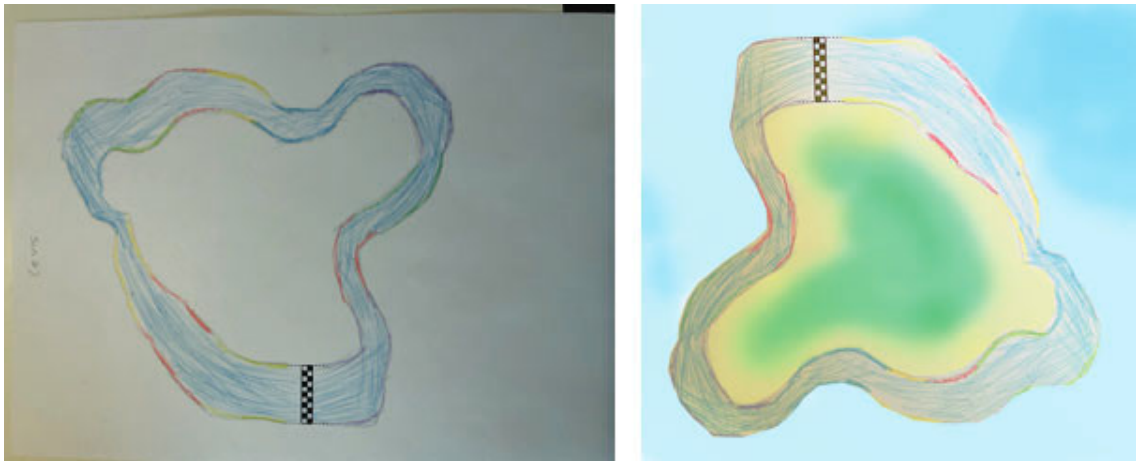

Figure 26: Game map drawn and digitally edited by a 9-year-old boy

The 7-year-old brother wanted to make a space-themed game and made a complicated road for it. After he saw that his brother finished his map on the computer he also wanted to do some digital editing to his map. Because I only had one laptop I opened his map in Procreate on my iPad and gave him my Apple Pencil to draw directly on the map. He drew yellow stars on his map in Procreate and later also used Photoshop for changing some colours, see Figure 27.

Figure 27: Game map drawn and digitally edited by 7-year-old boy

The 4-year-old brother made two maps with circular paths that looked similar to the map of the Boring Cube Game. He spent a lot of time colouring a map “like a rainbow”, as he called it, see Figure 28.

Figure 28: Game maps of 4-year-old boy

The workshop did not take long. The brothers were constantly at different stages of the workshop and I switched between them to give help or explain the next steps. I realised that I would only be able to handle a maximum of three children at a time in my workshops.

When the 9-year-old brother was finished with his map I showed him the three UV maps and 3D models. I also explained to him that he could draw whatever he wanted and that I could make that into a 3D model for his game. He liked the human model and chose to start with colouring its UV map. After some time he said that he wants the person to sit in a boat and row around an island. I told him that I could make the human 3D model sit down and row if he would draw me a boat. So he made a boat for his avatar, see Figure 29. He also said that he wanted to have palm trees on the island. So he drew a palm tree that I turned into a 3D model and added to his game, see Figure 30.

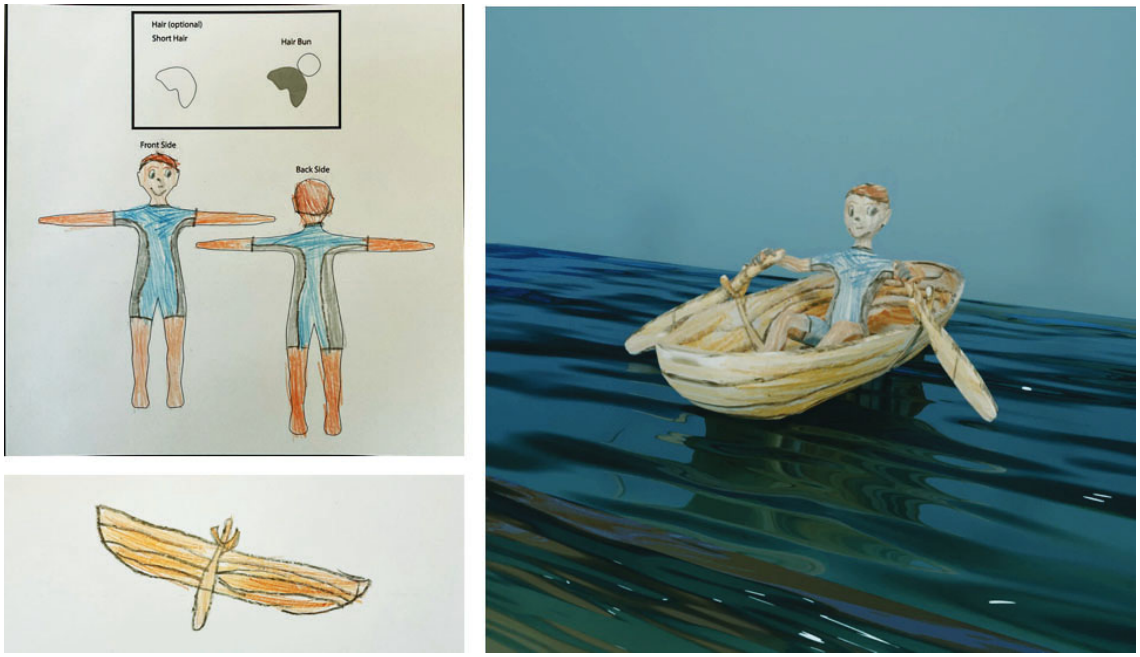

Figure 29: Avatar designed by 9-year-old boy

Figure 30: Palm tree drawing from 9-year-old boy

When the oldest brother was finished I asked him about the island and where to place the palm trees. He said that he wanted the island to be like a mountain covered in palm trees. Based on his description I shaped the island and placed the palm trees later on.

The 7-year-old brother also took the human UV map but said that he wanted to colour it in Procreate which he already had used for his map. We took a picture of the UV map and I opened it in Procreate for him where he started to colour it and said he was finished after just a couple of seconds, see Figure 31. I showed him how I uploaded both his map and his avatar to Unity and he tried to play his game for the first time. Then I told him that he could add music to his game and showed him the online library. The other two brothers were listening to us while we were collaborating. I noticed that all three brothers liked very energetic electronic beats, and they enjoyed listening to the different songs. After I added the music to the 7-year-old brother's game he said that he also wanted some aliens in the game. He drew an alien that I turned into a 3D model and added to his game, see Figure 32.

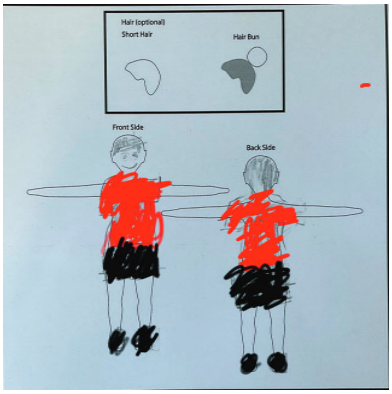

Figure 31: Human UV map coloured in Procreate from 7-year-old boy

Figure 32: Alien designed by 7-year-old boy

When the youngest brother was finished with his map he drew a couple of different characters on white paper. I did not push him to use a UV map because I wanted to see what he would come up with without being too much influenced by me and his brothers. He made two characters that he was happy with and that he wanted me to add to his game, see Figure 33. He also saw his older brother drawing with my Apple Pencil and wanted to try it out. I uploaded both his map and one of his character drawings to Procreate and showed him how to choose different brushes and colours. He experimented with Procreate to the point where neither the map nor the character were recognisable, see Figure 34. Later on, when I made a 3D model out of his drawing I decided to make the model from his original analog drawing since they were easier for me to recognise as characters.

Figure 33: Characters designed by a 4-year-old boy

Figure 34: 4-year-old boy working with Apple Pencil in Procreate

The two older brothers got to the point where they created covers for their games and chose names. The 9-year-old brother called his game “Ocean Race“ and the 7-year-old brother called his game “Space Race“, see Figure 35.

Figure 35: Ocean Race and Space Race game covers

I noticed that all three children started to have less interest in creating more game art after around 40 minutes. They sometimes left and came back to add more details to their drawings. After around two hours the workshop ended.

From my observation, I would say that these three boys did not want to express their ideas to me by drawing. Instead, they were all very verbal and talked much more about certain game details and ideas than they could express in their drawings.

After the workshop, I worked on the 3D models for the three games and recorded my process. I sent the videos together with the game links to their mother. The mother gave me feedback that they all liked to see the final result. And I could see on Unity Play that they all played their games multiple times.

I took the feedback I got from the children about the avatar movement in the game and changed the code to improve the avatar's mobility.

The 4-year-old boy's game can be tested following this link:
https://play.unity.com/mg/other/dancing-robot

The game Ocean Race can be tested following this link:
https://play.unity.com/mg/other/ocean-race

The game Ocean Race can be tested following this link:
https://play.unity.com/mg/other/space-race-2

Third workshop

I had the third workshop with a 6-year-old boy, his 11-year-old sister and their mother who also wanted to make a game. This workshop took place at a university building. We started with some cake and juice and I showed them the Boring Cube Game. It was a bit difficult to

keep the group together because the 11-year-old sister was very distracted by her phone while the 6-year-old had a lot of energy and switched between different other things he wanted to do.

I explained to them my plan for the workshop and that we would start with making a map. The mother and the daughter chose to draw their map on the template. The 6-year-old boy chose to draw on white paper. He was very clear from the beginning about what type of game he wanted to make. He explained to me that he wanted his track to be extremely hard and that there would be lava on both sides that would kill the player immediately. Similar to the three boys he preferred talking about his ideas instead of drawing them. To keep him motivated I showed him how to paint in Photoshop and he finished his map digitally, see Figure 36. Afterwards, I showed him how to create a transparent path underneath his map in Unity that the player could fall off from. He created a transparent path and he also placed the checkpoints on the map that the player needed to pass to win the game.

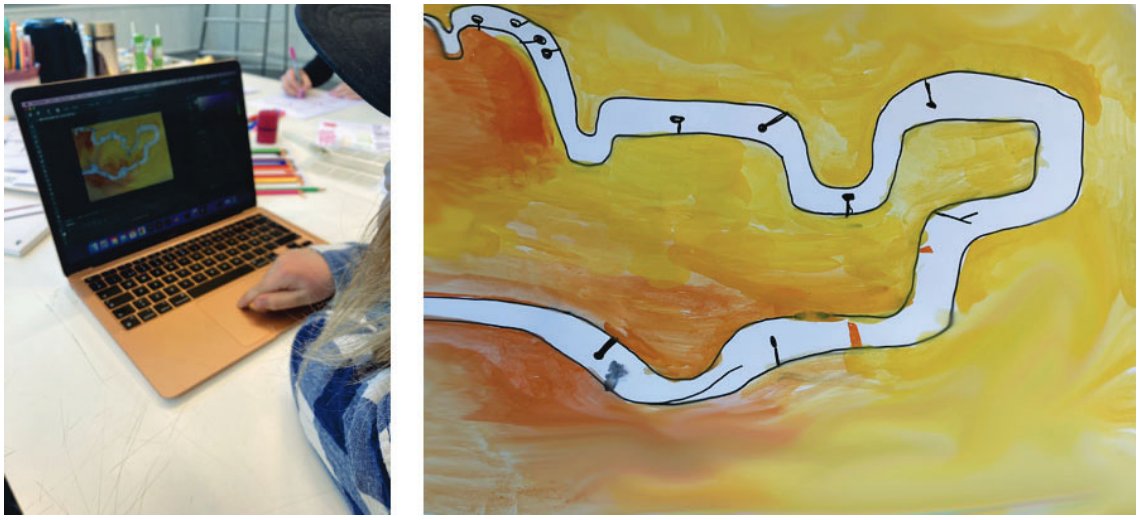

Figure 36: 6-year-old boy working with Photoshop and game map drawn and digitally edited from 6-year-old boy

Afterwards he chose some music from the online library and I showed him the three printed UV map templates and their 3D models that I had prepared. He chose the human avatar and coloured it very quickly, see Figure 37. We uploaded his UV map to his game and he tested it. He liked it but it was very difficult and everyone who played it needed a lot of tries to win it. It was a bit frustrating that there was no restart button for the game and that the player always had to close the game window and reopen it. I told him that I could fix that later in the code. I then told him that most games have a cover or icon and a name. While drawing the cover he came up with the name “Beware“, see Figure 38.

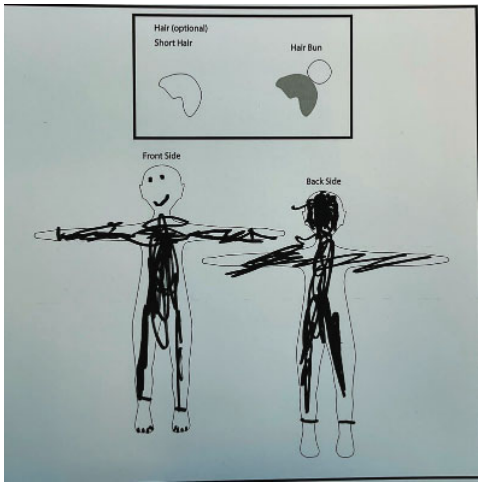

Figure 37: UV map coloured by 6-year-old boy

Figure 38: Beware game cover

The 11-year-old girl was a bit harder to motivate. Eventually, she painted a track with watercolours, see Figure 39. Afterwards, she made some UI buttons for her game and drew a little character without me giving her much advice, see Figure 40. I uploaded her artwork into Photoshop and showed her how to cut out the different buttons and how to save them into separate files. I also showed her how to enhance the colour of her art. When she was finished with Photoshop, she chose some music and we added everything to her game. She chose the name “Laser Fire” for her game. She enjoyed playing it once but then wanted to quickly get back to her phone.

Figure 39: Game map by 11-year-old girl

Figure 40: UI buttons and avatar design by 11-year-old girl

The mother was the most patient participant and spent almost a whole hour on her artwork while considering comments and tips from her children, see Figure 41. She called her game “Akta Dig!”. She was excited and fascinated about her own and her children’s games.

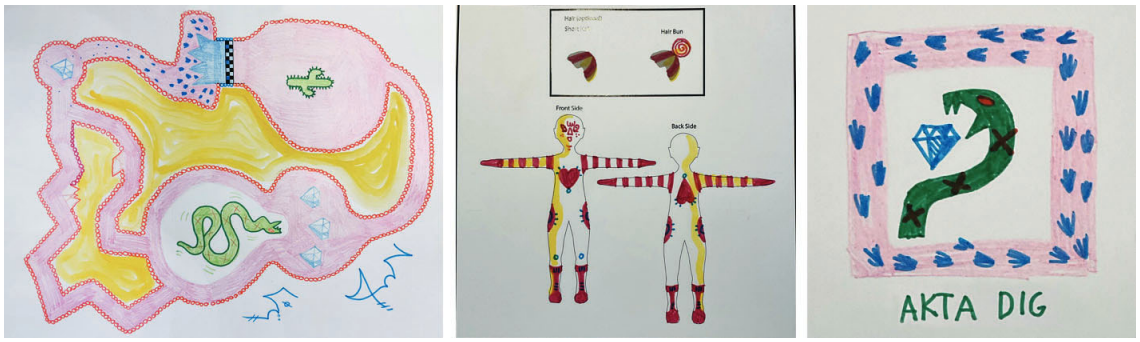

Figure 41: Game map, human UV map and game cover by the children’s mother

The only change I made to the 6-year-old boy’s game was adding a restart button to the code. Otherwise, we finished the whole game during the one and a half hour workshop. I later modelled the girl's character in 3D and added her buttons and UI designs to the game.

When I sent the final result to the mother she recorded a video of her children playing the games and said that they had fun.

The game Beware can be tested following this link:
https://play.unity.com/mg/other/beware-gz

The game laser Fire can be tested following this link:
https://play.unity.com/mg/other/laser-fire

The game Akta Dig! can be tested following this link:
https://play.unity.com/mg/other/akta-dig

Fourth workshop

After my first workshop with the two little girls their mother contacted me again and asked me if I would be interested in meeting the girls again. She said that the girls and the whole family enjoyed seeing their artwork in the form of a game and that the girls would love to explore this further. She also told me that her girls are drawing daily and that they play a lot with their drawings afterwards. I was curious to learn more about the girls' imaginary world made from drawings and agreed to meet them for a second workshop.

For this workshop, I only brought white paper and different coloured pencils, markers and watercolours. I visited the family at their home and the girls showed me their room with all their artwork. As I could recognise and understand from their explanations, princesses and fairies were their biggest interests. They showed me their drawings of Disney princesses like Ariel, Anna and Elsa and other princesses that were unfamiliar to me. Their drawings and play were centred around these characters and they created accessories and houses for them.

The girls were already briefed by their parents that we would make a game together and I decided to start with a character drawing session. This time the girls spent a lot of time on their art and they each drew a fairy/princess looking character. The mother talked a bit with the girls about the characters in Mongolese and she translated to me that the older sister was drawing herself as a princess while the younger sister wanted to copy what the older sister was doing.

Figure 42: 6-year-old girl drawing the backside of her avatar

When they were finished we took a picture of their avatars on my iPad, and since they only had drawn the front side of their avatar I told them that I would also need a backside to create a 3D model. The drawings were shining through to the backside of the papers so I told the girls to draw the backside of the character on the backside of the paper where they could copy the font-side silhouette, see Figures 42 and 43. The older sister understood the concept of back and front quickly while the younger sister started to make the backside an exact copy of the front. It was a bit of a funny situation when the older sister and I tried to explain to her that by doing so her character would have a face on the backside of its head. After she understood what we meant she coloured the face with a marker so it looked like hair, see Figure 44.

Figure 43: Avatar design from 6-year-old girl

Figure 45: Avatar design from 4-year-old girl

After the girls were finished with the characters the younger one lost interest in drawing. I continued to talk more about the game with the older girl that could speak some English. She told me that she wanted a big cake that stands on the road and that the player needs to collect. We spent the next half hour drawing cakes. I showed her what her cakes would look like in 3D and she made a couple of different cake designs until she was happy.

After one and a half hours I felt the children were done with drawing and we decided to meet up another time and continue the game.

After this workshop, I made 3D models of the two avatars and the cake. I decided to make a game with both of the girls' avatars in it to include the 4-year-old sister more in her sister's game-making process. I wrote some new code that allowed the player to switch between the two girls' avatars by pressing the first letter of the girls' names on the keyboard. I also placed the 3D cake model in the game scene, see Figure 46.

Figure 47: The girls' two avatars and their 3D cake in the game environment

Fifth workshop

During the fifth workshop the girls and I met at university again. We spent time playing the unfinished game, and the girls really liked to see their avatars, and we also spent time making maps. The older sister wanted to make a field of flowers. She drew the flowers and the grass from a side view. Her mother tried to explain to her the difference between the side and top view and I showed them what their different maps looked like in the game. In the end, we decided on one map that the girls liked the most, see Figure 48. The girls also wanted the unicorn and the butterfly from their first workshop as a part of this game.

Figure 48: Game map designed by a 6-year-old girl

This workshop was around an hour long. I uploaded the result of this workshop to Unity Play knowing that the girls and I might continue working on this game.

The result from the two workshops can be played following this link:
https://play.unity.com/mg/other/oyu-anu-6

Conclusion

I enjoyed having the game making workshop with the children and I see these workshops and the games that the children made as a unique and valuable experience and a nice outcome for everyone involved. Considering that all of these workshop sessions were between one to two hours I am surprised by how much we got done and that every child ended up with a playable online game.

Keeping the workshop groups small allowed me to support each child with their individual gameplay ideas and designs. I tried my best in giving the children creative freedom and an introduction to some digital crafting tools while taking away technical challenges that were too advanced to master within the scope of the workshop.

My first design question that inspired me to do this workshop series was: How can children be creators in and for a digital environment and how can I, through design, help children to do so?

I conclude that my workshop series helped children to be digital creators in these particular workshop situations. To give the children the experience of designing their own avatars and partly also their own gameplay and game art, I had to step away from my role as a designer and take the role of a pedagogue and a technical supporter. Therefore I conclude that the requirement “through design“ from my first design question did not get fully explored during my workshop series.

My second design question was: How can children be a part of a creative digital community and share their creations with others?

I conclude that it was great to do the workshops in small groups of children that could exchange ideas while working on their own online games. Creating in the same physical space and sharing the results on the same website created a sense of community during the workshop series. None of the children were interested in making a game together with the other children. Most children that I asked about making a group game were strongly against it. However, they still influenced each other heavily during the workshops by looking at each other's processes and talking about their ideas. Therefore I conclude that children that do this workshop want to have a game that they made alone as a result, but enjoy being in contact with other children while creating the games.

I conclude that this workshop series is worth continuing, but I don’t want to keep the role I had as a technical supporter or pedagogue. Instead, I would like to focus on design and make the workshop accessible to more children.

Next steps

I thought about different ways to continue the workshop series without me having to be involved in the individual workshop sessions.

One way I thought of was to find pedagogues at schools that could do the workshop in their own classes. In this scenario, the workshop could turn into a project week where a school class makes a game together. Maths/computer science, art, English and music teachers could be responsible to support their students in different parts of game making. The students could have different responsibilities depending on their interests, but all work together on the same game.

The challenge with this approach would be to find the right teachers for this project and to prepare them for this workshop. I have been in contact with a school in Germany to talk about this idea, but it will take a lot more time and preparation until this could be tried out.

My second approach to scaling my workshop series was to replace my role in the workshops with software that would help the children to create their own games alone or with the help of their parents.

Since the children from the workshops had a strong preference for touch screens and smartphones, I decided to create an app together with a colouring book that would contain the different UV maps.

Draw Your Avatar

For my final design I decided to have 7 to 9-year-olds as the target age group. According to the study “Svenskarna och Internet” (The Swedes and the internet), between the age of 7 to 9, the percentage of children in Sweden that have their own smartphone rises from 40 to 71% (Davidsson & Thoresson, 2017). It is highly likely that these numbers are even higher

today and that most children in Sweden have daily access to smartphones or tablet computers by the age of 7. This fact and my experience from the workshops is the reason why I believe that 7 to 8-year-olds will have enough digital literacy to handle the Draw Your Avatar app themselves. My second reason for choosing 7 to 9-year-olds as the target age group is that I want to use written instruction in my final design. To understand all activities in the book and the app some basic reading skills are required.

The 4 to 6-year-old children in my workshops have shown great interest in this project and I believe that they can use the colouring book independently, but they will need some support in using the Draw Your Avatar App, either from parents or older children.

The colouring book

During my workshops I gave the children the option to design their own avatars in combination with choosing one of the three UV maps (the human, the horse and the car) I had prepared for them. I analysed the different outcomes and decided to concentrate on the human-looking avatars for the scope of this design project. I noticed that all human avatars that were designed by the children came with a lot of accessories to make their avatars stand out and be more personal. So I decided to create a basic set of 3D models of different clothes, shoes, hairstyles and even a set of wings, see Figure 49.

Figure 49: Human with different assets as a 3D model with its UV maps coloured with coloured pencils

I tried to keep the 3D models as neutral and inclusive as possible. Sex, skin and hair colour and other characteristics were to be defined by the children's drawings. The clothes were made as basic as possible so they can easily be changed into different styles by painting details.

To give the children even more choices, more accessories could be added. I only had one body shape for the avatar in my final design, thus the workshop would be even more inclusive if there would be several different body shapes and hairstyles to choose from. The project is open to adding additional models in the future.

To organise all the different UV map templates for the human avatar I decided to bring them together in one colouring book, See Figures 50, 51, 52 and 53. The colouring book contains every UV map twice so the children get the chance to create multiple avatars with different accessories. I added pictures of the 3D model next to each UV map template so the children could have a better idea of what their avatar would look like in 3D.

To improve on the colouring book one could create more colouring books for different types of avatars. I would like to make a car version, a monster version and a horse version of the Draw Your Avatar colouring book.

Figure 50: The Draw Your Avatar colouring book cover

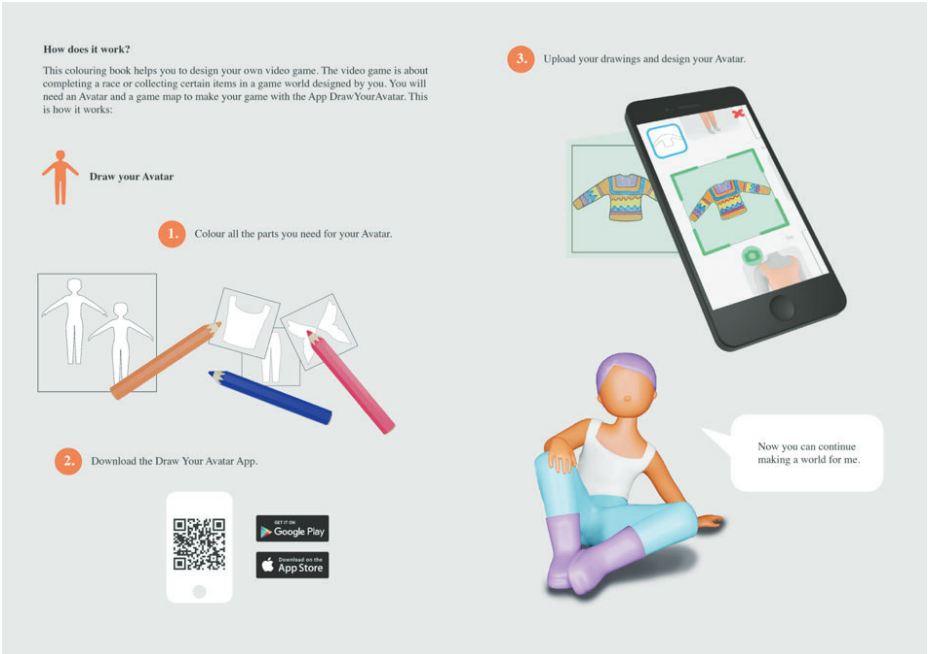

Figure 51: Instructions in the Draw Your Avatar colouring book

Figure 52: Instructions in Draw Your Avatar colouring book

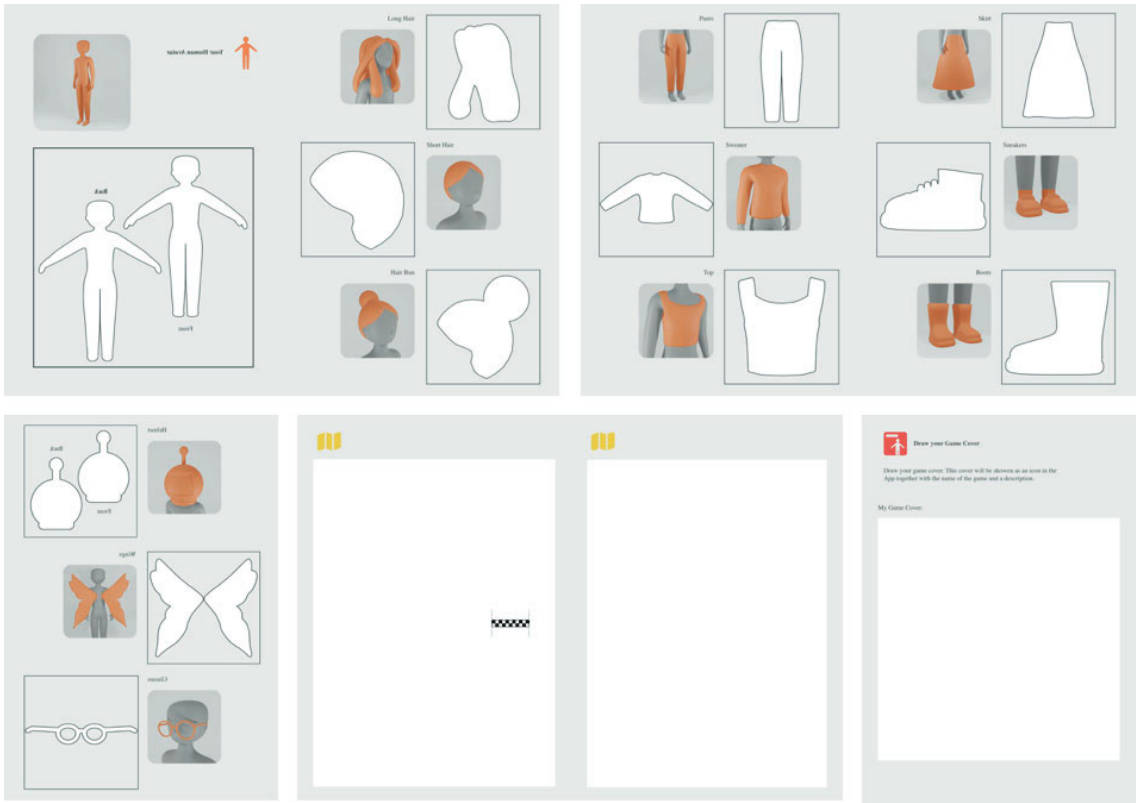

Figure 53: UV maps, game map templates, and cover template in Draw Your Avatar colouring book

The app

To enable the children to digitise the artwork from the colouring book I created an app concept called “Draw Your Avatar”. This app was supposed to replace my role as a technical supporter and pedagogue that I had during the workshops by automating many of the technical steps. The Draw Your Avatar app was intended to be free, and no registration was to be required.

When the child opens the app it can choose between creating a game or playing a game from the game library. The game library contains pre-installed game examples, games that the child has created previously and games that have been sent to the child from other users. When the child chooses a game from the library the game information is shown and the options play, edit and share are displayed on the screen. Pressing the play button will start the game. Pressing edit will lead to the game editing menu. The share button will give the child these two options to share the game: Export the game as a WebGL file or share the game directly to a phone contact using e.g. WhatsApp, e-mail or another communication app installed on their device. An exported game as a WebGL file can be opened in a web browser, like Safari, Chrome or Firefox. The file can also be sent, e.g. via the internet by using messenger apps, see Figure 54. In this way, the child will only be in contact with people that it already knows. When a game is sent via the second option the receiver gets to see the game icon in the chat that the child has chosen to send the game in. If the receiver presses on the icon a window will pop up and ask if he or she wants to add the received game to the Draw Your Avatar app. If the receiver does not have the app he can choose to play the game in a web browser.

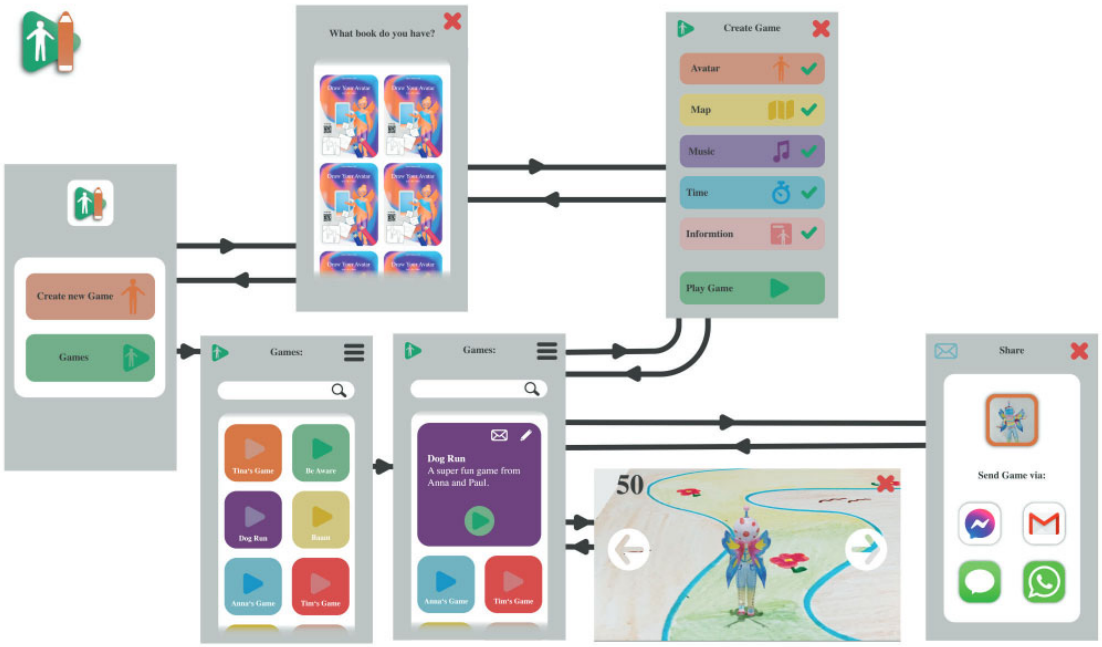

Figure 54: Draw Your Avatar UI screens

When the child starts the app the other option is to create a new game. In that case, the app will ask which colouring book the child wants to use for this game - human avatar, horse avatar, car avatar...

When the child has chosen a colouring book, the game editing menu will open. The menu contains the option to edit the avatar, the map, the music for the game, the time that the player has to finish the game and the game information. The child can choose in what order it wants to create the different game components, but the game can only be played when all components have been added, see Figure 55.

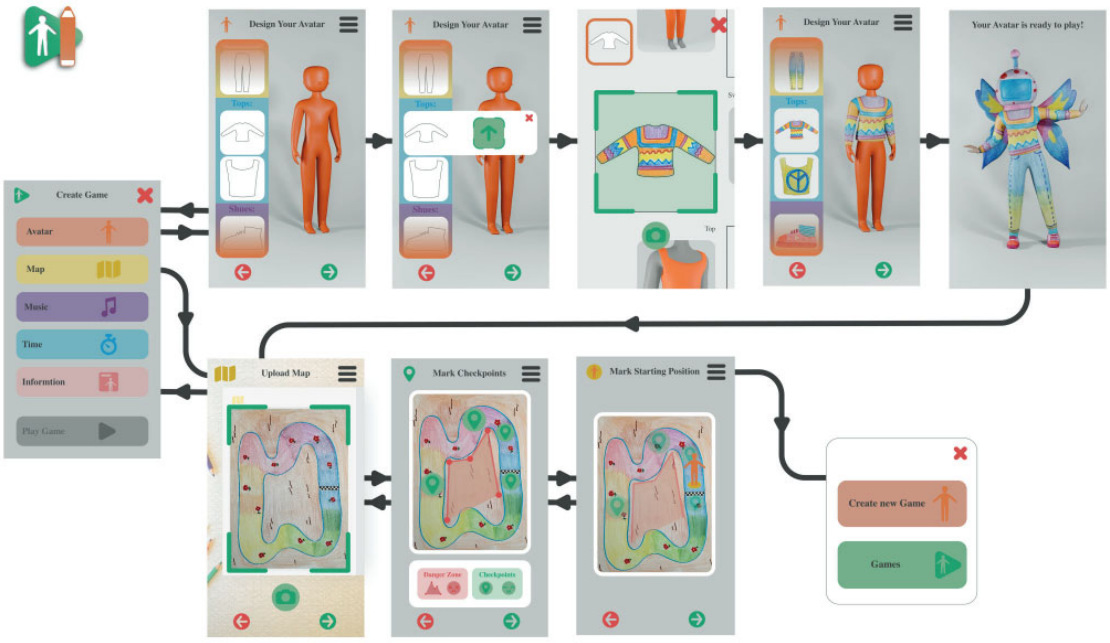

Figure 55: Draw Your Avatar UI screens

If the child presses the button “Edit Avatar“ the app navigates to the avatar creator screen. On this screen, the base body model of the colouring book that the child previously chose is shown, in this case, it is the basic human body model. On the left-hand side, the UV map slider is shown. The child can choose a UV map which will give the option to take a picture. The picture will then automatically be added to the UV map slider and can be added to the 3D model. If an already existing UV map gets selected it appears together with its 3D model in the avatar preview on the right side, see Figure 55.

When the child is happy with the avatar it can press the green arrow in the lower right corner. This will trigger an animation of the final avatar and lead the child directly to the next screen point which is the map editing, see Figure 55.

The child can cancel the process at any time by pressing the red button on the lower left side. This will lead back to the editing menu screen. If you press the menu symbol in the upper right corner you will go back to the starting page of the app, see Figure 55.

In the map editor, the child can take a picture of the map it has drawn. In a second step, the child can mark the green checkpoints that the player needs to trigger to win the game. The child can also mark danger zones in which the avatar will “die” and the player loses. In a third step, the child chooses the starting position for the avatar, see Figure 55.

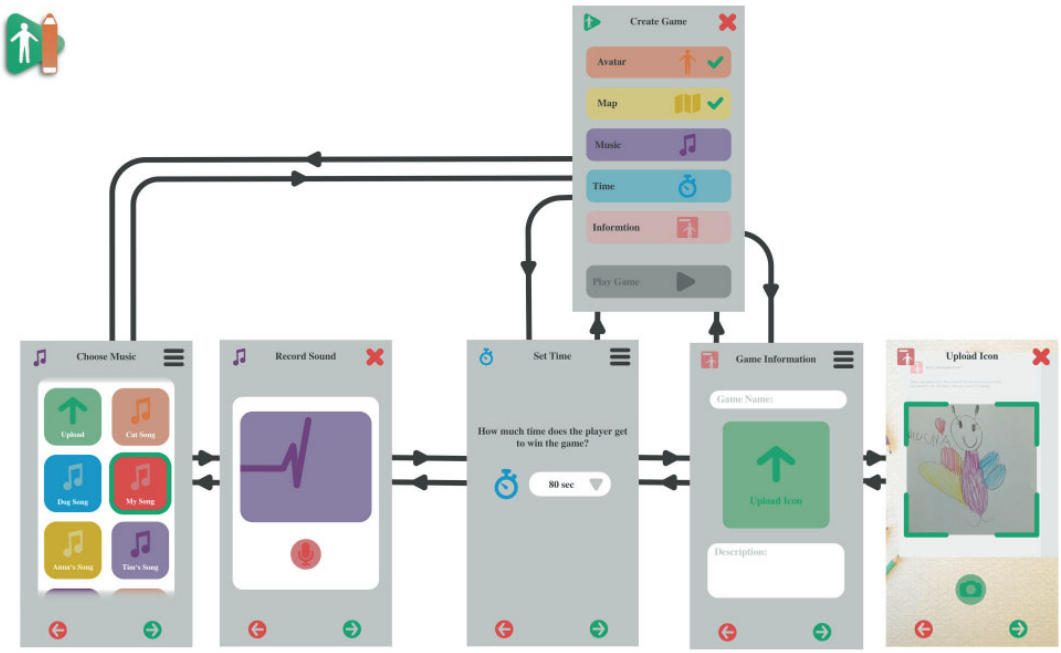

Figure 56: Draw Your Avatar UI screens

Once the child has chosen a starting position for the avatar and pressed the green arrow button it will come to the music library from where it can choose background music for the game. It can also optionally record its own music or sounds and add them to the library. When the child has chosen the background music for its game it will come to the time editor where it can choose the amount of time the player has to finish the game. After that, the game information can be added including the icon that the child made with the colouring book, see Figure 56.

When all information is filled in and the child presses the green arrow button the game will automatically start.

I have made a trailer of my final design in action which can be watched under this link: https://www.youtube.com/watch?v=p6BQvNdEbeg

Colours and icons

My goal for the graphic design of both the app and the colouring book was to develop an icon and colour based language that would replace and underline written instructions as much as possible, see Figure 57.

I chose the colour green for all actions in the app that are proactive or related to something positive. This includes taking and uploading photos, starting a game, setting the checkpoints that will make the player win, and continuing or finishing a step in the process.

I choose the colour red to resemble actions that are related to quitting or losing. This includes the go-back-error, the close-window icon and the danger zone settings that will make the player lose.

I used the colours orange, purple, pink, yellow, blue and light blue to resemble different aspects of the game making process, and they are explained in the following way:

- Orange was used for everything related to avatar making.
- Purple was used for everything music-related.
- Pink was used for game information.
- Yellow was used for map-making.
- Blue was used for the time settings.
- Light blue was used for sharing games.

The colours black, grey and white were used for the text and background.

Figure 57: Icons and colours used in the Draw Your Avatar colouring book and app

Ideal use context

In this chapter I will go through my recommendations for the ideal context in which the Draw Your Avatar colouring book and app are made accessible for children.

The environment should …

- … be accessible to children of all socioeconomic classes.
- … be a place where children and families are using smartphones and tablets for entertainment and other distractions.
- … be a place where children are already encouraged to have calm behaviour.
- … create situations where children have a lot of time.

I have found three context examples that fit with most of my requirements for this project:

- Waiting rooms, e.g. at hospitals or doctor's offices

- Trains
- Restaurants

All three environments are places where children are expected to be calm for a longer time. They are also places where parents often use smartphones and tablets to entertain their children and themselves. All three places are public and therefore theoretically accessible by everyone, however, restaurant visits and train travel might not be affordable for all families. I would like to see the Draw Your Avatar colouring book as a free giveaway for children in these environments.

I have found a couple of different companies that operate in my example environments, and which already have the practice of free giveaways to children. The first company I found was the German train company “Deutsche Bahn” that already hands out free train toys and magazines to all children taking their fast trains. These magazines could include pages from the Draw Your Avatar colouring book.

Other companies that are matching my context criteria were fast-food chains such as McDonald’s and Burger King, which have a practice of adding toys, magazines and collectables to their product. These companies are successful in reaching children of all socioeconomic classes and different cultural backgrounds. For many families, fast-food chains are the only restaurants they can afford to visit and I don’t think there is anything wrong with eating fast food occasionally. I believe that children and families that eat too much fast food will do so regardless if they are getting a Mickey Mouse car toy or the Draw Your Avatar colouring book, and in this case, I would prefer them to get a more creative giveaway which I believe a Draw Your Avatar colouring book would be.

Comparison to other designs on the market

When I compare the Draw your Avatar workshop to the digital tools I have analysed I see the Draw Your Monster app as the product that comes closest to what I am doing. Both have avatar making as a central activity. The Draw Your Monster app is using 2D images to create two-dimensional avatars for a boss fight, which is a slightly different approach. Another project that I have analysed is the game Sims 4 which has a very advanced 3D avatar creator. The Sims avatars do look very different to the Draw Your Avatar app due to the hand-drawn UV maps that Draw Your Avatar is using. The Sims4 avatars are made for an already existing game while the Draw Your Avatar app is more of a game making workshop.

I have not found any digital game engine or game workshop that allows children to draw different parts for a 3D avatar, using UV maps, like the Draw Your Avatar workshop does.

However, the art installation Future Park is using the same UV map method as Draw Your Avatar. Their 3D models are much simpler and serve the purpose of being a part of an interactive art installation in different museums and amusement parks. In short Future Park and the Draw Your Avatar workshop have similarities, but they are designed to be used in different contexts.

The conclusion I draw from the comparisons I made is that the Draw Your Avatar workshop is a unique design project with its own niche.

The Digital Makers' Club

During my workshop series I had more ideas for additional digital crafting tools for children. I would like to make more colouring books with different themed avatars as well as invest more into the creation of the gameplay and a child-friendly online platform where games and tutorials can be shared. To create a platform where all of these ideas could come together I invented the Digital Makers' Club.

I chose the word "Club" because I want children to feel like a part of a community.

I chose the word "Maker"because I want to be inclusive of different creative methods, such as designing, programming, drawing etc.

I chose the word "Digital" because I wanted to underline the importance of digital tools for this community and their members' making process.

Exploring the Digital Makers' Club further was outside of the scope of this Master's thesis, but I still wanted to use its name as a brand for my Draw Your Avatar project and as an example of how this project could be continued and expanded.

Final conclusion

My first design question for this project was: How can children be creators in and for a digital environment and how can I, through design, help children to do so?

My game-making workshop series is one answer to this question. However, I did not want to continue working as a pedagogue and technical supporter doing these workshops. Therefore I shifted the focus more on design when I transformed the workshop series into my final design project "Draw Your Avatar". In the concept app "Draw Your Avatar" I wanted to replace my role as a technical supporter and pedagog, this app would also make the workshops accessible for a larger number of children.

It was difficult to categorise the Draw Your Avatar app and the colouring book as either tools or a workshop. Looking at the final design I conclude they are workshops because they are not made for one particular task but instead they guide their users through a predefined making process as workshops do.

I see both the workshops I had in person as well as the Draw Your Avatar workshop rather as an introduction to digital making than a full digital game-making course. My workshops could have included more gameplay design to make the children's games even more fun. I hope that the experience of seeing one's analog drawings becoming three-dimensional objects that one can interact with in a digital environment will inspire children to engage more in digital making activities.

I tried to keep as many activities from the workshop series as possible in the Draw Your Avatar workshop. This was especially challenging for the avatar making process. During the workshop series, I 3D modelled the children's avatar drawings. A procedure that was unique

to each child's design and therefore could not be automated. To give the children more choices for their avatar design process in the Draw Your Avatar app I pre-modelled a series of accessories. These accessories are based on the original character drawings from the children in my workshop series and can be added to the base avatar model in the app. I think this approach is a good compromise. More accessories and base models could be added in the future to give even the children even more creative choices. I conclude that the Draw Your Avatar app can support children technically during all workshop steps.

Regarding the graphic and communication design aspect of both the app and the colouring book, I conclude that this project is not finished. During my last design phase for this Master's thesis, I focused on making the UI usable and did not have enough time to focus on its attractiveness from the perspective of a child. To continue this project I would like to further develop the corporate design and work on its overall look. I also would like to make a testable prototype of the app and test the whole workshop with children.

My second design question was: How can children be a part of a creative digital community and share their creations with others?

Transferring the sense of community from the game making workshop series to the Draw Your Avatar workshop came with two main challenges. The first challenge was that I wanted to prioritise children's safety and well-being while engaging with online communities as I mentioned in my second goal for digital citizenship education. I conclude that the Draw Your Avatar app is taking care of this challenge by not collecting any personal data from the children and not allowing communication between children and strangers.

The second challenge was to encourage communication and the exchange of ideas between children in a digital way. The game-sharing function of the Draw Your Avatar app makes it easy to share games with friends and family, and they don't need to have the app to test the game. This sharing process is only possible with known contacts using different messenger services, email or Bluetooth. I conclude that the Draw Your Avatar app creates a community of digital makers by allowing children to exchange their games with others.

Looking back on all projects and the research I have done for this Master's thesis I come to the following conclusion regarding my work and its relevance to child culture. I think what is special about using analog drawings for digital game making is that children get to see how they did their crafting process in the digital end result. This experience has shown to be empowering to the children I worked with and goes along with the deeper message that I wanted to communicate to children as digital citizens. This message is that everyone can be a digital maker and shape internet culture through digital art. Using children's drawings for digital game making has not been explored enough in the digital makers' community. Therefore I think that the Draw Your Avatar workshop, my digital game-making workshop series and the Analog Game Engine are all relevant projects for including more digital making into child culture.

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Appendix A: Analog Game Engine playtest notes

I did these playtests together with the help of the other design interns at Albert: Lina, Pratchi and Alberts UX researcher Klara. Their names will appear in the playtest notes.

Age:	5	Improvements:
Previous knowledge of Albert:	Has never played with Albert content before.	
First impression:	Choses pink Tablet Grandpa calls it a paper TV Lina asks what this is "it is an iPad“ A bit shy since the first test. Looked at instructions with grandpa.	
Background Crafting:	Grandpa does not fully understand that it will be a video game but he understands the first step. "I know just one thing. This (character sheet) is supposed to be cut." Grandma suggests starting to paint the background. is starting to paint the start sign very carefully with coloured pencils. is a bit unsure. Grandma suggests painting the sky. Grandpa asked what colour the sky is supposed to have. answers blue, chooses blue coloured pencil and paints the sky. "I think this is so much (to paint)" Grandpa shows how to draw more efficient continues painting the sky like Grandpa said Grandpa suggests to colour the letters of the start sign colours letters of start sign Lina suggests that the stickers could also be used. (grandma is surprised about that)	more organised stickers

	"This is good (because you don't need to paint everything) This is needed." chooses the green flower ground stickers and puts them on to the flower ground on the background (because it is the same pattern) loses interest and looks at Lina Grandpa suggests more stickers Lina suggests to glue to backgrounds together "Where do you glue?" Grandpa shows where to glue glues backgrounds together picks up the stickers again -does the character- picks up the sticker to continue on the background continues with the green flower ground stickers -puts everything together- comes back to decorating the background choses mushroom sticker and puts it on with a fold - but fixes it time is over "I am not done" Grandpa says that there could be a lot of time spent with this project	
Character Crafting:	Grandpa suggests to choose a character choses the ready made Mini figure cuts out the strip with Mini on Grandpa shows the instruction and suggests to paint the character more Is confused on where to paint Lina shows character stickers "What should I do with this?" puts chef heat sticker on Minis head wants to work more on the background	bigger sticker sheet for characters

Game Play:	puts the background in the iPad "I could glue together more backgrounds" "the background is stuck for some reason" puts the figure into the iPad (from the outside) but it goes underneath puts the figure in from the inner side of the iPad which is easier and works wants to decorate the background more Lina shows how figures and Background can move wants to decorate the Background first	

Age:	4	Improvements:
Previous knowledge of Albert:	older brothers have tried the Junior App but it was too hard so hasn't tried it.	
First impression:	Choses dark grey tablet. Tapping the app icons noticing the gaps researched the iPad first	
Background Crafting:	Mother is reading instructions "What are we supposed to do?" mother explains that this will be a game and that the background goes into the iPad understands and tries it out - gets excited about it mother says: “ You can make it longer” looking at instruction "Can I make a guy?" I show the stickers and materials for the character design - comes back to the background and starts to paint it follows the lines mother starts to glue the backgrounds together makes a plan for game	

Character Crafting:	chooses astronaut character mother shows character stickers gets excited and starts using them switches to the background - starts cutting wants to cut out the figure even though mother tells differently cuts the figure out can't imagine how the figures on the Stick will work. continues with background	bigger sticker sheet clearer instruction on the character so that they won't be cut out on the black outline
Game Play:	character is too small mother suggests testing with one of the other figures plays game together with mother plays boss fight "next game" plays game again with mother the paper gets stuck sometimes plays buss fight with mother again	bigger tablet opening so the paper does not get stuck

Age:	4	Improvements:
Previous knowledge of Albert:	Has played Albert quite a lot and has a high engagement with the characters before the test.	
First impression:	colour - dark grey. Tapping the app icons (recognise the apps) Calling it an iPad grabbed the characters that were in the bottom. "I can't find“	How should the order be organised? Bigger sticker sheet - to create overview

Background Crafting:	Klara instructs on how to put two papers together. Where to glue - distracted by the stickers. Decorates the characters. Klara instructs to paint/build the scene I just want the shiny - (diamonds) Put the diamonds on the glue area - even though he had glued it there before, in the previous sheet. "sorry perhaps I filled this one" - thinks he should paint the glue area as blue as in the instructions. Engaged in painting - focused. (boat and vampire house) No problems adding the stickers - use the "tunna" as a wheel - able to be creative in Put star - since it is the best Problems getting the mushroom sticker " This is difficult to get off" - Klara needs to help Mushroom is a nose on the house - imaginative Mushroom as a hat - put the sticker over the edge - won't be able to put it in the iPad. Instruction to understand how to put the background in the iPad. Does not understand without being shown how to. "Why doesn't it work!?" Starts to tell a story when he puts the background in the iPad, continue the story while putting stickers on it. Try to put it in again, put it under instead. Klara tells to pick a character- he takes a long time to pick the character. Outlined astronaut. Paint himself in the character - knows that it is him that is the astronaut.	Could you print on both sides - to make it be able to use again Make them a part of a bigger sheet and categorise them as avatar The details on the mushroom - remove
Character Crafting:	No problem to cut out - but what should we tell children and parents that they should use scissors at that age? Cut the character - does not keep the long strip. - Trying to put in the little character without the handle - from the side. Wants to glue the character on the paper. Cut out the Matchi outlined - really wants to finish colouring the character before putting it in the game.	Could they be pre-cutted/ perforation

Game Play:	Needs help to put the character on the iPad - Ooohh When he tries himself, the character ends up under the background. The background paper gets stuck and you can't move it. "Let's try it out!" Behind again. Would not be able to control the background and the figures simultaneously. Storytelling - until the frame finishes.	

Age:	6	Improvements:
Previous knowledge of Albert:	Has never played with Albert content before.	
First impression:	Choses pink tablet curious listens to mother reading instructions	
Background Crafting:	starts to paint background sees what sister is doing and glues background as well very engaged wants mother to draw a my little pony mother draws my little pony draws more laughs about drawings mother explains about characters - mother gives stickers starts to put stickers mother explains the iPad puts more stickers I suggest to add more backgrounds	

	glues on extra background adds more stickers adds one more background is exited mother puts it in the iPad	
Character Crafting:	starts cutting character slides	
Game Play:	mother puts the background in puts the figure in- mother helps plays the game with mother collects coins "ding, ding, ding..." changes character, because game is now under water puts more stickers to continue the game wants to continue decorating	

Age:	4	Improvements:
Previous knowledge of Albert:	Has never played with Albert content before.	
First impression:	Choses pink tablet starts tapping on the Apps gets excited about the stickers	
Background Crafting:	starts to paint background mother suggests to glue the background glues the background "It is going to be blue" (instruction show glue as blue paint) continues painting	change glue instruction

	very engaged talks with mother mother draws my little pony as for sister draws more mother explains characters - draws more on the background very engaged starts to put on stickers makes little stories draws a house I suggest to add more backgrounds wants it to be as gameplayed on mothers phone recognise that it is a video game mother glues on an extra background puts on more stickers adds coins paints more and adds more stickers "rainbow"	
Character Crafting:	starts drawing on characters starts to put on stickers on the characters starts cutting out the character slide with the decorated astronaut	
Game Play:	explains game to mother puts game in with help of mother puts in character with help of mother plays game with mother mother suggests the background of the character being see through wants to decorate more wants to continue	making transparent character slides

Age:	6	Improvements:
Previous knowledge of Albert:	Has played Albert before, has some engagement to the characters before the test.	
First impression:	Choses blue tablet wipes background with finger "how do I change pages?" explains how the iPad and the Apps work iPad has touch screen wants to make the iPad interactive sees stickers and gets excited "look how many stickers“	bigger gaps
Background Crafting:	father looks at instruction and says "so we will make a game" gets excited explains how it works looks at instructions with father "first we will use the stickers" father suggests to glue the background "Ok where is the background looks through the material and discovers characters things the characters are going to be glued on to the background wants to make multiple games at the same time father suggests to start with one choses the background with most details because the other ones are so empty looking father suggests to glue together the backgrounds glues it on the most outer edge because wants to keep the black lines visible father says that looks like a wall in the game does not want to have a wall and reglues the background	no white edges where to glue

	explains how the mechanism works father shows gaps at the iPad testing the background paper gets stuck "no we need to put stickers on, but first we make a guy" has a discussion with father about the game and potential obstacles for the character to jump over and stars and diamants to collect explains game while putting stickers has very concrete ideas for the different obstacle I suggest that the background can also be longer is very engaged father suggests to glue one more background has put on more stickers and another background says that there is a coin as a price and that you can walk on top of the mushrooms says that when this game is over there will directly be a new game talks more about game adds more different obstacles wants to make a character time is over continues to make the game longer makes plans with Leonie fixes paper edges with stickers tests game again wants to make new game wants to have the same start again, therefore uses the cloud stickers as a template to make cloud outline explains Leonie what the different stickers mean in the game	

Character Crafting:	wants to make a character father shows that you can also do your own character recognises Multi - "the game fits too many different characters" "everything is pink therefore I want her (Addi)" starts cutting wants to make multiple Apps explains what App is what game wants to test game time is over wants to make more characters - all beside the astronaut because it has no face starts cutting starts talking with Leonie "I like crafting" wants to test the characters to see which one is the best thinks that you need to be two people to control the game, because the paper can get stuck explains that character has different ways to move	bigger character sticker sheet
Game Play:	presses button and Apps to start game puts in Character father plays background (gets stuck) "this is not good it gets stuck all the time" plays game, collects life, loses game, starts game again "I wish the iPad was thicker (so the background does not get stuck)" manages to put in the background on her own always touches the Apps to start the game sometimes the character gets underneath plays together with Leonie	

	wants to make one game for each App	

Appendix B: Digital Game Making tools

Tool details:	Name: Roblox Studio Company: Roblox Corporation Product Category: Game Engine Running devices: PC, Mac Cost: free
Who is the target group of this tool?	Teenagers, and young adults
How popular is this tool?	According to https://www.statista.com/statistics/1192573/daily-active-users-global-roblox/ Roblox has 49.5 million daily active users worldwide - most users are playing not uploading games
How easy is this tool to learn?	The interface has medium complexity. There are a lot of tutorials and coding will eventually be needed
How does this tool support their users' learning process for video game making?	There is a big community with a lot of tutorials that get you started with Roblox.
To what degree does this tool allow its users to write their own code?	Roblox studio supports the coding languages Lua eventually you can also use the coding languages
How much freedom do the users have when it comes to using and making their own artwork?	A lot. You can create your own artwork and import it to Roblox. You can code
How much freedom do the users have when designing the gameplay?	A lot. The only limitation is that Roblox studio games are made to be played on the Roblox system.
How diverse can the games created with this tool be?	Very diverse

Tool details:	Toca Builders Toca Boca AB App tablets and smartphones $3.99/ 40kr
Who is the target group of this tool?	4+, Made for Ages 6–8

How popular is this tool?	App Store: 4.2 Stars 452 Ratings Google Play Store: 4.2 Stars 3.574 Ratings The different products of this brand have been downloaded over 100 Million times world wide.
How easy is this tool to learn?	For most users it seems to be quite intuitive to learn.
How does this tool support their users' learning process for video game making?	It definitely supports three dimensional thinking and 3D modelling on a very basic beginner level. This could be a good start for learning how to design a game world and game art.
To what degree does this tool allow its users to write their own code?	Not at all.
How much freedom do the users have when it comes to using and making their own artwork?	Some. They can only use blocks in predefined colours to build their models. They can only build up to 6 blocks high.
How much freedom do the users have when designing the gameplay?	They can build a world and move around in it, but Toca Builders is not really made to make video games.
How diverse can the games created with this tool be?	The outcome when using Toca Builders will always be some box-style sculptures that you can not really interact with.

Tool details:	Super Mario Maker Nintendo Video Game Nintendo Switch, Wii U, Nintendo 3DS Ca. 400 kr
Who is the target group of this tool?	3 and older
How popular is this tool?	amazon.com (Super Mario Maker 2) 4.8 Stars 16.585 Ratings
How easy is this tool to learn?	Intuitive
How does this tool support their users' learning process for video game making?	The users can practice gameplay design of 2D platform games
To what degree does this tool allow its users to write their own code?	Not at all.
How much freedom do the users have when it comes to using and making their own artwork?	None at all.

How much freedom do the users have when designing the gameplay?	The user can only make 2D Platform Games with the Game Objects from Nintendo. But there are a lot of possibilities in that scope.
How diverse can the games created with this tool be?	The Outcome will always be a Super Mario game. The user can control the level of difficulty.

Tool details:	Scratch MIT Media Lab Online Game Engine Every device that has Internet Free of charge (donation based)
Who is the target group of this tool?	8 to 16-year-olds
How popular is this tool?	According to Scratch, Scratch has the largest children coding community in the world. Scratch exists in 70 languages.
How easy is this tool to learn?	There are a lot of free tutorials to start with. Getting started is quite easy and there are a lot of things to learn through trying. Overall quite intuitive.
How does this tool support their users' learning process for video game making?	First of all Scratch is meant to teach children the basics of static coding. It also comes with a simple paint tool that is vector based and with a sound editor where children can record their own sounds. Scratch also opens up a lot of possibilities for gameplay design.
To what degree does this tool allow its users to write their own code?	A lot. Scratch describes itself as a visual coding language. It is beginner-friendly but can also be used for more complex programming. It is not an object-oriented language and therefore comes with some limitations.
How much freedom do the users have when it comes to using and making their own artwork?	The user can create 2D artwork directly on the Scratch website, upload images and create sound elements for their game.
How much freedom do the users have when designing the gameplay?	All the freedom that a static coding language has to offer, which is already a lot.
How diverse can the games created with this tool be?	Very diverse. The user can make all categories of video games both as single and multiplayer. But there are some limitations to storage size.

Tool details:	Minecraft Mojang Studios Video Game PC/Mac/Tablet $26.95

Who is the target group of this tool?	Some parts are for 7+, some parts are for 13+ do to the content of the game
How popular is this tool?	by 2020, *Minecraft* had sold a grand total of 200 million copies (source from GGRecon: https://www.ggrecon.com/articles/its-2021-and-minecraft-is-still-dominating-video-game-sales-charts/#:~:text=It%20was%20reported%20by%20Statisa,total%20of%20200%20million%20copies.&text=The%20Pocket%20Edition%20of%20the,400%20million%20downloads%20since%202017)
How easy is this tool to learn?	Minecraft (Education Edition)
How does this tool support their users' learning process for video game making?	The user gets to play an actual video game. The user can build their own world in 3D in a very intuitive way. The user can work with code and therefore create a gameplay. Minecraft has a large online community. The game is about the user telling stories.
To what degree does this tool allow its users to write their own code?	There are modifications (mods) from third party websites for Minecraft that enable the user to code. But there is no coding that is encouraged through the original game.
How much freedom do the users have when it comes to using and making their own artwork?	The user can express everything through cubes.
How much freedom do the users have when designing the gameplay?	With the different Mods there is a lot of freedom
How diverse can the games created with this tool be?	Very diverse through using Mods. But everything will always have the cube look.

Tool details:	The Sims4 EA Games Video Game PC/Mac, Smartphone, Tablet Free trial / monthly subscription $4.99/month
Who is the target group of this tool?	12+ (do to content)
How popular is this tool?	App Store: 4.7 Stars 555K Ratings Google Play Store: 4,2 Stars 1.498.301 Ratings The Sims 1 came out in 2000. Today there is already The Sims 4 on the market with a large global community
How easy is this tool to learn?	Quite intuitive. Learning through playing

How does this tool support their users' learning process for video game making?	It supports storytelling and Character art making.
To what degree does this tool allow its users to write their own code?	Not at all.
How much freedom do the users have when it comes to using and making their own art work?	The user can only make human bodys, but has a lot of freedom when choosing colours, hairstyles, clothing… The Sims4 even contained a simple sculpting tool where the shape of the base mesh can be directly manipulated.
How much freedom do the users have when designing the gameplay?	The Sims is all about storytelling and role play. The player is shaping the story while playing the game. The Sims is supposed to be a human-life-simulator.
How diverse can the games created with this tool be?	The user can tell all the stories with up to 8 characters that they can imagine.

Tool details:	Unity Unity Technologies Game Engine PC/Mac… Free of charge for small users free for companies below $100K in revenues
Who is the target group of this tool?	Video Game Companies and people with some basic coding skills
How popular is this tool?	There are a lot of professional companies using this tool (Albert as well), The support community on GitHub, Youtube and other websites is huge (based on my own experience)
How easy is this tool to learn?	Unity requires a lot of pre knowledge in C# coding. It is only available in English and the UI of Unity is quite complex with a lot of features to explore and to understand. There is a lot of documentation for all the features and a big community around Unity. The User needs to be good at formulating questions and to find answers online.
How much does this tool support their users' learning process for video game making?	Since the documentation and the support community is so good, everyone that can read and write in English and has a high frustration tolerance can get started with Unity. It is not an intuitive tool to learn.
To what degree does this tool allow its users to write their own code?	The user's skills are the limit.

How much freedom do the users have when it comes to using and making their own artwork?	The user can import 3D models and animations in a variety of different file types as well as images, videos and sound files. In Unity self the user can create simple 3D forms such as cube, capsel, zylinder, sphere, … and UI layouts. There will be a way to use whatever program for artwork and import the result to Unity.
How much freedom do the users have when designing the gameplay?	All the freedom.
How diverse can the games created with this tool be?	The User can make Video Games of all genres and export them as/ for mobile Apps, PC/Mac, web Game, Xbox, Playstation. The user can make Games for virtual reality. The user can make Apps of different kind (Also websites but that comes with some downsides…)

Tool details:	Draw Your Game Zero One SAS App Designed for tablets, but works on smartphones too Mainly free of charge
Who is the target group of this tool?	4+ (it seems like a lot of adults are using this App as well)
How popular is this tool?	App Store 3.8 Stars 67 Ratings Google Play Store: 3.2 Stars 167.976 Ratings
How easy is this tool to learn?	Super easy and intuitive.
How much does this tool support their users' learning process for video game making?	With this tool the users are mainly focusing on designing the gameplay of a single player 2D video game.
To what degree does this tool allow its users to write their own code?	Not at all.
How much freedom do the users have when it comes to using and making their own artwork?	Some. They can not design the character. Every form and colour that is used has a functionality for the coding the user needs to stay in the colour coding and more detailed forms might affect the gameplay.
How much freedom do the users have when designing the gameplay?	The user can decide between making an escape maze kind of game or making a game where different checkpoints need to be destroyed. With this game engine the user can only make 2D, single player puzzle games. (No enemies, no time, no other players, no collectable objects…)
How diverse can the games created with this tool be?	Very diverse for not needing any coding at all.

Tool details:	Future Park Team Lab Museum Installation
Who is the target group of this tool?	Families
How popular is this tool?	Currently this exhibition is exhibited at 27 Museums world wide.
How easy is this tool to learn?	Super easy
How much does this tool support their users' learning process for video game making?	It supports a fascination for collaborative digital creative work.
To what degree does this tool allow its users to write their own code?	Non at all
How much freedom do the users have when it comes to using and making their own artwork?	The visitors get an outline of a shape on paper that they can colour(human, house, fish, …)
How much freedom do the users have when designing the gameplay?	Non at all
How diverse can the games created with this tool be?	Very diverse when it comes to the designs of the art work.

Tool details:	Draw Your Monster Zero-One App Smartphone / Tablet Paid Advertising
Who is the target group of this tool?	Everyone (Play Store), 9+ (App Store)
How popular is this tool?	App Store: No rating Google Play Store: 3.9 Stars 3411 Ratings
How easy is this tool to learn?	Super easy
How much does this tool support their users' learning process for video game making?	It supports practising character design and some basic rigging for animation.
To what degree does this tool allow its users to write their own code?	Not at all.
How much freedom do the users have when it comes to using and making their own artwork?	A lot. But only in 2D and the user can only animate with the usage of a human body rig.

How much freedom do the users have when designing the game?	None at all. You can only make a boss fight with this game.
How diverse can the games created with this tool be?	The characters can be quite diverse but the gameplay will never change.