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# Aesthetic Design of Applied Games

Designing Games for Promoting Awareness about Visual Impairment

Master's thesis in Computer science and engineering

Markus Grahm

Hedy Pettersson



MASTER'S THESIS 2024

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Cover: Image created using the assets from the game Fabian and Fables, which features the main character Fabian in a forest environment.

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## Abstract

Games can be more than just entertaining, they can be utilized for more purposes, such as spreading knowledge and changing player behaviour. Applied games emphasise these other purposes. This thesis aimed to explore how different parts of Aesthetics could be utilized in order to further the purpose of an applied game. The question posed being “*What should be considered when designing aesthetics to promote awareness through an applied game?*”. A number of considerations were created, which together would form the parts of a larger SWOT analysis. These were formed through the development of an applied game called *Fabian and Fables*, which tries to spread awareness about the experiences of those with visual impairments. The game was created in collaboration with S. Dahlborg and E. Ekroth. They posed a similar question which focused on Gameplay as opposed to Aesthetics, which is the focus of this thesis.

Keywords: Applied Games, Serious Games, Awareness, Aesthetics, Visual Impairment, SWOT.



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# 1

## Introduction

In recent times games have become more popular and are now able to reach large audiences thanks to the increased availability of technology [1]. Although games' two primary functions often are seen to be enjoyment and escapism, developers have started to dive further into utilizing the medium to promote awareness through applied games [2]. These are games that attempt to make the player aware of different issues around the world that might otherwise not be apparent in their everyday life. This can include anything from disabilities, mental health, science, social dilemmas and more. In other words applied games could be useful to bring more light to any area that might be underrepresented to commonly misunderstood.

In this thesis we wanted to explore the aesthetic design and its role in applied games through the development of an applied game, specifically with the topic of visual impairment. This project was done in collaboration with Psyon Games [3], from which we have established contact and received a mentor who has prior experience of developing applied games. We also wanted to establish contact with different Swedish organizations working with visual impairment, to make sure that the experiences of a visually impaired person were accurately and respectfully represented. With this paper, we aimed to answer the question:

**“What should be considered when designing aesthetics to promote awareness through an applied game?”**

In this case, specifically an applied game that focuses on visual impairment. There may be several aspects that could be considered when answering this question. These could have different positives and negatives, and could depend on a number of variables. Because there might be context needed to be considered for each aspect we believe a SWOT analysis could be the most appropriate way to present each of these aspects. Therefore this paper will produce several SWOT analysis to evaluate each aspect and how they have contributed to bring more awareness specifically to visual awareness. In order to assure that the aspects found are relevant and that the area is thoroughly explored, this paper will go through the design process of an applied game which will be developed in collaboration with S. Dahlborg and E. Ekroth who are writing a sister thesis with a gameplay perspective[4].

When creating a game about the topic of visual impairment there are multiple things to consider. Sound and vision are the senses often relied on for video games. With visual impairment as the topic in mind, especially the visual part of the game could

be a challenging aspect to deal with. As seen in previous examples there are multiple ways to approach this. Some use no visual elements at all, and some rely heavily on visuals.

A problem can often be dealt with in multiple ways, of which there might be both positive and negative aspects. This is something to which there might not be any right or wrong answers. In order to gain some clarity into this we have posed a question which we will attempt to answer. The question being “What should be considered when designing aesthetics to promote awareness through an applied game?”, and perhaps in this project more specifically *What should be considered when designing aesthetics to promote awareness about visual impairment and blindness through an applied game?*

This thesis is meant for developers who are interested in making an applied game and those who are interested in how to make games which relate to visual impairment and blindness in general. Perhaps also those who are interested in a different topic could learn about the process of how to research and connect a topic for the making of an applied game.

Aesthetical design in this project refers primarily to the design of visual elements, which informs the player about the state of the game and ties together the players mental image to the application itself. This includes, but is not limited to, graphical design, sound design, UI design, and narrative design to mention a few. All these elements are supposed to be tied together in a respectful way to ensure that the chosen topic and those affected by it were not misrepresented.

This thesis will not explore how to develop games for visually impaired players, as the intention behind the product is rather to bring attention and awareness to visual impairment for those with little knowledge. The applied game developed will not be a finished game. Instead, we aimed to create a prototype demo, a smaller and more finished portion of what would be a bigger game.

# 2

## Theory

This chapter introduces Applied Games, and other related concepts. It will also introduce Aesthetics, and some information regarding Visual Impairment and concepts which were related to the project.

### 2.1 Applied Games

Video games have become increasingly popular over time, and can be regarded as a medium of similar nature to film and literature. While primarily focused on entertainment, there is a potential to use games for other purposes, such as education and spreading awareness. There are multiple terms for media which try to combine both education and entertainment, like edutainment, a term and genre of games popular during the 90s and 2000s [2]. This however had problems, which has been described as following:

The game industry has already witnessed the failure of edutainment, an awkward combination of educational software lightly sprinkled with game-like interfaces and cute dialog [5, p. 29].

A more modern (and perhaps more successful) take on edutainment might be gamification, as seen in applications such as Duolingo [6], or websites like Khan Academy [7], etc. Gamification makes use of typical elements seen in games such as scores, rankings, and rewards systems [8] to further some purpose. Gamification can however be applied to non-educational areas as well. We can see non-educational examples of this in (digital) stamp cards from coffee shops or fast-food restaurants, where points through purchases can be collected and potentially give a reward later [9] [10].

Applied games can be seen as being on the opposite side of a spectrum, with edutainment and gamification on the other side. Applied games include aspects and elements of a topic to make it more educational or meaningful, while keeping the primary focus on entertainment. The others instead try to make use of game elements to further for example educational, or marketing purposes.

One definition of applied games can be seen below:

Applied games are defined as an implementation of a subject, inspired by and designed along a context- and user-centric transfer of design

concepts and qualities from the game world[2, p. 101].

The term “Applied Games” is similar to, and sometimes used interchangeably, with the perhaps more common term “Serious Games” and can also be connected to education. As such, it can be a bit unclear what one means when talking about applied games.

In order for the game to be successful in teaching the player something it is important to not forget that at its core an applied game is still a game. It needs to incorporate the elements of a normal game, elements that make the game enjoyable. Even educational games in which the learning is emphasized even more one can not forget about the game design [11]. Adding educational elements to a game therefore needs to be done carefully, as they might otherwise work against the core purpose of the game [12]. Applied games and games of similar nature offer a way to make learning more appealing, and can sometimes offer the players experiences which they might otherwise not encounter [13].

Looking at the term serious games these types of games are often used to simulate experiences which would otherwise be challenging to recreate. Some examples include military operations, large scale crisis management, and surgical training [14], [15].

Applied games also show potential in regards to mental health, as in terms of making a potential service or application more appealing, engaging, and effective [8]. Applied games can also be used to encourage players to exercise and to take care of their physical body as seen with examples like Pokémon Go [16], Just Dance [17], and Ring Fit Adventure [18].

There are no limitations to what kind of topics applied games can cover. They can be used to spread awareness and knowledge about any topic for any cause. Specifics such as genre and general gameplay and more is to be decided by the developers and adjusted depending on what the topic is.

Like any other media such as film and literature, video games can provide both entertainment and meaningful experiences for its players [19], [20]. What kind of effect a game has on its players could depend on the genre and theme of the game itself. Nonetheless, the experiences of video games can have an effect on the players emotions and behaviors [21], and perhaps more so than any of the other traditional mediums [20].

## 2.2 Aesthetics

Aesthetics is a word which can be defined in a number of different ways. Within the world of game development and game research one particular framework and definition comes to mind, a framework called MDA (Mechanics, Dynamics, and Aesthetics). Aesthetics from the perspective of the MDA framework is described as ‘...the desirable emotional responses evoked in the player, when she interacts with the game system’[22].

Aesthetics here are seen as the component of the game which is “fun”, and a suggested list of vocabulary is provided in order to more easily define parts of a game’s aesthetic. The words suggested were:

- Sensation (Game as sense-pleasure)
- Fantasy (Game as make-believe)
- Narrative (Game as drama)
- Challenge (Game as obstacle course)
- Fellowship (Game as social framework)
- Discovery (Game as uncharted territory)
- Expression (Game as self-discovery)
- Submission (Game as pastime)

With these words one can classify what specific kind of “fun” a game provides, as not all games are fun in the same way. Aesthetics in this sense describes the feelings of the player rather than the things that are causing the feelings.

This is not the definition of aesthetic that will be used in this thesis. Instead we created our own, which was developed early in the process of the project. To see the precise definition which will be used, see section 5.1.9.

Aesthetics can be an important factor in making a game appealing, and might be what makes some games great rather than “just okay” [23], [24]. Four elements which were noted in [25] as adding to the entertaining aspect of games were overall game design, visual presentation, audio presentation, and complexity and diversity. Visual and audio presentation are aspects of the aesthetics of the game.

When it comes to research regarding games, aesthetics tend to be dismissed or reduced to only graphics. Corti notes that ‘... far too often, the role of aesthetics in the research ... is relegated to a surface discussion about graphics, or the topic is neglected altogether’ [24, p. 1]. Because of this it might be important to examine aesthetics as the primary focus point, and also to have an inclusive definition of what aesthetics are.

Story is, as mentioned earlier, a part of the aesthetics of a game. In order to make a meaningful game, story could play an important role [5], [19]. This might therefore be especially relevant for applied games.

## 2.3 Visual Impairment

Visual impairment is a broad spectrum that can be generally categorized into four categories: low vision, partially sighted, legally blind and totally blind [26]. A common misconception is that blindness refers to individuals who are not able to see anything and only blackness, while in reality this is very rare [27]. Instead it is more common for the field of vision to become highly limited or highly blurred. [27]

goes through several conditions of blindness and shows examples of how they might affect one's vision.

Many of these conditions lead to spotty or very small fields of views, which would make it difficult to rely on vision for everyday activities. But some function remains which makes it possible to track faces and rely on light to make minor decisions and can make the individual appear as a sighted person.

In society there are certain areas of interest that people with visual impairments struggle with especially. Some are related to the accessibility, some are related to lack of knowledge from the surroundings. Some of the more significant ones are identified and explored in a study from [28], which include violence, commute, communication, leisure, and education. The study focuses on students with visual impairments, their needs and problems within these areas, and especially highlights some of the needs and problems related to education. For example, inaccessibility to books and other materials, and better education related to visual impairment for both themselves and others are mentioned.

[28] also discusses the problems with commuting. It does note that for the particular group participating in the survey might not be representative to people with visual impairment in general. The study in [29] also discusses the topic of commute in relation to visual impairments. It points out that traveling is usually a larger issue in urban areas as compared to highly developed areas such as cities. This because areas like cities have better accessibility, although there are still areas of improvement. More accessibility leads to more independence, which in turn leads to increased quality of life [29].

### 2.3.1 Orientation and Mobility

Orientation and Mobility (O&M) [30] is something which is taught to those who are visually impaired. The goal of O&M is to help people with visual impairments develop certain skills and improve their utilization of certain tools and senses.

Orientation focuses on spatial awareness. There are multiple ways to improve one's orientation without vision. Examples include identifying landmarks, developing mental maps, and information gathering through other senses about one's surroundings [31].

Mobility focuses on the ability to utilize spatial awareness, and being able to move both efficiently and safely. The usage of visual aids are especially important, in order to develop these skills and work towards higher degrees of individuality [31].

### 2.3.2 Visual Aids

Those with low vision are often either near-sighted or far-sighted in such a way that can not be adjusted for with more common visual aids such as glasses or lenses [26]. Other visual aids such as magnifying devices, high contrasting colors, or brighter lighting can be of help [32], [33]. Given the right tools, these people can make use of their vision in a similar manner to someone who is not visually impaired. These

tools can also be useful for some partially sighted or legally blind individuals, but this depends from person to person as the limit to their sight might vary.

For those who are totally blind there are other aids which could be used. One example is human guides [34]. These people can be especially helpful when there is a strict time schedule, when navigate new areas, or when other aids are difficult to use. Two of the most common ones being white canes and guide dogs [34]. Which of the two is most suitable depend on the individual and the situation. The goal of both is to make the person not have to rely on other people, striving to become more self-sufficient.

These aids also serve a secondary purpose. They inform the surrounding public that the individual is visually impaired [35]. While this can be helpful in some cases, it can also be a disadvantage since there could be people trying to take advantage of the individual. Using these aids can cause both relief and anxiety, make people more independent but also more insecure.

Another example of aids which can be useful are tactile markings. Through changes made to the texture or appearance of an object one can differentiate it from other similar objects. Some examples of tactile markers are bump dots, 3D fabric paint, colorful stickers, or hair ties. These can be used to for example mark different buttons on appliances, to differentiate between shampoo and conditioner bottles, or to distinguish between different spice shakers [36], [37].

Different tactile markers have different strengths and weaknesses, and are suitable in depending on the situation. For instance, marking a shampoo bottle with a sticker might be troublesome if it dissolves in water, or if a new sticker is needed every time a new bottle is purchased. But a sticker might work well for marking buttons on a screen, or other more permanent fixtures.



# 3

## Background

In this chapter there will be several examples of applied games in general and specific ones which cover a the same topic. We will also cover a small part of the discussion regarding the representation of people with visual impairment and also people with other disabilities in general.

### 3.1 Examples of Applied Games

The following is a list of examples of games that we consider to be applied games. A more detailed description of what an applied game is can be seen in Section 2.1, and our own definition can be seen in Section 5.1.9.

- **Antidote COVID-19** [38] is a Tower Defence game which seeks to inform the players about the immune system and how it handles viruses and bacteria. Based on the original game Antidote, this game adds information specifically about the COVID-19 virus, how it works, and the importance of developing vaccines. Both the original Antidote and the COVID-19 versions were developed by Psyon Games[3].



Figure 3.1: Image from the Psyon Games press kit for Antidote COVID-19 [39]

- **Minecraft Education** [40] (formerly known as Minecraft: Education Edition) is a special edition of the game Minecraft which can be used in classroom settings to teach and learn about a number of different topics. Some examples include math, computer science, sustainability, chemistry, and more. Because of the structure of the game itself, it also allows educators to use it as a tool in the classroom setting.

### 3. Background

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- **X-Plane** [41] is a series of flight simulators which are commercially available, but could potentially be used as part of training in order to get a flight license in the US. Although it can be played more casually, with the right equipment connected it could simulate the process of flying a plane in a relatively realistic way and help players better understand the complexity of the process.



Figure 3.2: Promotional images for X-Plane 12 taken from its Steam page [41].

- **Mindlight** [42] is a puzzle adventure game which is meant to help children dealing with anxiety. Reading and analyzing the brainwaves of the player, the game then translates this into input for the game. Through the game the player will learn to recognise what their relaxed state feels like.
- **Celeste** [43] is a platforming game where the main character Madeline is climbing a mountain. The game portrays depression and anxiety through the main character and a personification of these emotions. The game explores these aspects through the narrative between the main character and NPCs (non-player character) as the player climbs the mountain. Many of the game elements are also representations of mental issues, and some gameplay elements are directly tied with how to deal with a panic attack or similar.

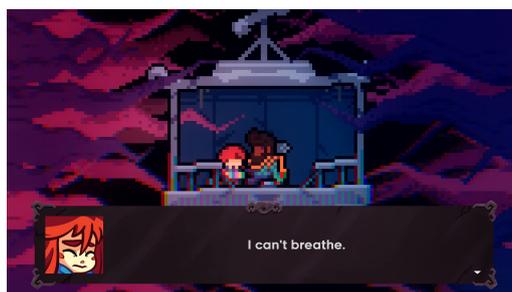


Figure 3.3: Promotional images for Celeste taken from its Steam page [43].

Applied games can cover a wide range of topics and are not limited to a specific genre, demographic, platform, or similar. It can be a simulator which mirrors the world closely, or more abstract with fantasy elements. The applied part of the game can for example be presented more through the gameplay as with Antidote, or more through the aesthetics as with Celeste.

## 3.2 Representation of Visual Impairment

Our understanding of the world is something which is learnt as we grow older, and is affected by our surroundings [44]. (Mass)media are a part of these surroundings. And so, representation in the media is important, as it affects the real world and how people interact with one another [45].

Blindness as a theme has been present in various media for a considerable time, in movies since the beginning of film itself [46], and in literature from thousands of years ago [47]. But these portrayals in the media are not always accurate, nor helpful. As with other disabilities and impairments, there is a tendency to either be portrayed overly negative [48], or overly “positive” and “inspirational”. While it might be more obvious why an overly negative portrayal might be problematic, it might be less obvious with the overly positive and inspirational portrayals.

Grue [49] describes some of the problems with these kinds of portrayals. People are presented not as people, but as objects of inspiration. The impairments are often seen as an individual problem which can be overcome through willpower and personal efforts, rather than problems with society being inaccessible. Everyday normal activities are great achievements, while simultaneously athletic accomplishments (such as in the paralympics) could be achieved by anyone, if they just tried hard enough.

Grue highlights the words “desirable but undesirable” from a passage by Goffman [50]. The words describe the idea that there is a balanced tradeoff,

A sharp mind compensates for a weak body; blindness implies second sight or special insight. Or, as is the case with Paralympic athletes: Impairment begets extraordinary willpower, leading to extraordinary achievement [49, p. 843].

This idea is not true for most people, and sheds a negative light especially on those who are unable to achieve the same as their peers. It also disregards outside factors such as economical means.

The exaggerated portrayals of people essentially reduces them to only one specific trait, their impairment. Whether it falls on the positive or the negative side, everything about that person is centered around the impairment rather than the person. So when it comes to representation what is needed is not necessarily blind characters, but rather characters who are blind [51].

It is therefore of great importance as a group of sighted persons to ensure that what we create is grounded in reality, and to consult with people with significant experience regarding visual impairment.

## 3.3 Representation in Video Games

There exists a number of games which feature visual impairment and blindness as the main topic. It seems that games which are in some way related to the topic tend to

be aimed towards those who also themselves are visually impaired. Most are audio games and have no visual elements at all, although there exist games that make use of visual elements extensively. Some games are meant to both be accessible to those with visual impairment, while also trying to simulate the experience of being visually impaired.

Even if a game is not simulating the experience of being visually impaired, it can still be representative of peoples experiences. In addition to examining games which cover the topic of Visual Impairment, it is important to also consider if the games representation of the topic is helpful. As mentioned previously, not all portrayals are good ones, something which applies to all media, including games.

Worth noting is also that a game about visual impairment is not always accessible to those with visual impairment. Although that seems to be a common trend, it is not necessarily a requirement. The following games are some examples of games that feature visual impairment as a major theme in the game.

- **A Blind Legend:** The game [52] centers around a famous knight Edward Blake, who is fighting to get his wife back after she was abducted by the king. Because Blake is blind he relies on his daughter to help him navigate the world as they travel through the kingdom to the king's castle. The game does not make use of any visual elements at all, relying solely on audio for its gameplay. The two core gameplay components are navigating the area to reach the goal, and fighting against the dangers along the way. It is a game that features a blind character, and is also accessible for those who are actually visually impaired or blind. When it comes to the portrayal of a character who is blind, it has been mentioned that some consider the game to be stereotypical [53].

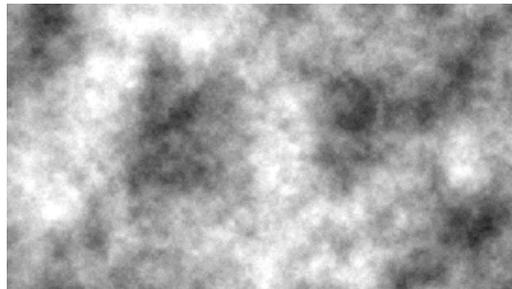


Figure 3.4: Promotional images for A Blind Legend taken from its Steam page. Showcases what is visible on screen while playing the game.

- **Lost in Blindness:** The main character of this game [54] is an archaeologist named Alex. He is especially knowledgeable regarding Mayan culture, and is invited by his old friend to examine a newly discovered temple in the Amazon rainforest. In their last adventure together Alex was blinded in an accident, and the game itself is played without visual elements. In this game navigation is also one of the core mechanics. Once a section of navigation is cleared, the player can review their navigation in the environment as they are shown a visual representation of how they moved. The game seems to be made with the intention to not only be enjoyed by the player, but by viewers as well.

Although the game is intended to be played without visuals, it is possible to turn on visuals with the intent of streaming it to others by turning on Streamer Mode.



Figure 3.5: Promotional images for *Lost in Blindness* taken from its Steam page. Showcases what viewers are seeing while playing in Streamer mode

- **Beyond Eyes:** The main character of this game [55] is a young girl named Rae, who is searching for her cat. While Rae is also a blind character, this game makes use of visuals extensively to represent her understanding of the world. While the world appears empty at first, as she walks around more and more parts of the world around her come into view for the player. Things she can hear can appear even if they are further away. There are some parts of the world that she misinterprets based on their sound which become clear when she gets closer, such as mistaking a sewer pipe for a fountain. The game has been praised for its beautiful visual elements, and criticized for its slow pacing.



Figure 3.6: Promotional images for *Beyond Eyes* taken from its Steam page



# 4

## Methodology

This chapter will cover some of the possible methods, software, and other various tools that could be relevant and could be used over the course of the project. At the end of the chapter, a brief plan of the project will be presented.

### 4.1 Wicked Problem

Design problems are often difficult because the knowledge and context needed to solve them are unknown at the start. Only once the designer has started working on the problem does these things become more apparent, making it difficult to come up with a perfect solution at the start. These are a special kind of problems which have been identified by designers, and are called wicked problems [56].

Wicked problems are defined by ten characteristics listed by [56]. Together they show a problem that is difficult to approach, does not have one right answer and has no set parameters. Each time a wicked problem is approached the approach can change and the work might need to adapt a lot. Therefore it is important to be aware if the problem being worked on is a wicked problem or not.

### 4.2 Workflow

When trying to tackle a wicked problem it is often useful to split it down into more refined parts with different milestones and purposes. The Double Diamond [57] is a method that attempts to give an overview of the workflow and something concrete to plan around.

This method breaks down the work process into two parts that each have a start and an end. The first phase is about brainstorming and setting the scope for the project while the second is about implementation and finalizing a product. Each of these parts starts by broadening the scope and then limiting and focusing the scope at the end of each phase. This helps the project by keeping in mind that it is important to explore many options and at the same time that the scope needs to be limited and finally settle on a solution or idea.

Another approach to this is the Triple Diamond [58]. This method is really similar to the double diamond but divides the work into three phases instead of two. This

third phase focuses more on research and testing between the ideation and implementation phases. This might be an important stage if there is a stakeholder outside of the project that the product and idea has to work with. But since there are three diamonds this method requires an overall bigger time scope than the double diamond.

When working in a team towards a wicked problem one possible workflow to utilize is Agile Workflow [59]. This workflow aims to divide the project into small tasks and delegate these tasks to smaller teams that will tackle each issue for a set time period called a sprint. This creates an adaptive progress that can easily take in more tasks for the team to tackle as well as quickly implement changes and perform testing to make sure that the product produces customer satisfaction. It also allows each member of the team to tackle new issues every sprint and not get stuck with the same work. This further makes sure that different parts of the team frequently interact with different parts of the product and helps to keep it unified. A similar workflow is Iterative Design [60].

Iterative Design is a cyclic design process where the same design steps are repeated in small loops. An instance of these loops could be planning to implementation to testing to analysis back to planning. This cycle allows for each step of the process to be analyzed and built upon to ensure user quality. The process allows for experimental work as the process of implementation and evaluation is short and can then be scaled up if efficient or dropped without a big loss of time. Although similar, the main difference is that iterative design aims to keep track and keep a steady workflow for a well defined product while agile allows for more flexibility and bigger scope changes while allowing for more user interaction and testing to evaluate each step.

Scrum[61] is one type of agile workflow which can be used. The difference from other agile workflows is its distinct roles in the team working on the project.

Scrum is a workflow similar to agile, but attempts to bring more structure to it. For instance different roles are assigned such as; project owner, developer and scrum master. Thus dividing the work and ensuring that different teams have different focus and responsibility areas. Scrum also has short and timed work sprints in which the team is expected to complete a set amount of user-stories, which are defined tasks.

Scrum board [62] is a tool used with Scrum that aims to keep transparency and clarity of where each task is in its development process. A scrum board is a board divided into different sections that represents a different part of the development process. The exact sections can vary but common ones are: Development, Testing, and Evaluation. The tasks are then put up on the board and different smaller teams or individual team members can claim tasks and move them across the board as they work towards the goals of the task. Thus everyone is able to keep track of everyone else and help out where they might be needed or take on tasks that still have not been assigned. This tool works great in an agile workflow and iterative design.

For evaluating different features and implementations throughout the process a powerful tool to utilize is User Testing [63]. This method relies on providing prototypes of varying fidelity to users to test the product or feature and observe and interview them. This provides new perspectives to the different features and useful insight to evaluate the process and find out where the product might be lacking. User testing can therefore provide valuable data to back up what aspects of the product that works or not.

### 4.3 Methods of Interest

Many of the methods used in the design process can be used for different purposes, and can sometimes be combined with each other. Following the diamond structures, these methods can often be used in more than one phase. The following section will describe some of these methods.

Brainstorming is an important step towards at least one solution to a wicked problem. The goal of a brainstorming session is to generate as many ideas for a potential solution as possible. An important tool when brainstorming is sketching. This is useful to visualize different ideas on paper and get a basic concept that can be built further upon or changed before the idea is finalized.

A powerful brainstorming method is Crazy 8s [64]. This method has each team member write or sketch down eight ideas in eight minutes. This technique forces each member to focus on getting their ideas down but not expand or linger much on them. These ideas may not be a solution or may even make the problem worse but it is still important to generate as many ideas as possible.

A method to counterbalance Crazy 8s could be Six thinking hats [65]. This method has six members "wear" hats which represent different perspectives. This then forces each idea to be analyzed from six different perspectives and might find strengths or weaknesses that might otherwise have been overlooked. This can then further shed light on what would be important solutions and help narrow down the scope.

SWOT analysis [66] is another method useful to analyze ideas and pinpoint strengths, weaknesses, opportunities and threats. This gives both an internal and external view of the idea and can help to tweak the idea for better results. This external view is powerful but there is a risk of different aspects being missed since each member needs to investigate from multiple perspectives while Six thinking hats limits each member to one perspective at the time.

Once multiple solutions have been thrown out it is important to start narrowing down the scope to arrive at one potential solution to develop further. A method to narrow down the scope is Dot Voting [67]. Each member gets a set of votes and are then allowed to place them on the ideas they like. It is also possible to vote on the same idea multiple times.

Another approach is Plus Minus Voting [68] which works in the same way as dot voting but each member gets an equal amount of negative and positive votes. This allows each member to express which ideas they dislike as well as likes. However,

this risks that ideas that have mild approval might be weighted down. This could impact team morale in negative ways. However, both approaches help narrow down the scope in which case it is possible to reuse some of the previous methods in order to settle on a single idea or to redo the brainstorming with new parameters limiting the ideas to build upon the current ones.

A common bridge between brainstorming and implementation is Paper Prototyping [69]. This is a method where the idea is created as an analog prototype made out of paper. This allows for early internal and external testing and different aspects can be quickly tested and evaluated. The method can therefore be used at different stages of the process where a new feature needs to be evaluated.

Another way to prototype something through role-play. One or multiple people can act out as the item or system being prototyped. Compared to the paper prototype this might require less time in terms of producing, but might instead require a more thought out plan in order to work sufficiently well. If this method is suitable might also depend on what kinds of interaction is planned, and the functionality of the imagined final product. This can be combined with the paper prototype and could be suitable to simulate complex systems which a computer would handle automatically in the final product.

## 4.4 Possible Software

There are a number of different possible softwares that we considered to use for different aspects of the project. The following lists give a brief description about each of the softwares considered.

### 4.4.1 Communication

Different communication softwares provide different benefits, and which will be used also depends on the preferences of those who are using it. These are some examples, and are more or less popular depending on which discipline one might belong to.

- **Discord** [70] is a free application for communication over text, voice, and video. Stores files and messages without a time limit. Commonly used for casual activities such as talking with friends and about hobbies.
- **Zoom** [71] is a voice and video communication application used for virtual meetings. Text messages can be sent but will not be stored automatically. Commonly used within learning and work disciplines.
- **Google Meet** [72] is a voice and video communication application used for virtual meetings. Commonly used within learning and work disciplines.
- **Slack** [73] is an application for communication over text, voice, and video. Without a paid plan messages are only kept for 90 days, and only one-on-one calls are possible. Commonly used within work disciplines.

### 4.4.2 File sharing and storage

- **Google Drive** [74] allows for online storage of documents, files and folders. These can then be accessed in real time and edited by the authors. The folders or individual documents can then be shared between multiple members through direct invites or links. The access can also be restricted to reading, commenting or suggestions if needed.
- **GitHub** [75] is a website that allows developers to store and manage their code projects, and also to share it and collaborate with multiple people more easily. It makes use of the Git tool which is used for version control, but adds a number of features making it more convenient in many cases. GitHub allows for each member of the team to work on a copy of the code on their own machine while a copy is kept online. When a member is satisfied they can push their work to the online version so everyone can take part of it. GitHub also allows for the work to be split into multiple different branches so that work can be further divided without interfering with other team members' work. It is also easy for each member to see what changes another has done with each change. It is also possible to backtrack and revert any work that has been done in case some work has a negative impact on the code as a whole.

### 4.4.3 Game development tools

- **Unity** [76] is a game engine and game development tool used by many developers. Unity offers a wide and powerful toolset. Unity also has a big version library so that it is possible to select which one to work with and does not force updates that might make it incompatible with older projects. Unity is also for the most part free but if the game generates enough money the developers need to use Unity Pro if they wish to work on new projects. Unity has a vast online library and tutorials.
- **Godot Engine** [77] is a free community driven game engine that can work with both 3D and 2D games. As Godot is community driven the code is also open source for maximum transparency. Godot is fully free to use and has no requirements such as Unity to pay after a game is launched. A game developed in Godot is owned by the developer and has no strings attached to the game engine.
- **Unreal Engine** [78] is a game engine which primarily focuses on working with 3D assets. It is free to use, with a fee only once the product has earned a certain amount. It has been used to produce a number of popular games, and can also be used for other purposes such as for film and simulations.

### 4.4.4 Visuals

- **Microsoft Paint** [79] is a relatively simple graphical software which is included in every version of the windows operating system. Could be used to do quick illustrations of concepts, especially in discussions.

- **Medibang** [80] is a 2D drawing program that offers a variety of creative tools. Useful features range from layers, folders, custom brushes, shapes and selections.
- **Clip Studio Paint** [81] is a 2D drawing program that offers a variety of creative tools, although not for free. Useful features range from layers, folders, custom brushes, shapes and selections. Possibilities to make animations.
- **Aseprite** [82] is a 2D pixel animation program that allows for uses of drawing tools, layers, and other animation features. Can efficiently export any animation to sprite sheets that can be used by other programs.
- **PixelOver** [83] is a 2D pixel animation program that offers similar tools to Aseprite in addition to bones and 3D calculated rotations. These tools are useful to quickly produce more animations of the same character. [83]
- **Blender** [84] is a 3D modeling software that also offers animation. Blender is a fully free application that offers a multitude of tools and can utilize plugins to allow third parties to add more tools.
- **Figma** [85] is an online application that is commonly used to design digital 2D applications. Figma stores its files online and allows for them to be shared and edited by multiple members in real time.

### 4.5 Planning

This section details our planned schedule of work. It includes descriptions about more general work flow, software and other more detailed aspects, and the schedule of the project overall.

The process for how the project was planned to be conducted was based on our collective experience for a previous project [86]. For this project we wanted to use an agile workflow as it had worked relatively well in our previous experiences. This also seemed appropriate when considering that the project was conducted with 4 people with different needs and schedules. We wanted to work with a week by week structure, with tools like scrum boards. We believed that a week would be sufficiently long to make significant progress, while short enough easily make adjustments as needed, and to suit the agile workflow. At the beginning of each week we also wanted to have a meeting with the sister thesis group, in order to share what work has been done in the different sections. Outside of these meetings we worked in online environments where both groups are able to chat with each other and exchange ideas and feedback.

We wanted to have a Minimum Viable Product (MVP) finished by the beginning of March, which we would then try to iterate over until the end of the project. This so that evaluation could be started early, and the project could be evolved through iterations. With each evaluation of the game we were given an opportunity to also iterate on the the answer to our research question.

The play tests we believed would help us test the effectiveness of the different parts of the aesthetics. An overview of the schedule can be seen in Figure 4.1 Each week we had a suggested area of work to focus on, which were tied to our own internal goals called milestones. As for the details of each week that was to be decided on a smaller scale, week by week, as needed. Adjustments to this schedule were needed as the project continued.

Week	Start Date	End Date	Sprint	Deadlines	Milestones	Suggested work			
3	2024-01-15	2024-01-21	1		Group contract	Ideation	Explore applied games	Group contract	
4	2024-01-22	2024-01-28	2		Ideation finished	Paper prototype	Explore topic		
5	2024-01-29	2024-02-04	3		Paper prototype	Paper prototype testing	Research Prestudy	Planning report	
6	2024-02-05	2024-02-11	4			MVP			
7	2024-02-12	2024-02-18	5	Planning report					
8	2024-02-19	2024-02-25	6						
9	2024-02-26	2024-03-03	7		MVP Done	MVP Testing			
10	2024-03-04	2024-03-10	8			Product development	Product iterative testing	Guidelines Research	
11	2024-03-11	2024-03-17	9						Writing report
12	2024-03-18	2024-03-24	10					Guidelines Research	
13	2024-03-25	2024-03-31	11						Writing report
14	2024-04-01	2024-04-07	12					Guidelines Research	
15	2024-04-08	2024-04-14	13						Writing report
16	2024-04-15	2024-04-21	14					Guidelines Research	
17	2024-04-22	2024-04-28	15						
18	2024-04-29	2024-05-05	16					Guidelines Research	
19	2024-05-06	2024-05-12	17						
20	2024-05-13	2024-05-19	18	Master thesis repor	Product Done	Evaluative testing			Fix presentation
21	2024-05-20	2024-05-26	19	Final presentations					
22	2024-05-27	2024-06-02	20	Final presentations					Final report revisions
23	2024-06-03	2024-06-09	21	Final presentations					

Figure 4.1: The planned schedule of work at the beginning of the project.

At the time, we had not decided any specific dates or intervals for when testing of the game would take place. But we were aiming for it to happen at a somewhat regular basis throughout the period marked with Product iterative testing in Figure 4.1.

We wanted to keep the majority of the work remotely, as it would suit the agile workflow better. It made it significantly easier to manage the different schedules, and other factors such as traveling distance. Working remotely allowed us to have more easily access to our tools, and also allowed us to communicate more consistently and easily with people who were in other cities and countries.

The primary channel for communication between the people working on the project was Discord. It was a software all members felt comfortable and familiar with, and also had many of the convenient features other platforms offer combined in one application.

We made use of Google Drive as a compliment to store records of our communication from meetings, both between members and with outside parties such as our supervisor and mentors. The meetings with people outside of the project took place on Zoom. This was also be the primary storage location for other files, such as images, texts and recordings.

We used GitHub for storage of the game and its assets. It was a tool all members were familiar with, and seemed to be somewhat of a standard for these specific purposes. The game was developed in Unity as we, and the members of the sister thesis working on this project, had the most knowledge and experience with this game engine.

#### 4. Methodology

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The main software selected for development of the visual assets was Aseprite. One of the main reasons for this choice was that one of the members have plenty of prior experience with the software, and could therefore offer support to the others with less experience. Another reason was that the game would be a so called pixel game. It therefore seemed like one of the most suitable softwares, as it is specifically meant to be used for pixel based assets and art. Other softwares were also used, but in those cases it was primarily for the purposes of sketching and brainstorming ideas.

# 5

## Process

This chapter will detail the process of how this project was conducted. We have divided this into 4 larger sections: Prestudy, MVP, Iteration 1, and Iteration 2. These sections summarize distinct periods of time within the project in order to make the process more comprehensible.

### 5.1 Conducting the Prestudy

At the start of the project we still did not know what the topic of the game would be. As such, the start of the project was dedicated to deciding the topic, and gathering knowledge about said topic. At the same time, while we were gathering knowledge we also slowly started creating sketches and planning some more general parts of the story of the game.

#### 5.1.1 Collaboration with Others

Before the start of the project we had decided to do this project in collaboration with two other students, Samuel Dahlborg and Emil Ekroth. Together we would create some kind of game, although with two different perspectives and two different research questions. While our question was “**What should be considered when designing aesthetics to promote awareness through an applied game?**”, theirs was “**What should be considered when designing gameplay to promote awareness about visual impairment through an applied game?**”. Because of the complexity that comes with working in a larger group, one of the first things done in this project was writing a group contract. This detailed how we would deal with conflicts, potential future work on the project, and more.

Through our connection with our sister thesis we had also established contact with a Finnish game publisher called Psyon Games[3]. They have been focusing on creating and publishing applied games, which includes one of the examples brought up in Section 3.1. They provide input and shared insights into how an applied game is developed. We were in contact regularly throughout the project, and they were able to follow the progress of the game. Especially, they were able to give some pointers on who might be relevant to contact, and provided feedback on the initial ideas we had. They also gave feedback on the game overall, and especially the gameplay.

### 5.1.2 Narrowing Down the Game Idea

In order to conduct research for this project we needed to not only read about applied games in general, but also learn about the topic which the game would be about. Before any research into this could be done, we would need to decide on the specific topic. We conducted several ideation sessions in order to get a sense of what the game's topic would be and what the actual game might be like.

In the ideation sessions we used a variation of crazy 8s, and dot voting. With a timer of 8 minutes, each member wrote down as many ideas as possible on paper. In between rounds the members would present their ideas and discuss them. Sometimes there were ideas of similar nature or which seemed compatible, and these could then be grouped together. Figure 5.1 shows an overview of how these ideas were organized during the sessions. In the following rounds it would then be possible to present completely new ideas, or possible additions to previous ideas. This form of ideation was similar to the format of the ideation from another previous project [86] which we have worked on.



Figure 5.1: The whiteboard on which the ideas were stored and grouped together.

Once a sufficient number of rounds had been completed, we used dot voting to get a sense of what was of the most interest for the group. We wanted to pursue something which we had a genuine interest in, as we believe that would make the project as a whole better.

Arriving at four general ideas we tried to develop them a bit further and held another vote to order the ideas. Figure 5.2 shows the notes from the four most popular ideas. Sketches of the further considered concepts can be found in Appendix B. These ideas were then presented to our supervisor and our mentor to receive input and guidance. We reconsidered and further discussed the four ideas, and removed the two least popular.

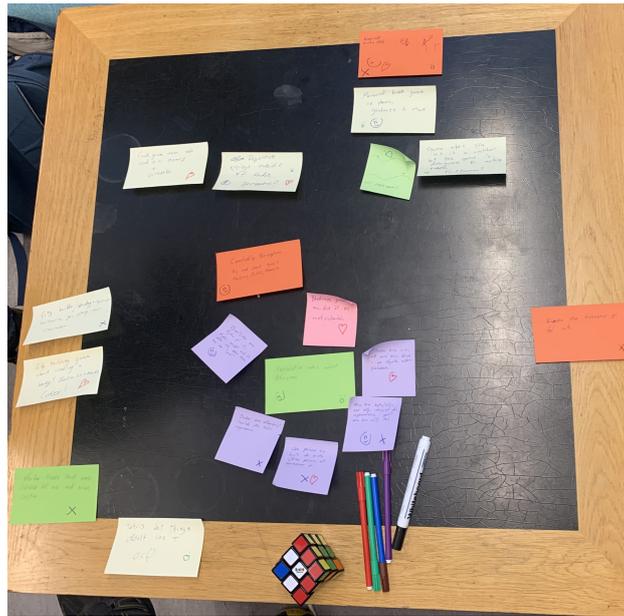


Figure 5.2: The notes which represent the four most popular ideas within the group.

### 5.1.3 Paper Prototyping

From previous experiences we have found paper prototyping to be useful for testing game concepts and ideas at the early stages of making a game. It had previously allowed us to relatively quickly express the ideas we wanted to get across. It was also flexible, often allowing for changes and fixes to be made as needed. Because of its relative simplicity, it was also easy for all members to collaborate and work on.

The two remaining ideas from the ideation had some similarities, they were both centered around gathering ingredients for creating potions. One would be focusing on exploring the environment as a person with some kind of visual impairment. The other would be focusing on the potion making itself as a person with dementia.

We created paper prototypes for both of the ideas. This to get a more concrete sense of what the games would be like in practice, and to test the basic gameplay. We tried them both amongst ourselves and also with other students.

Because the ideas had some overlaps we were able to use some parts for testing both ideas. We tried two different versions for the idea that focused on the theme of visual impairment, as there were two potential representations of the world which we considered. For the idea that focused on dementia there was one version.

### 5.1.4 Making a Game About Visual Impairment

The idea for this game was that the player would have to navigate and explore an environment in order to find ingredients for the potions. There would be a set number of places in the world where resources could be gathered, with each spot providing a specific resource. When a resource was found, the player would receive a description, and then choose if they wanted to gather the resource or not. At this

time we wanted to focus on the description of items, trying to make them according to how a person with a visual impairment might do it. These ingredients the player could then bring back to their house and use to create a potion.

For the paper prototypes we had created a number of papers which had a drawing of an ingredient on it. We considered it the players would get to see these images while playing, and then having to match them with descriptions given when they encountered an ingredient. The players would be able to mark the locations of these ingredients in some way to more easily remember where they had been before, and if they had picked up the ingredient or not.

In one version of this idea the map is drawn beforehand, and the players had to explore through the narrow hole of a paper cone. This version of the paper prototype can be seen to the left in Figure 5.3. Differently colored lines and textures on this map were intended to represent the surrounding areas, and to make it clear to the players where they could and could not go. The places where they were able to gather resources were marked using red dots. We noted that this prototype required the player to physically move around, more so than they probably would in a digital game.

This version might have helped players remember things better, as it makes use of spatial memory as well. The connection between memory and the movement of the body is something which we noted could be of interest. A digital version could have difficulties provide the same experience, as it would not rely on the same bodily movements. Probably, it would only make use of finger movements to press keys on a keyboard, or buttons on a touch screen or controller.

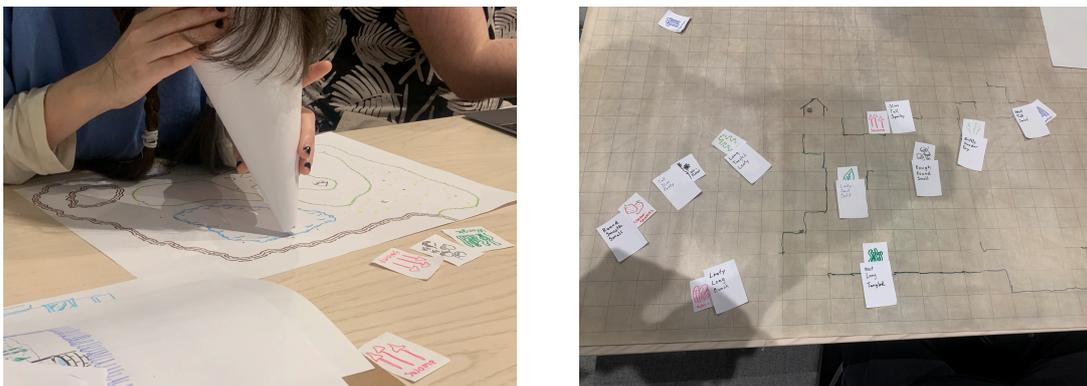


Figure 5.3: The two different versions of the game about visual impairment. Left uses the paper cone, and right uses a grid system.

In the second version the player was placed in front of a mat with a square grid. The location of their house would be marked down, which would also serve as the starting point for the player marker. From here the player could move around on the grid. Lines would be drawn onto the mat once the player got close enough to a wall. These lines indicated where it was possible to move. The test leader would also indicate to the player when they were walking close by to an ingredient. The

player could place a marker to represent what they thought the resource was at the location. This version of the paper prototype can be seen in Figure 5.3.

This version required more work from the test leader, as they had to draw out lines by hand, one by one, as the player progressed. This slowed down the game significantly, but was something which would not have been an issue in a digital version. This was adjusted for slightly in subsequent tests. There the players could draw out markings themselves based on the information given by the test leader. This seemed to make the game more engaging and removed the awkward pausing of the game waiting for lines to be drawn. Like with the first version of this idea, there was a physicality and tangibility which could be difficult to transfer to a digital game.

### 5.1.5 Making a Game About Dementia

The idea for this game was that the player be given the name of a potion which they would have to make. They would be given a recipe, and would have to gather resources from their garden and house. The test was executed as a role-playing game, with a game leader that kept track of where all the resources were located, the players inventory, and more. The purpose of the game would not be to diagnose people with dementia, or to conduct research about dementia as an illness<sup>1</sup>. Instead, it would be to spread awareness about the condition itself.

The player was allowed to move over two areas, the inside of the house and the garden outside. The player was only allowed to view one area at a time, and had to move between the indoor and outdoor areas to collect and mix ingredients. An overview of the setup of this game can be seen in Figure 5.4.



Figure 5.4: The general setup for the dementia prototype

In the garden area the player had access to three garden beds with different plants, a chicken coop, and a well. Here the player could ask the game leader about what

<sup>1</sup>An example of how games can be used for research and help with diagnosis can be seen with the game Sea Hero Quest

## 5. Process

crops or herbs were growing in the garden beds, and if there were any possible interactions available. They were able to pick up plants from these garden beds for their potion making. The plants growing in the garden beds would remain the same as long as the player stayed in the area and did not reexamine the beds. If the player moved to the inside area the plants could change place or to entirely different plants. The player could interact with the chickens in the coop by feeding them. The player could also interact with the well in order to collect water.

In the area inside the house the player had access to cabinets and ingredient storage. They also had access to a mixing station where potions could be made, and also a cat and goldfish. The player could use the items available in the cabinets and storage for their potion making. They could also place items into the storage. The items in the cabinets would not change unless the player had changed the items themselves, as long as they remained inside the house. The player also had the option to interact with the pets in the house by feeding them.

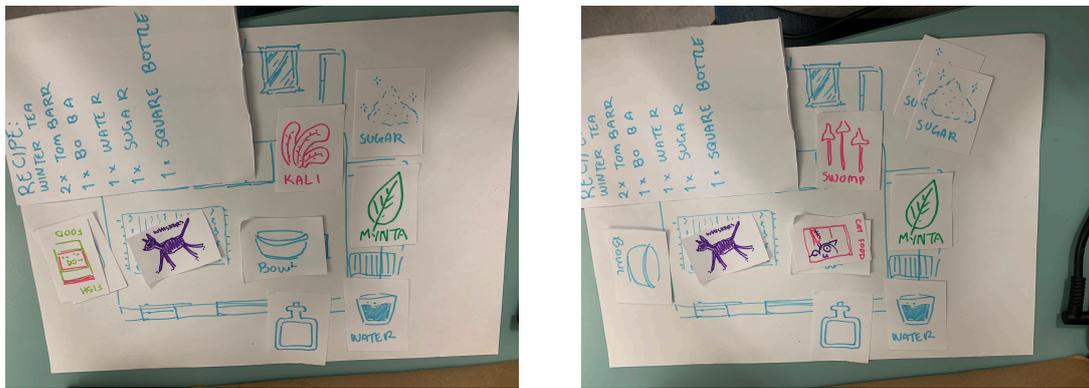


Figure 5.5: The game leader changing the inside of the house for the player. Left before change, and right after change. Note the token representing sugar, the removal of fish food, and the change from Kali to Swomp.

As with the garden beds, if the player left the inside of their house, the game leader might change some of the items in some way. For example, if the player had taken out two piles of sugar and placed them in a bowl the game leader might remove one. An example of the change of items can be seen in Figure 5.5. If the player does not notice this change the potion they are making might fail, as the ingredients are not matching with the recipe.

In one iteration of testing the player had a limited inventory space of two items. This meant that they needed to make multiple trips between the house and the garden in order to gather all the ingredients for the potion. And as such, the game leader would have multiple opportunities to make changes in the different areas.

The overall experience by the testers was frustration, although in a positive manner. To consider is that in the prototype the players are interacting with a person. Some testers expressed that the frustration would be worse if played with a system rather than a human game leader.

### 5.1.6 Selecting the Game Idea

After conducting the tests with the paper prototypes and further reflection on the ideas we decided move forward with the topic of visual impairment. From the testing is seemed as if it would be easier for players to make the connection to the topic itself. From our reflections we concluded that the idea felt more clearly defined at this point, and also seemed more feasible to implement.

We also believed that it would be a more interesting topic to research, considering our research question. Perhaps because the most common, and perhaps stereotypical representation, is to remove visual elements entirely. There also seems to be little, if any, research done regarding the topic in the context of applied games.

### 5.1.7 Researching the Topic

Once the topic had been chosen, we started reading about visual impairment more. We read both academic research articles about the topic, and also texts like blog posts, forum posts, and others which could tell us more about the normal everyday experiences from people with visual impairments. We also did some reading regarding representation of people with disabilities in general. The findings from this can be read in Chapters 3 and 2.

After doing some research we wrote an initial list of aspects which we would like to consider for the final SWOT analysis. More aspects could be added to this list, the current aspects could be changed, or they could be removed entirely. This served as the very first iteration of the SWOT analysis.

- Using a wide range of sounds
- Using no visual elements at all
- Using visuals as a representation of memory
- Including representations of different aids
- Including a lot of dialogue

### 5.1.8 Changing the Initial Plan

As we conducted the prestudy we realized that some changes needed to be done to the original schedule. One of theses changes was that we realized more time was needed to properly conduct the research in the prestudy phase. Because of this, we reduced the time reserved for the creation of the MVP and also postponed it by two weeks. We also postponed some of the time reserved for paper prototyping to a later week. An updated version of this can be seen in Figure 5.6.

After the topic of the game was chosen we realized the importance of establishing contact with people from relevant communities. This to ensure that what we make is grounded in real experiences, and that we portray visual impairment in an appropriate way. Although some information could be inferred through records, we believed that dialogue with others would be the better alternative. As mentioned

## 5. Process

Week	Start Date	End Date	Sprint	Deadlines	Milestones	Suggested work			
3	2024-01-15	2024-01-21	4		Group contract		Ideation	Explore applied games	Group contract
4	2024-01-22	2024-01-28	2		Ideation finished	Paper prototype		Explore topic	
5	2024-01-29	2024-02-04	3		Paper prototype		Paper prototype testing	Research Prestudy	Planning report
6	2024-02-05	2024-02-11	4						
7	2024-02-12	2024-02-18	5		Planning report 16th				
8	2024-02-19	2024-02-25	6			MVP	Paper prototype testing		
9	2024-02-26	2024-03-03	7						
10	2024-03-04	2024-03-10	8		MVP Done		MVP Testing	Guidelines Research	
11	2024-03-11	2024-03-17	9			Product development	Product iterative testing		Writing report
12	2024-03-18	2024-03-24	10					Guidelines Research	
13	2024-03-25	2024-03-31	11						Writing report
14	2024-04-01	2024-04-07	12					Guidelines Research	
15	2024-04-08	2024-04-14	13						Writing report
16	2024-04-15	2024-04-21	14					Guidelines Research	
17	2024-04-22	2024-04-28	15					Guidelines Research	
18	2024-04-29	2024-05-05	16					Guidelines Research	
19	2024-05-06	2024-05-12	17						
20	2024-05-13	2024-05-19	18	Master thesis report	Product Done		Evaluative testing		Fix presentation
21	2024-05-20	2024-05-26	19	Final presentations					
22	2024-05-27	2024-06-02	20	Final presentations					Final report revisions
23	2024-06-03	2024-06-09	21	Final presentations					
24	2024-06-10	2024-06-16	22						

Figure 5.6: An updated version of the planned schedule of work.

previously, the game is not primarily aimed towards people in these communities, but rather those outside with less knowledge. Because of this, communication with members of these communities is also important in order to validate the results.

At this point we also decided some limitations on the development of the game. Firstly, about the accessibility of the game. Making a game about visual impairment is not the same as making a game accessible to those with visual impairments. The game is specifically aimed towards people who do not have a visual impairment themselves. Whether the game can be adjusted to be more accessible in this regard is something we will keep in mind, but the game might still end up inaccessible to some. Secondly, we do not plan to make a complete game. Rather, we will try to focus on making a smaller and more finished game, which would be a part of a larger project.

### 5.1.9 Creating Working Definitions

As we started researching we realized that there might be multiple understandings of certain words, and that certain concepts might have multiple definitions. Therefore some clarification is needed. For this thesis we have chosen to define Applied Game as following:

*An applied game is a game that has another defined purpose than to serve as purely entertainment. For example, it could bring awareness or knowledge about some topic, or it could encourage player behaviour in consideration to physical and mental health. The primary focus is however still on being a game, and it makes use of typical game elements in order to further the purpose.*

*An ideal applied game should transfer knowledge about the topic to the player. It should not be too difficult for the player to make a connection to the topic. The underlying topic and the transfer of knowledge should not overshadow the main purpose which is to be enjoyable.*

The purpose of aesthetics as we define it is as follows: *Aesthetics themselves are the*

*parts of the game which the player can observe or experience in some way, primarily through visuals, sounds, and text.*

The aesthetics in this thesis is, as mentioned earlier, primarily focused on the visual elements. However, given the chosen topic it would be relevant to also include sounds and audio as elements belonging to aesthetics. The narrative and dialogue in a game is what we refer as “text” in the definition, and is also counted as part of the aesthetics.

### **5.1.10 Considering the Setting of the Game**

When considering the setting of the game there were two suggestions. To have the game take place in the present real world, or to take place in a fantasy world. Taking place in the real world could potentially make it easier for players to experience some of the every day situations. How everyday experiences such as cooking, shopping for groceries, traveling etc. are still very much doable, although there are some adjustments which are necessary. A concern here was that the game could either become too boring, or make light of the everyday problems encountered.

A fantasy world seemed like it would be more fun, but also could have some issues with making distinctions between what happens in real life and specifically in this game world. Perhaps the main character might seem capable because they live in a fantasy world and can use magic, instead of them being a capable person by themselves as they are, regardless of magic. There is also a question of the limits of the magic in this fantasy world. If there is magic, why would the character not use magic to make it so that they can see? If they can, why do they choose not to do it? Other games we considered for inspiration were Stardew Valley [87] and Animal Crossing [88]. These could be suitable as inspiration for both settings, both reality and fantasy.

We decided to proceed with more of a fantasy setting. We believed it would still be possible to present everyday normal tasks in a fantasy setting, and that questions regarding story aspects were less of a concern as compared to having a game which seems dull or boring.

### **5.1.11 Sketching**

During ideation sessions and when working to decide what the game would be about sketching was used. For our part of the project, a significant portion of work started with a sketch. There were times where brief text descriptions can be used, but often it was easier for us to communicate ideas using imagery. It allowed for better understanding and clearer discussions.

### **5.1.12 Designing the Main Character’s Appearance**

In deciding what the main character would look like several sketches were made, as seen in Figure 5.7. What we knew about the character at this time was that they would be a witch or wizard of some sort, and they would have some sort of visual

impairment. There were some suggestions of human characters, some animal like characters, some mushroom like characters, and some more undefined.

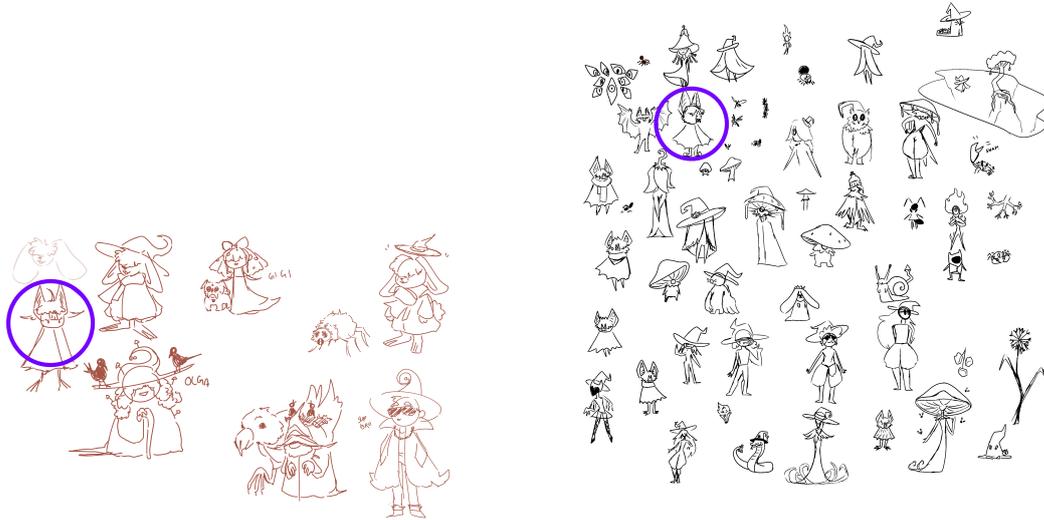


Figure 5.7: Some of the sketches of possible characters which could act as the main character, and some other figures which could be related to the main character. The design that we decided to continue with is present in two groups of sketches, and are both circled.

From these we chose the character which we, subjectively, thought was the best one. This character was a bat, which we thought could make the connection to visual impairment more apparent. But it was also the character that simply appealed to us the most, visually.

### 5.1.13 Deciding on the Representation of the World

A key factor that we wanted to include was some sort of limitation to the players view of the world. As we had noted from previous games related to the topic there were multiple ways that this could be done.

To use only sound and no visual elements would be difficult considering our lacking experience in working with sounds. The game was also targeted towards people who were sighted, and as such it seemed more reasonable for us to try to incorporate visual elements still. It should also be pointed out that audio games are seemingly not that popular amongst sighted players. It is a genre of games that amongst sighted people is not played all that much, unless perhaps specifically because of their relation to visual impairment. As in visual impairment is one of the primary topics in the game, or because it is a game playable by those with visual impairments.

There were several ideas of how to represent the world surrounding the player, some which can be seen in figure 5.8.

For areas not explored we considered having a solid color. Black is sometimes used to



Figure 5.8: Sketches of some concepts which were used for discussions regarding the representation of the world and the spatial awareness of the player and the character.

represent visual impairment, but there are also games like *Beyond Eyes*, as described in Section 3.3, which uses solid white. Black and darkness is often used to make the mood of the game more scary. This is not the kind of game we were aiming to make. Instead we were aiming for a more cozy mood game, a game where visual impairment is not something to be scared of.

The character itself would always be visible on the screen. For the surroundings there were several ideas. One idea was that the environment would remain visible after the player had walked past, as it was. Another was that the environment would remain visible, but changed in some way once the player moved away. It could become a gray-scale version, or a stylized version as in some other games which uses “fog of war”.

Another suggestion was that only the surroundings closest to the player would be visible. In the versions where some of the environment would still be visible this would be a visual representation of the characters memory and spatial awareness. In order to make it more clear that it is only a representation and not the character “seeing” the world could be to include things which changes in the environment. Examples could include NPCs which might walk to different locations, or trees which fall over in a storm. These could remain marked on the screen, but once the character moves closer these would disappear or change. The version which only allows for the immediate surroundings to be visible could encourage the player to actually remember the location and relations between areas more. But would also leave a large portion of the screen blank, or would need to be zoomed in to focus only on a small area. Including the white space could help signify that the game is actively limiting the visible areas. Another suggestion to represent the characters spatial awareness was to have a trail of footsteps which showed where the player had walked.

Yet another suggestion was to let the surroundings be remain for a while, and fade out as the player left. But the more frequently the player would walk past the area, or interact with objects, the longer they would remain on screen. Ultimately, although all ideas were worth considering as concepts, we worked on the one which seemed the most feasible to actually implement. Meaning the one in which only the surroundings closest to the player would be visible.

Another related idea we had was to have the player start in an area which would be very familiar to the main character, for example their house. This place would be completely visible to the player as a way to represent that the character knows this place well, and would be able to move around as any character would. If you didn't know that the character was visually impaired, it wouldn't be noticeable in this area either. However, once the character enters a different place, the ideas as mentioned above would be used to represent these areas. This is an idea which we as of writing has not dismissed, but also have not focused on.

### 5.1.14 Writing of Overall Story

Because the main character is visually impaired we wanted to make use of text as different means of communicating to the player. In games we can often make judgements about what something feels like based on what they look like. We can sometimes identify them as things we interact with in real life, and sometimes we can tell by texture and how things move. Using visuals as representation of touch here would maybe make it easier for the player, but would might greatly reduce the visually impaired aspect. Instead, we tried to use writing to describe the items. In the beginning some of these were based on sketches we had created. Later on some would be written without any sketches made.

We also wanted to include some distinctions between how a sighted person might describe an object to someone, and how a visually impaired person might do it. One of the challenges the player would face would be to make use of the description which was supposed to have been written by a sighted person, when the character is visually impaired. The character would give his own description of items, which the player would then have to match. Some descriptions would be more easily matched, while others would be more difficult. Descriptions made by someone who is sighted could include descriptions which make use of colors for example. Descriptions made by the main character would not mention this, and would focus on describing other aspects. Things like touch and smell, and other clues which could be specific to that particular ingredient.

Something which we noted in our reading of different experiences was the difficulties of moving to a new place. This was something which we thought could be used to include and show multiple different aspects for the players to learn from. Central to this event is the need for meticulous planning. This includes finding a suitable location to move to for the persons needs, packaging belongings in a way which they can be unpacked and reorganized, explaining how large furniture pieces need to be placed and more. This was also compatible with the idea of having a place which would be very familiar to the main character.

For the story of the game, the general idea was then that the main character was just about to move to a new place, and that the players will then get to follow along and explore this new place. With him, he would be bringing service animals of some sort. Figure 5.9 shows the design of two potential characters which could serve as service animals. One of these animals would help the main character to locate ingredients. When there are no available ingredients nearby, the service animal would follow the main character closely and keep him company. Another could help him fly to and from certain places, or help him by sending items to other characters on his behalf.

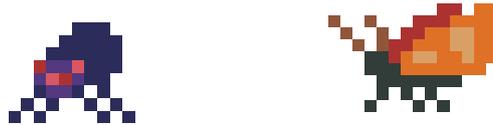


Figure 5.9: Two animals which were meant to act as service animals in some way. To the left a spider, to the right a moth.

## 5.2 Development of MVP

In our planning we had decided that we would create a Minimum Viable Product (MVP). There were several reasons for this. We wanted to have the opportunity to test the game often, and to iterate on the feedback we would receive from players. We wanted to have something which was actually completed. Hopefully this would also help us in making the scope small enough to make something which would appear to be mostly completed as well. This was also the strategy we had implemented in a previous project.

### 5.2.1 Creating a MVP List

In the beginning of this phase we wrote a list to give an overview of what we would essentially need in the MVP. This list included things such as specific tile-sets for the ground which the character would walk around on, some objects to place in the world such as trees and a house, the playable character and all the related animations and more.

### 5.2.2 Creating Sprites

Both authors have been producing 2D images for several years, and have limited experience with 3D modeling and usage of 3D assets. While it is possible that we would make use of other people's work, such as freely available models, we believe that there would be a limited number of ways which we would be able to modify, and make use of them.

We considered how to make the whole game appear cohesive. With multiple people working on the same game, it is important to create some kind of standard for how assets should be designed. From previous experiences we know that working with

a more pixelated style could make it easier to make the games assets look cohesive. This would also allow us to make modifications to previously existing assets more easily as well.

It seemed like the best option in our case was to create and make use of 2D assets, specifically in a pixelated style. While the theme of the game could also be suitable in a 3D environment a significant amount of time would be consumed to learning how to create, modify and actually use 3D assets. We could also have chosen to make a 2D game without making it pixelated. A concern here would be that assets would look notably different, since two people would be making them. Two people who usually have relatively different styles. This would also most likely be a problem with any creative process, regardless of if it is in 3D or 2D. These differences could potentially be solved by making a clear division in who makes what, for example only one person creates characters, only one person creates backgrounds, only one person makes assets for UI etc. And also by establishing some basic guidelines, maybe some color palettes and something to refer to for sizing. As we had more experience working together using pixels this is what we decided to continue with.

We knew from previous experiences that the amount of pixels per unit probably should be decreased compared to our previous project. For reference the main character in the previous project was approximately 8 times larger in terms of pixels as seen in 5.10. Reducing the pixels per unit we believe would make it faster and more simple in many cases.



Figure 5.10: The main character from a previous project to the left, with the main character from this project to the right, using the same pixel resolution.

The size of each unit was decided by how small we were able to make the main character. At the time there were key details we wanted to be visible and distinguishable to the player. The first draft of the character can be seen in Figure 5.11. This was the level of detail we felt was large enough to distinguish details like the characters nose.

Each unit was set to 24x24 pixels, and the rest of the assets would be made in comparison to the height of the main character, which was a bit shorter than two



Figure 5.11: The first draft of the main character as it would be in the game.

units. The exact number was not as important as having a standard to compare against.

While the character could have remained a static image throughout, making it animated makes the game seem much more lifelike and also completed. The character was able to walk not strictly according to a grid pattern, and was able to walk diagonally. Because of this, we also decided that the character should also have animations for walking diagonally.

Animation takes a significant amount of time to do, and the more complex the movement, the more time it requires. The main character would always be on screen for the players, and it therefore seemed reasonable to let it have the most detailed animations. As for other characters even small movements can make a significant difference in how lifelike they seem and therefore how immersive the world is.

### 5.2.3 Designing Ingredient Markers

Many of the ingredients were imported directly from the paper prototype and therefore already had a set look and description 5.12. The images of the ingredients were made into sprites with a 24x24 resolution. Each ingredient got a total of four sprites made for them.



Figure 5.12: The ingredient markers created for the paper prototypes.

The first two of these sprites were variations of how they looked in the paper prototype but with slight variation between the two sprites. The intention of having two variations of the sprites was to introduce variation but also to give options to the rest of the team to pick which sprite looks better. These sprites were also designed to be representations of the ingredients as they appear in the inventory which would allow for a different look elsewhere in the game. These usually appear as a cluster of leaves or twigs, a flower or a mushroom. The second pair of sprites are therefore the way that the ingredient appears in the world before being picked. These appear as shrubs, plants or mushrooms growing. Furthermore, the design attempts to use elements of the inventory sprites to make it look like they could be directly collected from these sprites. An example of the finished set of four sprites for each marker can be seen in 5.13. This is to ensure that there is a strong connection between the different sprites so that the player does not get confused when picking one sprite but another appears elsewhere.



Figure 5.13: An example of the sprites created for each of the markers.

The design choice of having two different appearances of the same item was debated due to some worries. Many of the worries came from the sprites feeling inconsistent. If a player chooses one sprite but another appears in the world or inventory there is a risk that the player gets confused and thinks the system did not work or that a mistake was made. However, a decision was reached to keep both sprites and use one set for the inventory and one set for the world. This would as well be tested to see if confusion is generated by the difference in sprites. The world markers are the markers the player gets to choose from when reimagining the different ingredients. This choice was made to keep the choice consistent with what the player will see on screen to hopefully reduce confusion.

### 5.2.4 Designing Tile-sets

The 24x24 unit as mentioned previously is what we based the tile-sets on. While we could have made a large static map for the game, would make it difficult to make changes as needed, and each part of the world would have to be planned in detail at an early stage. Because the world might need to be altered it seemed like it would be worth the time investment and effort to make a tile-set.

When making the tile-sets there were several things we wanted to include. One aspect was to include multiple types of material that the player could walk on.

Another to have the materials contrast against each other in terms of color. These different materials could produce different sounds when walked on, so that the player could recognize also by sound where they were walking to some extent. This because textures, high contrast and sounds can be helpful for navigation in real life. The players would hopefully notice these aspects, and make use of them to help with navigation and remembering places. The placement of these tiles could allow for the player to identify landmarks, which would also hopefully help in their navigation. Each tile-set has some basic tiles that look similar, and then some tiles which are more varied to break up the patterns, serve as landmarks, and to be more appealing.

For the tile-sets to work efficiently they firstly need to be tileable. This means that there should be a smooth transition between each of the tiles. This allows for more immersion for the players and gives the game a more complete feel.

To ensure that each tile can be used next to itself all tiles were drawn on a 12x12 grid. The first parts of each tile-set are then drawn in a cross along this grid. The cross is then broken apart in tiles of 12x12 and rearranged to a 24x24 square where the cross drawn instead acts as the border of the square. This process can be seen in Figure 5.14. This ensures that each square will be able to tile seamlessly with each other square. These squares are then duplicated four times and filled out with the rest of the texture. This duplication helps ensure that no two tiles are exactly alike but will also work together. Thus variation is introduced making the texture feel more natural and repetitive.



Figure 5.14: Step by step process of making tiles. Starting with a cross shape on the left.

As mentioned, multiple tile-set were created as we wanted to include different terrains and biomes. These sets needed to work not only with themselves, but also with each other. To achieve this an additional tile-set was created specifically with transitions from the different other sets. They need to be able to border each other along edges, corners and diagonals. To note here is that if every tile-set created needed to be able to tile with all other tile-sets, the amount of transition tiles will scale exponentially. To lessen up the amount of transitional tiles needed one tile-set was chosen as the default tile set, and all sets can only transition from or into this set. The chosen tile-set was the grass tile-set, as many textures seemed reasonable to border with grass.

Through these transition tiles we can ensure that all tiles can smoothly change into any other tile-set using at least two transitional tiles, or more if desired, as seen in figure 5.15. This does put a limitation on how the environment can be built,

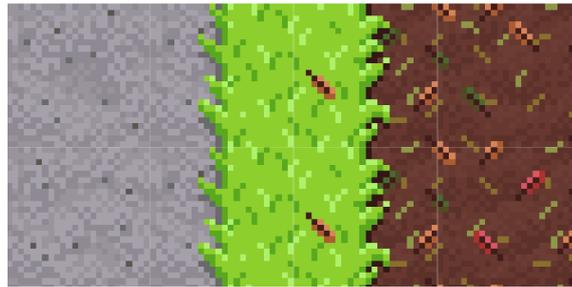


Figure 5.15: Example of a transition from left to right of gravel, grass, and forest floor.

as there needs to be grass between any other two sets in order to transition them, which might not be fitting in certain areas of the game. To increase the flexibility a secondary default tile was selected and had transition tiles added to it. The second set selected was dirt, which we also believed would border with the most textures.

After this we also created a set with three way connections, allowing three different tile-sets to connect. These included grass, dirt, and each of the other sets. With these defaults a wide arrangement of possible environments can be created.

For the creation of the tile textures we looked at multiple sources. These included the textures from the games Minecraft[89] and Stardew Valley[87], which helped design the pixelart and the selection of colors. We also looked at the real world for inspiration 5.16, and to make sure that we created tile-sets that were grounded in reality.



Figure 5.16: Reference images used to design the forest floor tiles.

There was a discussion about the level of detail in these tiles. Perhaps more simple and stylized tiles would be more accurate to the main character, but on the other

hand the game is meant for players who are sighted, and who might enjoy a more detailed texture. And then again, much of the details would also be obscured by the so called Mask, which will be discussed more in 5.2.6. And another consideration is how the players then interpret the level of detail. Do they think that what they see is what the character himself sees? Or is it just how he imagines it to be? Is it some kind of translation of what main character senses described visually for the players who are sighted? This is something which can be difficult to communicate clearly without explicitly stating.

Perhaps doing something similar to what was done in the game *Beyond Eyes* [55], as described in Section 3.3, could make it clearer. They included objects which the main character imagine one way based on sounds, but as she gets closer and she hears more clearly and uses other senses these objects change. An example being that she hears running water and imagines a fountain, which upon getting closer she realizes is a drainage pipe.

## 5.2.5 Conducting Interviews

During this time we also received some answers from organizations we had reached out to. The response was limited, and we were able to conduct five interviews with three different people with visual impairment. During the interviews we asked about different experiences, about representation, about thoughts on the project and more. When asking about opinions on the game we sometimes had to describe it verbally, and sometimes we were able to show the game directly.

These interviews helped in several ways. We were able to confirm some beliefs we had, hear about real experiences that people with visual impairment have, and gain perspective on aspects which we might not have considered otherwise.

Among other things, we wanted to know if there were any overly stereotypical elements to avoid. Something which was noted during an interview was the stereotype of the character with visual impairment being a bat. Perhaps it was something we would have realized if we were native speakers of English, as there is an expression “blind as a bat”. It could be something we would have realized if we were more familiar with more blind characters in media, especially those with non-human characters. A redesign of the main character was done after some time for consideration.

There were some ideas of stories which could be incorporated to the game which we asked about in these interviews. Examples included events such as moving to a new location, receiving unwanted help, being asked to do tasks with insufficient instructions, people forgetting that someone is visually impaired and more.

## 5.2.6 Creation of the Mask

Because we wanted to limit the range of the view of the player we created something which we would internally refer to as the “Mask”. This would represent the range which the character either could see or how much of the world they were able to keep track of. It was up to interpretation by the player. In later discussions with

the other group working on the project, as well as interviews held, we realized that people tended to interpret it as the character literal field of view, rather than a representation of the characters understanding of the world.

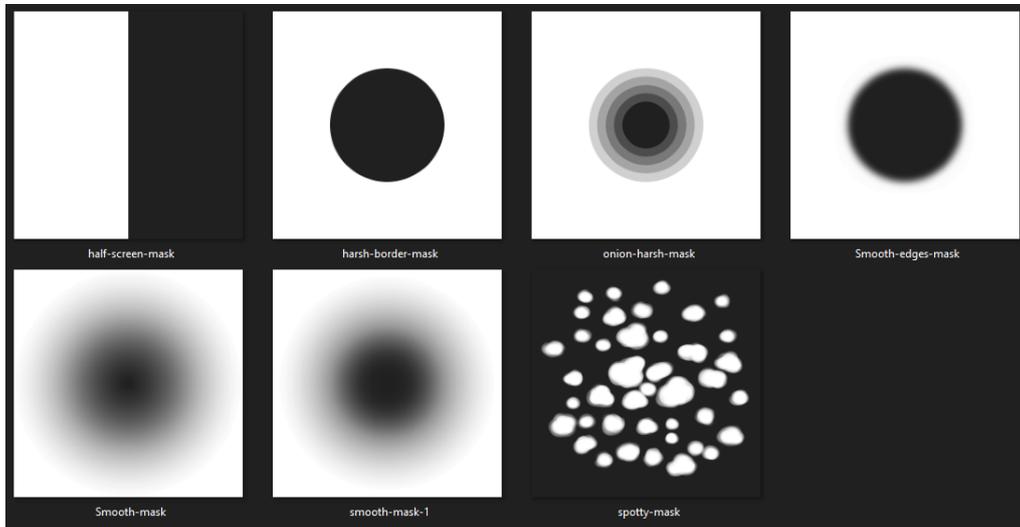


Figure 5.17: A variety of different masks which could be used in the game. The white parts of each image would be covering the screen for the player.

After interviews we also realized that this mask could perhaps be changed and made more specifically representative of certain conditions. Not every person with visual impairment are affected in the same way, and this mask could relatively easily be modified. A few different alternatives were created, and can be seen in Figure 5.17. Some were based on previous examples [27].

### 5.2.7 Writing of Dialogue and Events

Through the storytelling of the game, we wanted to include and bring forth experiences people with visual impairment might have. This would include both the everyday moments which anyone might experience, and moments which are more exclusive to those with visual impairment. Overall it should be a story which we think should be interesting and well written. If possible, we would like it to have the experiences portrayed in such a way that the player can understand without having to make it seem like a lecture or overly informative. We want to make it interesting from another point besides the gameplay itself. There is a common stereotype of associating visual impairment with horror, we wanted to make a game which would have the opposite feeling. To make visual impairment something which is not to be feared, but rather something which simply exists with the character. Something which doesn't necessarily have to have only a negative or only a positive attachment to it. With stories which can be affected by the character's visual impairment, and stories which are less affected.

These stories we implemented through quests and NPC interactions. With NPCs we can relatively directly implement interactions or conversations that people with visual impairment have experienced. In these interactions we also allow the player to

make their own choices. There are sometimes choices of what the character will say, which only affects what the conversation will be like. At other times these choices could be used to change the outcome of the game more substantially. An example of dialogue options can be seen in Figure 5.18.



Figure 5.18: Depending on the which dialogue option is selected, the player might experience an event.

The interactions that the player has with the NPCs can be used to reflect both negative and positive experiences that a person with visual impairment might have. Both with characters who are sighted, but also other characters who are visually impaired. An example which might be interesting to include is an older character who has become visually impaired at a later stage in life, as compared to the main character who is still relatively young. Through other characters it might be possible to incorporate more diversity for the spectrum that visual impairment is.

Beyond interactions with individuals, through quests the player the main character could also interact with the world. Changes such as making new areas accessible, both in the sense of allowing the player to enter new regions, and also in the sense of making areas more accessible for the main character and others in relation to visual impairment. Something to consider here is to perhaps try to avoid putting the responsibility of change onto the main character. From our understanding it is a common problem to put the responsibility of accessibility onto those who need it the most. Either that these people need to “adapt and overcome”, or that they are responsible for ensuring that changes happen. Although some are able to do this, it is not true for every person. The blame is put on the people affected rather than the system which fails them.

As for events not related directly to visual impairment, there were other kinds of quests and events we imagined for the world. For example, we wanted to include characters which play music which the player would recruit on behalf of a musical director. We thought about having two groups, beavers and bears, which need to be reunited after years of conflict. We thought about different stories and events which

could be part of the different regions of the world. An overview of the planned world can be seen in Figure 5.19, with the different regions marked out.



Figure 5.19: A sketch of the different regions of the world.

## 5.2.8 Selection of Sounds

Although we have limited knowledge about sounds and how to work with them, it is an aspect which we believe is important to include, especially considering the topic. In particular, music was something which was mentioned which seemed to play part in setting the desired mood of the game.

Additionally we wanted the player to be able to make use of some sounds in certain situations. For example, we wanted the player to be able to distinguish the material which they are walking on based on the sound effects. In real life sound can inform a person about a number of things regarding their surroundings, if one pays attention. Things like the size of a room, the material the floor and walls are made of, and also about things and people which are close by.

We also wanted to have some objects in the game that make sounds, both to make the game more life-like and enjoyable, but also to help the player in their navigation of the world. For example in some regions of the game there is water flowing, which the player should be able to hear from a distance.

In the development of the MVP we managed to implement most of the sound effects which we deemed necessary. These sounds were created by other people and uploaded to websites such as Freesound [90] and Pixabay [91], or were part of a soundpack a member from the sister thesis had purchased. Some of the sounds were

modified slightly. At later points there were only a few additions to the usage of sounds, such as the selection of background music for new areas and an additional sound effect for walking.

## 5.3 Iteration 1

Once the MVP was finished, we moved on to iterating upon what we had, and focused more on things that would be needed in order to make the game not just appear functional. Within this section there are several smaller iterations which are summarized for brevity and the readers convenience.

### 5.3.1 Redesigning the Appearance of the Main Character

As mentioned in Section 5.2.5, we knew that the main character should be changed. Either to another animal which does not have such a stereotypical association, or to a human. Something which was mentioned in the same discussion was that while it might be fun to interact with animal characters, and that games can provide an fantasy experience, a non-human main character might reduce the relatability for players. Making the main character human was something which had been considered earlier. We could also make all characters in the game human, to make it perhaps more realistic. However, we believed it would not provide any particular benefits as compared to only changing the main character.



Figure 5.20: Old version of the main character as a bat to the left, new version of the main character as a human to the right.

The main character alone was then changed to be a human, and all other characters created so far remained as non-humans. We tried to make few changes to the character, both because we wanted to keep the general feel of the character, and in order to reuse some of the previous assets. The changes can be seen in Figure 5.20.

### 5.3.2 Creation of NPCs

As mentioned in Section 5.3.1, it seemed as if there were no apparent problems with having the other characters in the game be non-human. Examples of these characters can be seen in Figure 5.21. Something we considered however were whether or not these character should be seen at all.

A suggestion was to only have vague representations of the characters. Examples of these can be seen in Figure 5.22. The player would be able to tell that there are NPCs in the world, and perhaps their approximate size and shape, but no further details. This was suggested based on the experience that some people have, where they might know that there are people around but not exactly who. Even though it might be a person they know very well, they might be indistinguishable from others.

A variation on this could be that the NPCs would be more clearly visible once the player interacted with them. This to represent that the character recognizes them and can identify them in a similar way as when they find a new ingredient they have found previously. Or perhaps that the main character can see enough to distinguish between the NPCs, but only at close range.



Figure 5.21: Some of the NPCs which were included in the game.

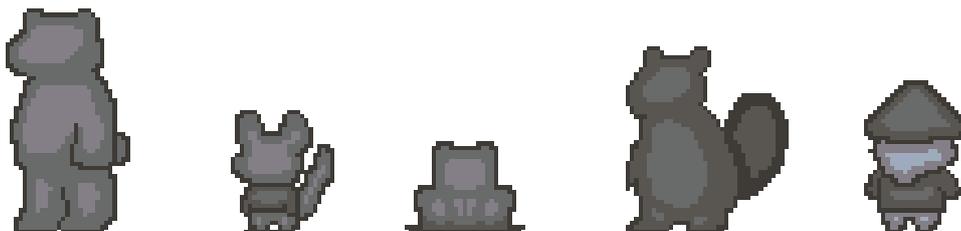


Figure 5.22: Suggestion of some unknown NPC characters.

### 5.3.3 Conducting Playtests

Once the MVP was finished, testing of the game could be started. Before each test a set of questions would be written, which would be asked to the players during the playtest session. Examples from the first test include “Did you ever feel lost?” and “What was the general feeling of the game?”. Sometimes a more general discussion point would be brought up. During the playtests there were always at least two testers, meaning there were always at least one other player which they could discuss with. These tests were conducted throughout the project at a somewhat regular interval from the time of the MVP being finished, to the end of development.

The basic structure of the playtests are based on previous playtests we have conducted for other projects. The playtests were conducted online through the communication software Discord, and were divided into two parts. Firstly, the playtesters would download and play the latest version of the game. While they were playing they would share their screens which allowed us to observe and take note of how they were playing the game. Secondly, after a certain amount of time had passed, the players would answer questions and discuss the game amongst each other.

No larger changes would be made to the structure of these tests. They were conducted in the same manner for the second iteration of the project as a whole.

The playtests were especially important for getting a sense of if the different parts of the aesthetics were communicating to the players as intended. There were a number of insights gained from conducting the tests. One being that players interpret the main characters view of the world differently. Some players thought that the character was fully sighted and did not realize that the character was visually impaired, while some thought the character was completely blind, and some had other interpretations.

Another insight was that players who did not understand the overall topic of the game consequently had problems understanding other parts of the game. The logic of the world, and why the character acted the way he did, certain players struggled to understand. Some players eventually realized what the topic was, either through being explicitly told so or, more often, through discussion with other players. Once the players had this realization, several stated that the rest of the game became much more clear and easy to understand.

### 5.3.4 Designing Potion Crafting

The potion crafting system was primarily designed by the students focusing on gameplay design. The player walks around the world and gathers ingredients for different quests provided by NPCs. Inside the players house there is a cauldron which they can interact with. Once they interact with this object the players are presented with an interface for making the potions.

There were several suggestions for how this interface could look like. One suggestion was to include recipes, inventory, and a list of verified markings. This can be seen in Figure 5.23.

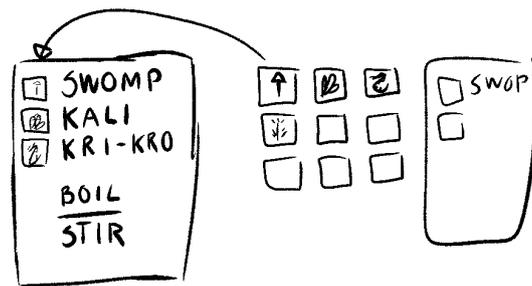


Figure 5.23: A suggestion of what the crafting UI could look like. On the left, changeable recipes depending on the potion being made. In the center, the players ingredient inventory. On the right, a list of verified ingredients and their assigned markers.

The recipes would be made to resemble actual recipes, with spaces for the player to place ingredients from their inventory. Additionally, there would be a dictionary with verified answers. During the game the player is allowed to assign markers to the ingredients, but they do not get any explicit kind of verification of which ingredient is which. In this suggestion, as players try to make the potions, if they successfully create a potion, the ingredients would also be recorded and verified as correct. This feature of verifying correctly assigned answers can be seen used in games such as Chants of Sennaar [92].

A concern with this design is perhaps that the usage of texts in this way could be counter intuitive to the topic of visual impairment. This is also true for all other texts within the world of the game. A solution could be to include braille into the visuals somehow, or to have some character which reads information out loud for the main character. Another idea could be to take advantage of the fantasy setting, with the main character casting some spell to be able have text read out loud. This could be literal, disembodied voice reading out the text to the player. It could also for example be that the book itself comes to life and directly speaks to the main character.

Another suggestion was to have a dictionary of all ingredients and potion recipes, the players inventory, and some space for adding ingredients to the cauldron. As the player are making the potions they might want to be able to have key information ready on hand. With this suggestion the player would receive less feedback regarding their choices. Only once a potion is brewed would they be able to verify whether the ingredients they put in were correct or not, as they would have to examine the resulting potion.

For both versions there were discussions regarding where feedback would be given to the player. When would they be able to know if they had collected the correct ingredients? Should this happen before or after a potion was made, and how?

There were also concerns about how the main character himself would be able to tell these things within the world. From the perspective of gameplay, the player needed some confirmation that they were choosing the correct ingredients. Up until

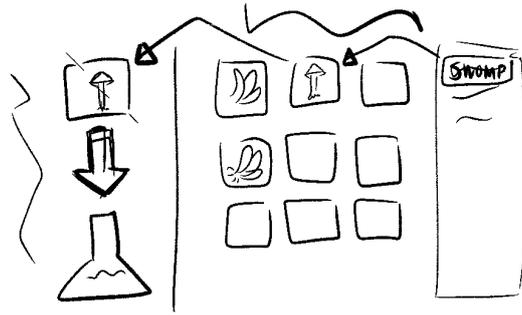


Figure 5.24: A suggestion of what the crafting UI could look like. On the left, input of ingredients to the cauldron which makes a potion. In the center, the players ingredient inventory. On the right, a dictionary containing information about each ingredient and potions.

the making of the potions the player would have no method of knowing whether the ingredients they had picked up where the right ones or not. To give the players some verification, after the creation of the potion seemed like the most suitable time. It could be given later, once the player tries to deliver or make use of the potion, but this point seemed too late in the process.

In some other games where potions can be made are Minecraft[89], Terraria[93], Baldurs Gate 3[94] and Potion Craft[95]. In some of these games the potions are distinguishable only through their color, or a lable on the bottle. In the others the potions have different colors, but also have differently shaped bottles. From the perspective of the game's story it is important to consider how the main character know what potion they have made and how he distinguished between them.

While there were details to consider, some suggestions were rejected based on feasibility of implementation. At this point of the project, a more simple version was implemented. The player would have their own inventory on screen, and an inventory for the cauldron. To craft a potion the player simply have to put any ingredients into the cauldron and press the craft button.

All potions made would look identical (except for the failed potion), and the player would need to interact with the item in the inventory to know what potion they had made. Perhaps the main character can recognize the potions by some other means than the look, such as smell or taste. And perhaps a failed potion is instantly recognized by the main character once it is finished, as the character is somewhat experienced with potions. It is of interest from a gameplay perspective, as this ensures that the player is quickly aware that something is wrong and can start to analyze their process and try to find where they potentially messed up.



Figure 5.25: On the left, the players pouch which contains ingredients they have gathered. On the right, the inventory of the cauldron where the player can place ingredients. Some ingredients have been put into the cauldron.

### 5.3.5 Designing Smell Particles

Smell is a sense which seems to often be excluded from games. If present it might be a description in a dialogue or a short text, but rarely is it a feature in games<sup>2</sup>. When considering what senses one might use in real life to navigate, smell was one of the senses which was discussed in an interview. We considered how smell could be represented in a game. The available channels which this could be represented through were sound, visuals, and text.

Sound had several limitations. Firstly a practical one, that the software used only allowed for a limited number of sounds to be played at the same time. Secondly, that it might be difficult to distinguish between actual sounds and sounds representing smell. There is also the question of what different smells would sound like.

This remapping of smell to another sense would also be difficult, which would also be true if one instead tried to make a visual representation. Here however there were less technical problems, as there the software had less of a limitation on the number of assets which could be displayed at the same time. Because we had limited the range of visibility for the player we also had a relatively large amount of available screen estate. These smell could potentially be shown in these blank regions.

When it came to text we wanted to make use of it in dialogue and story to tell the player about some specific details. But for navigation we were aiming for something more continuous, and a dialogue could be too disruptive to the gameplay. Perhaps some description could have been shown in the corner somewhere as part of the UI of the game. However, we also wanted to keep the representation of smells somewhat abstract, yet still distinguishable. Using text could be difficult if we did not want to be too specific when describing what something smelled like.

The player has the ability to choose a representation of the various plants once they

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<sup>2</sup>Even more so when it comes to digital games. There exists some examples of physical board games which make use of smell.

are discovered. A suggestion which was discussed was to make visual representations of smells based off these visual representations. However, we thought this could make the game too easy. And rather than using a sense of smell, it would seem like the player would be using visuals in a too visual way. We also thought that there should be a distinction between what something smells like and how one imagines these plants.

Many of the choices regarding smell at this point did not have any previous work, as far as we had found, which could be used to justify or motivate any decisions. As such, we chose what seemed the most appropriate or interesting to us, and noted that testing this feature could give some insight to how it can be bettered.



Figure 5.26: Some of the smell particles which were made. Some were included in the game.

We decided to start by making some abstract looking images, which would be used as particles floating around on the screen. The closer to the source of the smell, the more particles would be displayed. Some plants might have a stronger smell, and some might have a weaker smell. This would then determine the amount of particles on screen and also the distance from which the player could detect the smell.

### 5.3.6 Writing Story Regarding Visual Impairment

Writing of the story was done continuously throughout the project, but at earlier stages it was sometimes difficult to know certain important aspects. Things like precise locations of obstacles like water and dense forest, placement of buildings and NPCs. As the world of the game was built up some of the writing had to be changed and modified. Changing the main character to a human for example also meant that changes were needed, removing all references to the character having claws or being a bat.

As the other students working on the game were mostly responsible for the gameplay, there were times where writing also needed to be adjusted according to what they needed. For example, the gameplay is primarily focused on exploring, and the player receives tasks that they need to do in order to progress. Some of these tasks are more or less realistic to what someone might ask a person with visual impairment to do. Many of the tasks involve the player fetching items, finding items, creating items and delivering them. This is a relatively common kind of task in many other games. In the world of the game, perhaps this can be justified by the fact that the other characters might not know that the main character is visually impaired, and therefore asks him for help as they would anyone. There are some tasks which focus more on trying to incorporate experiences of those with visual impairment, but those are also more difficult to write.

As we have not experienced these things ourselves we can only base the writing

on what we have heard from others. Something we considered was how to let the player experience at least some of the emotions in some events. A problem here is that some events might not be representative, because what invokes emotions is especially the repetition of the same events over and over. It is these events that are the most difficult to include in a representative way, but also those who are the most difficult.

### 5.3.7 Redesigning Ingredient Markers

Towards the end of what we call Iteration 1 we returned to the design of the ingredient markers. Because these were created early on in the project, the appearance of these did not match with other assets created later. A redesign was needed to make it look more cohesive, but also because we felt they could be made better. Some of the markers received tweaks in their design, and some were changed drastically. Examples of markers which were changed can be seen in Figure 5.27.

Previously, it was unclear to players that the ingredient had been harvested and that there was no longer anything which could be picked up. Another change to the ingredient markers was then the addition of sprites for when they were harvested. Examples of this can be seen in Figure 5.28.



Figure 5.27: Old sprite designs to the left, and new sprite designs to the right.

There were also more, completely new designs created in order to offer the player with more options and variety for their markings. These new designs were created after first writing some descriptions, and can be seen in Figure 5.29. Among these new designs was also the unknown ingredient. This is how an ingredient that the player has not interacted with appears at first, and can be seen in Figure 5.30.

The last change that was made to the ingredient markers was in the user interface. Previously, when the player would choose which marker they wanted to use they would be presented with how the ingredient looks like as they appear in the world.

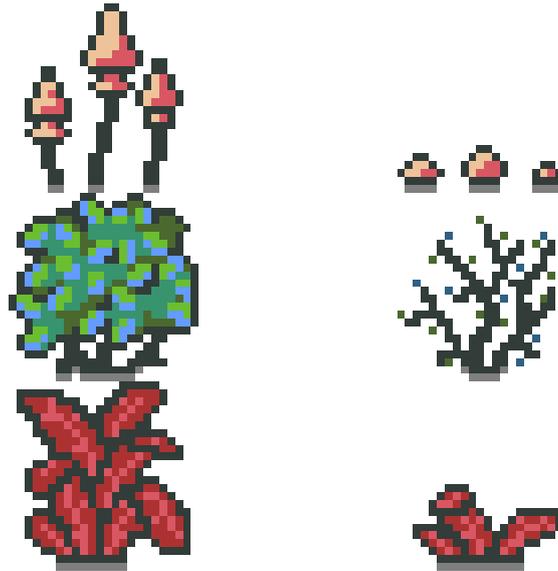


Figure 5.28: The world sprites to the left, and their harvested counterparts to the right.

Here, we changed it so that the user interface instead showed the marker as it appears in the inventory. This because we believed it would make it more intuitive for the players during the potion making process.

## 5.4 Iteration 2

Around the middle point of the project we changed our focus. There were some aspects we realized we would not be able to test within the digital game, as it would require too much time and effort as compared to the results. As such, we decided to return to using paper prototypes. With a paper prototype we would also be able to try aspects which might not be suitable for this game project, but could be of interest for a different kind of game still related to the topic of visual impairment. The game was still iterated on at the same time by the sister thesis group.

### 5.4.1 Designing Inventory Sorting

Something we wanted to include was to let the players arrange their inventory. Placement of objects is important in order to remember what is what, and to be able to easily find it. Something which can be helpful to those with visual impairment is marking similar objects somehow to make them distinguishable. Examples can include adding a contrasting label or attaching tactile button stickers.

As mentioned earlier in Section 5.3.4, one of the mechanics of the game is that the player can make potions. At first all successful potions had the same appearance. To make them different by way of color or labels as in some other games didn't suit with the topic. These potions we instead wanted to be distinguishable by means that the main character also would be able to use. Suggestions for these can be seen

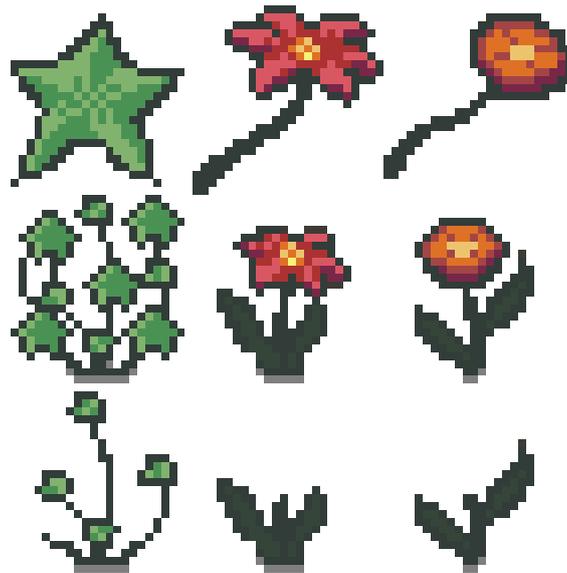


Figure 5.29: The new markers available to the player. Inventory sprites at the top row, world sprites in the middle and harvested in the bottom row.

in Figure 5.31.

These bottles have different shapes, and different additions, such as stickers or hair ties to make the bottles visually distinct in the inventory. In the world of the game tactile markings are utilized when potions are made to make them distinct from each other. For the player they are distinguishable from the visual design of the bottles. This helps the player keep track of different potions through their visual appearance, while at the same time not making it obvious from the appearance itself. Rather, the player can learn to associate certain markers with the potions. This an attempt to replicate the way some people with visual impairment differentiate between certain objects by using tactile markings as mentioned in Section 2.3.2.

On the leftmost column there are examples of potions that are failed. Of the potions that were made successfully we considered letting the player assign a bottle for each kind of potion they make. The player would in this scenario also be able to place the potion freely in their inventory. The player would then not be able to know what potion they are holding through tool tips after the selection is made. This to make them more considerate of their selected representations and organization in the inventory. However, this would require changes to the inventory system we had at this stage. This was a change that the people working with gameplay also agreed should probably be changed, but would be left for potential future work.

At this point in time, each potion is assigned one of the bottle designs from Figure 5.31 by the game, and the player themselves can not make any changes to this. This we hope somewhat manages to combine the need for visually distinct items for the players which use sight, and the topic of the game. If the player interacts with a bottle they will receive a tooltip which tells them what kind of potion it is, as seen in Figure 5.32.



Figure 5.30: The marker that represents an ingredient the player have yet to interact with.

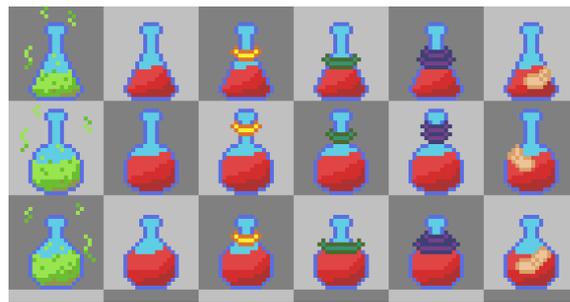


Figure 5.31: Example of some bottles which are supposed to be distinguishable by the main character in the game.

As mentioned in Section 5.3.4, we believe it can be justified within the game world to let the player know what kind of potion it is by interacting with it. The main character has experience with potions to some extent and would probably be able to distinguish the potions through means such as smell, taste, or some magical power which is not necessarily related to sight.

## 5.4.2 Conducting Survey About Smell Particles

As mentioned in Section 5.3.5 smells were something we chose to represent through visuals.

It seemed like the first version of particles on screen where difficult to interpret, and confused players. Sometimes it was ignored. An attempt to introduce the concept to the player was made through dialogue from one of the NPCs. The NPC mentions that something smells strongly, and there are items places nearby which generates the smell particles.



Figure 5.32: A view of the players inventory, which contains 3 potions and an additional item. There is a failed potion, and two successful potions which have distinct appearances. Tooltip has been opened tells us that the rightmost potion is a strength potion.

A different solution could be to create some indicator of the smell as part of the user interface instead. For example, having a small box displays all smells within reach of the player, and some kind of text which describes them. For example by using words like sweet, flowery, grassy, etc. Another could be to give it more direction, perhaps by using animated particles.

As it was implemented in the first version, the particles appear all around the player, with more particles appearing the closer the player gets to the source. This because the direction of a smell can often be difficult to tell without moving closer or further away, unlike sounds. For the players it could have been easier to understand if the particles only appeared in the direction of the object. But it could also reduce some of the intended feelings of being lost, and not being able to locate items easily.



Figure 5.33: In the top right corner, an indicator of what is smelled is shown. In this case, there is only one smell close by, as indicated by the opacity in the UI.

A version of the indicator on the user interface was implemented, and seemed to make it much more apparent to the players what the particles were representing. This did not replace the previous system, instead it was an addition as can be seen



Figure 5.34: In the top right corner, an indicator of what is smelled is shown. In this case, there are two smells further away, as indicated by the opacity in the UI.

in Figure 5.33 and Figure 5.34. In this indicator, up to three different smells can be detected at the same time. Depending on how strong each smell is, the transparency of the image changes.

As for the particles themselves it seemed that some were more appropriate and memorable, while some were less noticeable and more difficult to make connections with. Associations between shape and smell, as far as we could tell, was something which there did not exist much previous work on. As for color and smell, we found some previous work in [96]. From [96], we could tell that there appeared that perhaps generalized associations could be made. Something to note was the similarities and differences across cultures and locations.

In order to improve the particles, we conducted a small survey. In this survey we asked the participants about which colors and shapes they preferred for a few certain smells and concepts. As we also had considered the movement of the particles as something which could be helpful, we also created a few animations which we received feedback on. The available options can be seen in Figure 5.35, Figure 5.36, and Figure 5.37. With these options we aimed to capture a more general sense of peoples opinions, which could then be examined and iterated more closely at a later point. The results of this survey can be seen in Appendix A. These results, in combination with previous research into these associations, could be used to improve the representation of the smells in the game.

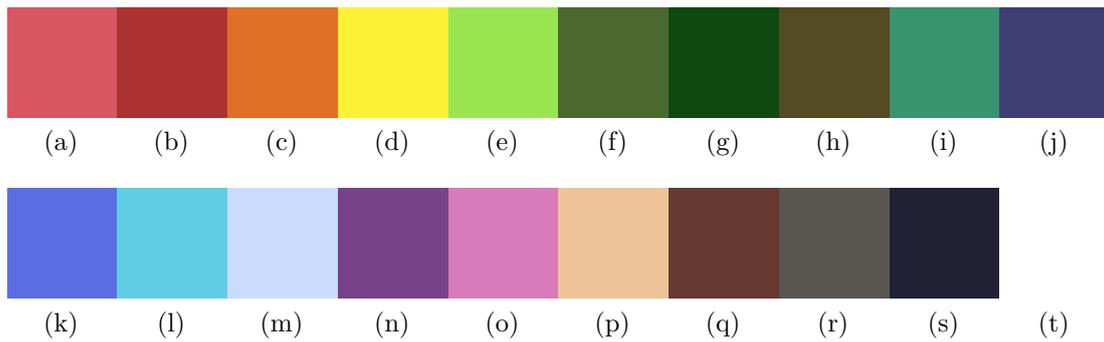


Figure 5.35: The colors which were available in the survey.

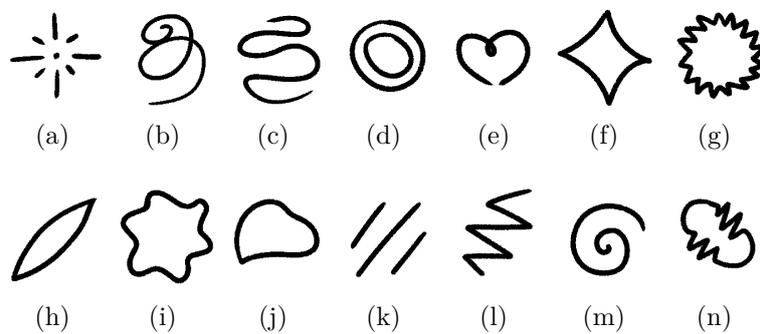


Figure 5.36: The shapes which were available in the survey.

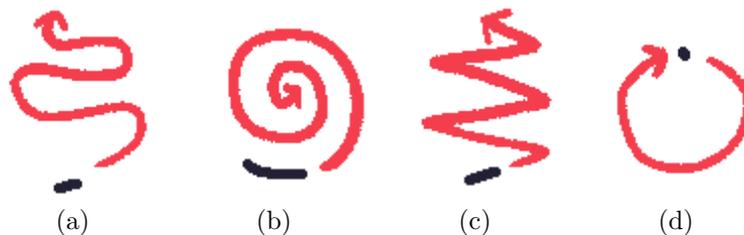


Figure 5.37: A sketch of how the animations moved.

### 5.4.3 Considering the Target Audience

A target group for the project had not been explicitly written. As the project continued, there was a realization from some of the people working on the project that perhaps the game has a more specific target audience. This was realized especially in discussions about game design. Most of what had been created for the project from the authors of this paper remained unaffected by these discussions. It seemed as if the visual elements, the story, the sounds, and everything else related to the aesthetics needed no changes.

Although it was difficult to pinpoint precisely who the target audience was for this game, we were able to pinpoint that they would most likely enjoy other games with

a similar feeling. Probably games which are often described as “cozy”. Games which are more casual and relaxing. We noted that perhaps there would be some overlap with players who enjoyed games such as *Stardew Valley*. This seemed like reasonable assumption as it was a game which served as inspiration in the conceptualization of the game, and later on also inspired the general look of the game.

#### 5.4.4 Writing of Dialogue and Events

As mentioned previously, there were some stories which were more difficult to write and implement. Part of the problem is not knowing whether the intended message would be delivered or not.

One story we wanted to include was one about the main character being physically moved by another character. From our understanding it is a relatively common occurrence for those with visual impairment to have strangers try to help them with navigation. Sometimes it is done in a more proper manner, but too often people tend to drag the person along which can cause a number of problems. It can be disorienting and annoying, but also scary. Having a stranger suddenly take you to an unknown location could be an uncomfortable or scary experience for anyone.

#### 5.4.5 Testing of Features Outside the Game

There were a number of things which were difficult to test through the actual game without investing a significant amount of time. There was also the need to consider what would be appropriate for the students who focused on gameplay, as there were things which could be appropriate or interesting from our perspective but not theirs. For these things we returned to creating paper prototypes.

For this test there were two things we wanted to test. Firstly, we wanted to test how players would react to the attempted experience of being dragged away, as discussed in Section 5.4.4. Would the players be able to understand what the story was about? And what would they learn from trying the paper prototype? Secondly, we wanted to know if players cared about the appearance of NPCs and if choosing the appearance themselves was something which was of interest. It could be of interest to let the player themselves assign an appearance to the different NPCs in the game.

In the test a map as seen in Figure 5.38 was printed out and hidden from the player. The players were told that they had just crossed a bridge, and were given a first goal, to reach a fountain in the middle of a plaza. They were given a mat which they could draw on and move a playing piece, as well as pens and paper for taking notes and drawing. The world was divided along a square grid, and as the players moved through the world, one person followed along using the printed out map. The players received information about the ground which they were walking on, and could also receive information about their closest surroundings. They would be notified if they were walking into something like a tree, a fence or similar. In order for the player to reach the fountain they would need to move across a large portion of the test area.

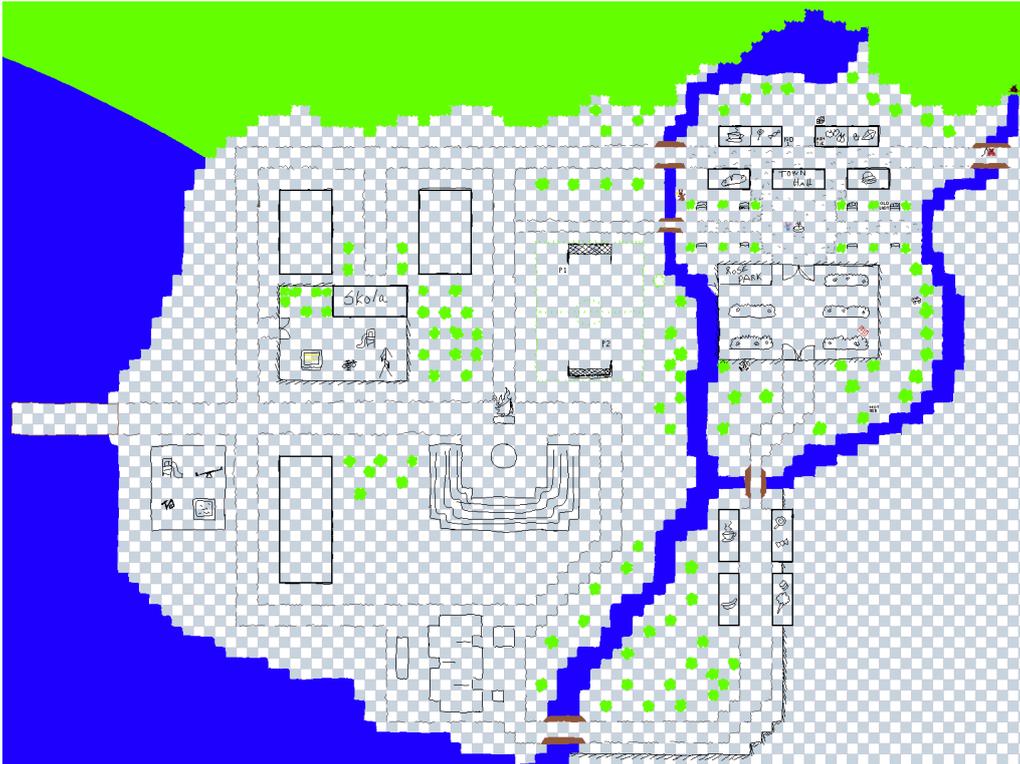


Figure 5.38: Map over the area which the players could explore. The area on the left remains to be tested, as only the top right part of the map has been used in the tests so far.

Once the player reached this fountain, there would be an indication that there was an NPC next to it. Players would either interact with this NPC by themselves, or otherwise be instructed to interact with it. This NPC then gives the player a task to help find a lost object. There are several objects which the player can find in the region. The purpose of the players having to walk to the fountain and to find these objects is so that they can become somewhat familiar with the surroundings. Once the players returns the correct object to the NPC this NPC moves them to a different location. During this move, the player is not told or shown where they have been moved to, and they are also not told that they are facing a different direction. This is to try to replicate some of the disorienting feelings one might have. The players are then instructed to return to the starting point.

Throughout the area there were also other NPCs which the player could interact with. There was some information planned that the players could receive, and given the free format of the test structure it was also possible to improvise some interactions depending on what the players tried to do. As the players were able to interact with people in a less artificial setting, their reactions might have been different to what it would have been like in an actual digital game.

The area which the player could move around was initially planned to be larger, meaning the majority of what is shown in Figure 5.38. However, before conducting any tests we decided to first limit the test to a smaller part, and then only expand if

the tests were finished too quickly or did not seem to be disorienting enough. This would not be needed, as we would discover.

Each test was planned to take about one hour to complete, but the speed of the players varied greatly, and overall most needed more time. Players tended to move relatively cautiously, and it also took more time than expected to get the communication to an efficient point. In order to speed up the game slightly we had also allowed the players to examine their surroundings. Meaning the 8 squares surrounding the player would also be accessible. The in game justification for why the player could also examine the squares next to them was because the character was holding a white cane. Even with these adjustments and extending the time limit of the tests, some were unable to fully complete the test.

Although not intended to be as slow as it was, it could be considered appropriate for the topic. Requiring more time to complete certain tasks, such as navigating to a location is something which is needed at times for those with visual impairment.

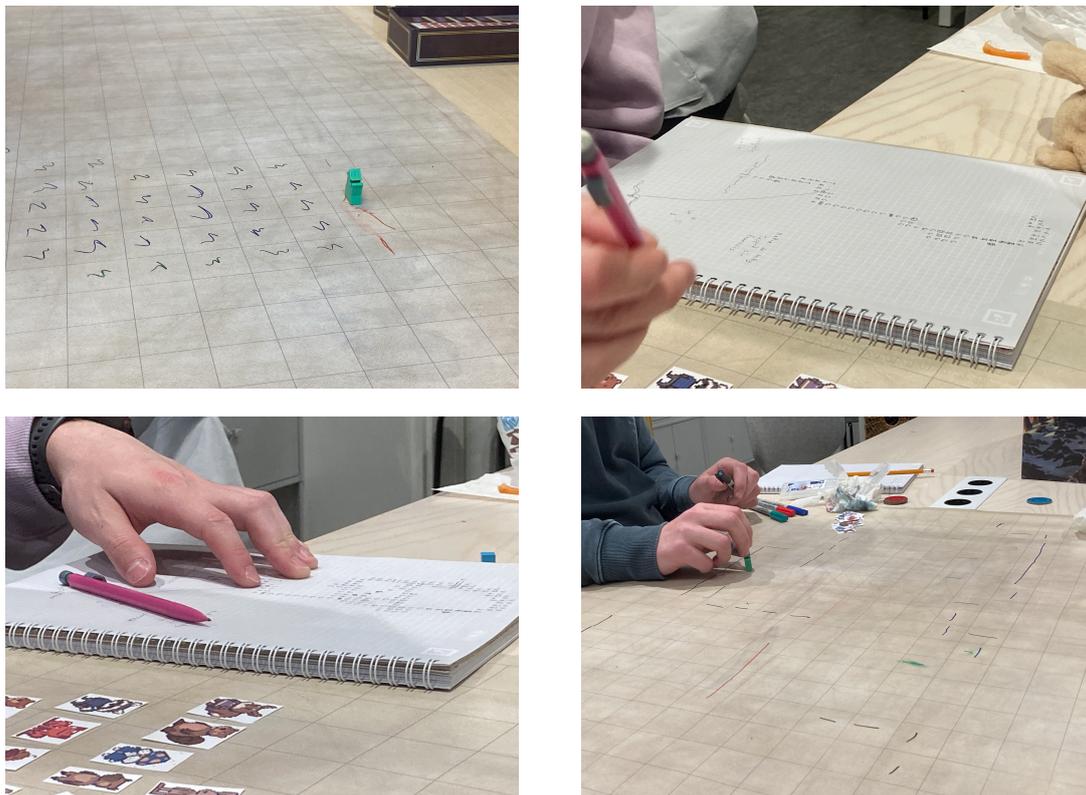


Figure 5.39: Different players had different strategies.

The players had different strategies for keeping track of their movements. Some drew directly on the mat, and some chose to use paper and pen. Some took detailed notes, which included the texture of each tile they walked across, and some only noted some of the larger structures such as houses, fences, and trees. One person expressed regret over not being more meticulous in their note taking, as they had become lost.

Some players mentioned that a lead animal would have been appreciated. Including a lead animal could have increased the feeling of safety or reassurance. It could also perhaps have been implemented in a way that helped the players move differently, which could have made the game less slow.

As mentioned, another thing we wanted to test was letting the player choose visual representations for the NPCs. As with the ingredients that the player can pick up in the game, we considered also letting the player assign their own representations of the characters they interact with. During the test the players could use printed out pictures of characters which they could use if they wanted to to mark NPCs on the larger grid.

What we took notice of was that most of the players did not seem to care about how the NPCs looked or were represented in the prototype. Interactions were often brief, trying to get the information from them as quickly as possible. Some made use of the printed out images, and some chose to mark the NPCs out on the grid in the same manner as they would with buildings, trees, or other objects.

# 6

## Results

From this project we produced two things. We created a game, and we created a SWOT analysis. In this chapter we will describe the game overall, which also includes elements contributed by both us and the two other students working on the project. We will also describe the SWOT analysis created which attempts to answer the research question posed at the start of the project.

### 6.1 Fabian and Fables

The game that was produced as part of this project was named *Fabian and Fables*. *Fabian and Fables* attempts to bring awareness about the topic of visual impairment for players who are sighted. The main character of this game is called Fabian, who is visually impaired. In the story of the game, Fabian is a witch which specializes in making potions and has just moved to a place called Moonlight Springs.

As Fabian, the player gets to explore new places and environments while foraging for different herbs and ingredients for potions. The other characters in Moonlight Springs are sometimes in need of help, and request potions to solve their problems. Sometimes they might need help in ways other than making potions. The fact that Fabian is visually impaired can sometimes play a role in his interactions with others, and sometimes it has no particular impact.

To communicate to the player that Fabian is visually impaired, their view on screen is limited to a relatively small circle around the player which shows the world around him. The rest of the world is mostly white or black, depending on the time of day in the game. This can be read more about in Section 5.2.6. Instead of relying solely on what they can see, the players can make use of other senses as they make their way through the world.

Firstly, they can rely on sounds. As the player walks around in the world, the ground which they are walking on varies. Depending on what material they are walking on, the sound effect of Fabians footsteps changes to reflect the texture. The players can also use some sounds from the surrounding environments, such as the sound of running water, or different background music tracks to orient themselves. This is something which becomes more important the less the player is able to see, as in certain regions of the world the players view becomes more obscured. More details about sounds can be found in Section 5.2.8.

## 6. Results

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Another sense that is available to the player is smell. Whenever Fabian is close to an object which has a distinct detectable smell, particles will start to appear and move around in the white areas of the screen. They will also appear in the indicator on the players interface. These both to communicate to the player what scent Fabian is currently experiencing, and how strongly. As the player gets closer to these objects, more particles will appear on screen, and the symbols within the indicator will become more opaque. The design of the smells are documented in Section 5.3.5, and 5.4.2.

As the player walks around, a trail of footsteps follow behind which represents Fabians spatial awareness. These are, like the smell particles, shown in the white area of the screen. Examples of what this looks like can be seen in Figure 6.1. These serve to give the player some guidance in how they have moved, but not to the extent that they can map out the whole world.



Figure 6.1: A trail of footsteps follow behind the main character where he has walked. They remain visible even in foggy areas where other objects disappear, as seen to the right.

The last sense that the player gets to experience is touch. This is utilized not for exploring and movements, but specifically for foraging. When finding ingredients for potions Fabian provides a description of the items. This description can include for example the smell and taste och the item, but especially focuses on touch. The shapes and sizes of the items, and what the textures might remind him of. This to emphasize that Fabian either can not rely on vision, or that other senses are more reliable.

Fabian always carries a book with him, containing recipes for potions and information about the different ingredients he can find in the world. The descriptions of ingredients in this book were not written by Fabian himself, but someone else, someone who was most likely writing descriptions for something like a dictionary. These descriptions sometimes assume that the person reading is able to see, and can make use of colors or similar, which a character like Fabian might not be able to make use of. The player has to compare both kinds of descriptions, the ones given by Fabian and the ones given by Fabians book, in order to figure out which ingredient is which.

The player has the option to use markings for the different ingredients that they find, as shown in Figure 6.2. These will affect how the ingredients look in the real world, and in Fabians inventory. The player is free to chose whichever marker they want

to represent the ingredient, as there is no right or wrong answer. This is to make it easier for the players to remember which ingredient is which, without having to read through the description again, although it is possible to do so if the player needs to. This is also to make it easier for the player to know whether they are encountering something for the first time or not.



Figure 6.2: The markers available to the player in *Fabian and Fables*.

If Fabian interacts with an ingredient which has been found before, he comments on it, and the sprite is changed according to the marking that the player had previously chosen. It is up to the player to remember which marking represented which ingredient, and to choose markings which help them do so. The design of these markings can be read about in Section 5.2.3, and 5.5.

As mentioned, the purpose of collecting these ingredients is primarily to brew potions. In Fabian's house there is a cauldron. The player can use ingredients from their inventory and place them into the cauldron to create a potion. If the player has correctly identified the ingredients and marked them, then this could serve to verify that for the player. Because only certain combinations, which are described in the recipe section of Fabian's book, will work to generate a potion. More details about the potion making process can be found in Section 5.3.4.

The first area that the player gets to explore is the area around Fabian's house called Forest Meadows, which can be seen in Figure 6.3. This area consists mostly of trees and bushes, with some open paths which lead through dense forest. If the player walks to the east from Fabian's house they will encounter a roadblock consisting of multiple rocks. Once the first quest of the game has been completed these roadblocks will disappear. This limits the area which the player can explore at the start of the game. In this limited area the player can find two different ingredients which they can gather and use for the first quest.



Figure 6.3: Overview of the Forest Meadow area.

Once the roadblocks have been removed the player can continue further and encounter a large road. This can lead the player north to the another area called Critterton. If the player instead continues east of the road they will come across a body of water. The player can also follow the road south and encounter an area with heavy fog. This fog further limits the players field of view, leaving them to rely on other senses. Besides the larger road there are also a few smaller stone paths that can be used as guidance. The goal of the area is to evoke the feeling of initially being lost, while also preventing the players from wandering too far away from Fabian's house as the player explores. There are landmarks that the players may learn to use for their navigation eventually, making the same area familiar and more safe.

Following the large road north the player will enter Critterton, the capital of Moonlight Springs. This area contains a number of houses with different NPCs living there. These NPCs can be interacted with, and can be seen in Figure 6.4. A river runs through the capital and flows into a lake. In the middle of Critterton is a town square, with a fountain-like structure in the middle and a town hall to the north.



Figure 6.4: Overview of the Critterton area.

There are several roads and paths leading around Critterton that the player can follow. The different buildings in the capital include houses, a blacksmith, a bakery, a flower shop, and a town hall. If the player proceeds to the east of the town hall they will come across a path made of lily pads leading over the water. At the end of this path lies the Amphibian Theatre, a large Colosseum like structure. Critterton is meant to be interesting, filled with interactions with NPCs. But it is also meant to appear busy and overstimulate the players senses in some regards. For example there are several objects which give off smell, and there are several buildings which look the same which could cause confusion in some areas.

The last implemented area is called Bear River and is located to the east of Forest Meadow, across the river. The name comes from the combination of the words Beer, Bear, and Beaver. This area is only accessible to the player after completing a quest that leads to the reparation of a bridge. This area follows closely along the river, and is populated an number of NPCs, including several beavers and bears. This area can be seen in Figure 6.5. To the north of there is a bar founded by beavers, and to the south is another bar founded by bears. The beavers have built a beautiful and well structured establishment, while the bears have created an outside bar with poorly made pieces of furniture scattered about. This area does not have any quests or story elements which have been implemented. Some kind of conflict between the two groups, bears and beavers, is taking place here and would be a part of the game which focused especially on story elements.

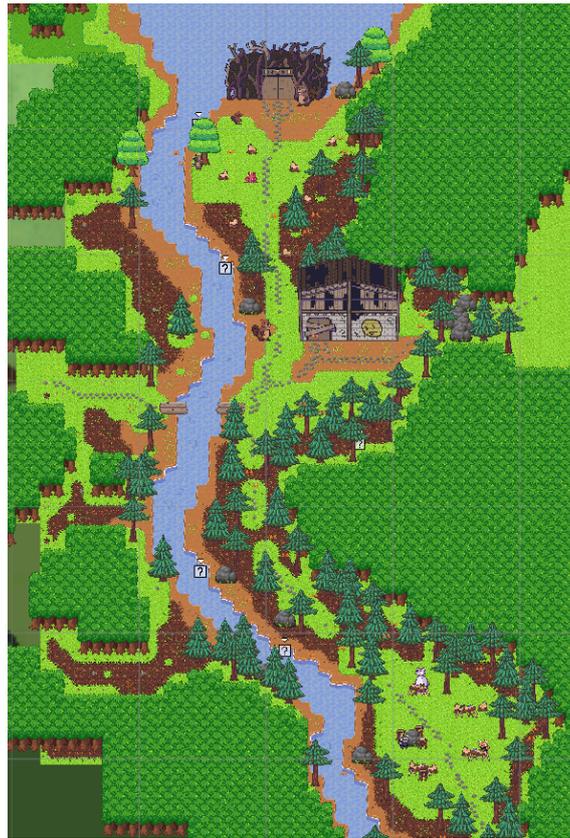


Figure 6.5: Overview of the Bear River area.

Within the world the player might also experience the change of time through the day cycle. Each day is approximately 10 minutes long in real time, and as the day progresses things change in the world. The perhaps most apparent being that there is a change in appearance both within the players view, and the mask. In the morning the players view and the mask will have an orange tint. As the morning passes the tint is removed, and the world appears as usual, and the mask is white. Once the day nears its end the view becomes tinted in orange and pink. Finally night arrives, and the players view becomes darker while the mask shifts to black. Examples of these different states are shown in Figure 6.6. The view becomes even more limited, and it becomes more difficult to navigate using sight. The state of night will remain until the player goes back to Fabians house and goes to sleep, which will then make the game move on to the next day. This can be useful for some story and quests in the game.

Some areas also have additional changes to them. For example, the southern parts of Forest Meadow which are usually filled with fog will be clear during the night. Another change is related to the moths which appear throughout all of Moonlight Springs. At night, light is much more limited at night these moths can be of help for the player. This because the moths give off a subtle light, which the players could use to get a better view of their surroundings.

Once the player has gone to bed, before the next day begins, they will be prompted

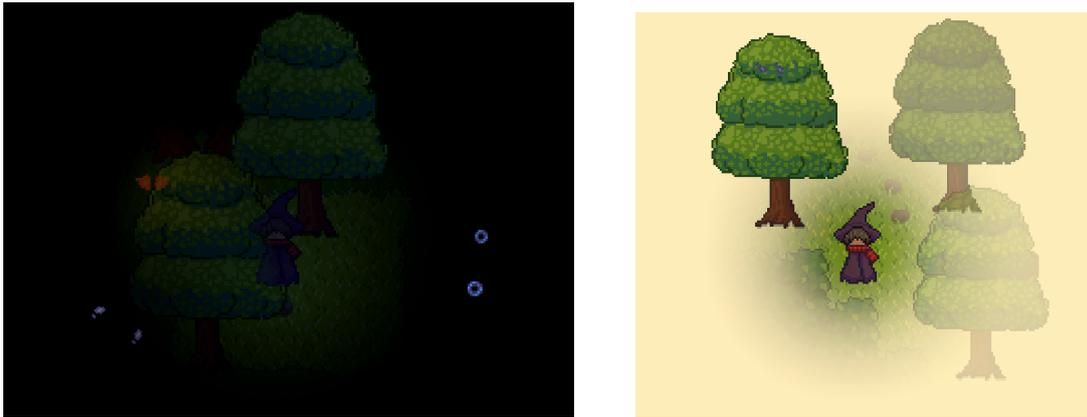


Figure 6.6: What the game might look like at night to the left, and at dusk to the right.

with a question which is related to the topic of visual impairment. These questions are meant to partially make the topic of the game more apparent, but also to make the player reflect about the topic visual impairment. Each night there will be a new question for the player to answer, with one example being shown in Figure 6.7. There are no correct answers, and the player may choose to not enter any answer at all. The player may also go back and look at their previous answers.



Figure 6.7: An example of a question presented to the player at night.

As the player walks around in the world they might encounter NPCs which they can interact with. Sometimes there are a few sentences which can be read, and sometimes the NPCs might have a quest for the player. Sometimes there might be a special kind of interaction available. The NPCs which have these quests or special interactions can be distinguished by the exclamation point displayed over their heads, as seen in Figure 6.8.



Figure 6.8: An NPC which has a question mark indicating that there is some special event or quest available.

There are several questlines and quests which attempt to fulfill different purposes, as written about in Section 5.2.7, 5.3.6, and 5.4.4. Once the player interacts with these NPCs the quest or special event might take place. This sometimes depends on the player and how they interact with the NPC. In the quest the player might have to do a number of tasks in order to complete the quest.

The first quest the player will encounter is given by a character standing outside Fabian’s house. This character complains about a stuffy nose, and requests that Fabian help him in some way, as seen in Figure 6.9. The goal of this quest is to introduce to the player to the game and its format with a relatively simple task. In order to complete this quest, the player needs to brew a specific potion, meaning that they have to start exploring the area to find the needed ingredients.



Figure 6.9: An NPC has requested the help from Fabian to make a potion.

The game is at this point limited to a smaller portion of Forest Meadows, as described

previously. Once the player has provided the character with the potion and gone to bed, obstacles will be removed which lets the player access new areas and other NPCs. The player can interact with a large portion of the NPCs in the game at this point, and there is no particular order that the player needs to follow for the following quests.

One example of a questline included is given by an NPC called GP, a nickname for Grizzly Paw. This NPC can be found by following guitar music played in a certain area by the river, as the player gets closer the music will become louder. GP will tell Fabian about what is on the other side of the river, and give hints about the story between bears and beavers in the area. He will also tell Fabian about a broken bridge further south, and it is hinted that if he is given a hammer he could repair the bridge.

In order to complete the questline Fabian needs to complete two additional quests from two other NPCs. In Critterton, there is a blacksmith which tells Fabian that a hammer can be made. But only if Fabian helps find and return his son. The son is stuck under a rock and the player needs to create a potion to help him get out. Once this potion has been made the player can help the blacksmith's son to escape the rock, meaning that they can receive the hammer from the blacksmith. This can be given to GP who will repair the bridge the next day and therefor completing the questline. The repaired bridge can then be used to access the Beaar River area.

An example of a special event is if the player interacts with an NPC called Matty. When walking up to Critterton this NPC is standing to the left side of the road with an exclamation point displayed. Interacting with Matty will prompt the player with a question asking if they have seen the old shrine. Depending on what the player answers a special event might take place. If the player says yes the quest will end, and there will be no special event. If the player answers no Matty will excitedly tell Fabian to follow along, and as he drags Fabian with him the players area of view is removed. They arrive at a different location where Fabian explains to Matty why this is troublesome and tells him to not do it again, as seen in Figure 6.10. This event focuses on providing the player with an experience that people with visual impairments might experience, and is mentioned in Section 5.4.4 and 5.4.5.

## 6.2 SWOT Analysis

In order to answer the question “**What should be considered when designing aesthetics to promote awareness through an applied game?**” we created a SWOT analysis. This analysis is divided into parts, into a list of aspects which could be considered.

These aspects were considered as the project continued, and were changed and modified along the way. These aspects we believe are not the only ones, and not necessarily the most important ones, but could still be helpful to consider. These aspects could be more or less suitable depending on the circumstances of the game which one wants to develop, and the specific topic which one wants to promote awareness about. Since we had chosen the topic of Visual Impairment, many of the aspects



Figure 6.10: Fabian at the shrine talking with Matty about how his actions have affected Fabian.

are related specifically to this topic, and might be best suited for a game about that. The following list shows the aspects which we included into the SWOT analysis.

- Inclusion of Sounds
- Using No Visual Elements
- Using Visual Representation of Senses
- Inclusion of Dialogue
- Directly Addressing the Topic of the Game
- Inclusion of Different Visual Aids
- Using Player Assigned markers

The following sections cover each of the aspects, and its contribution to the SWOT analysis.

### 6.2.1 Inclusion of Sounds

There are some things which need to be considered when selecting sounds to include in a game. As we know from previous games, as described in Section 3.2, for games related to visual impairment sound can be important. Or in some cases crucial, as many of these games are audio games.

Strength	<ul style="list-style-type: none"> <li>• Makes the game seem more finished, as it is expected by most players to exist.</li> <li>• Allows the player to rely on senses other than sight.</li> <li>• Can make the environment seem more living, and increase the immersion.</li> </ul>
Weakness	<ul style="list-style-type: none"> <li>• Sounds need to be carefully selected, to be appropriate and not break the immersion.</li> <li>• Sounds need to be carefully selected, to be distinguishable from each other.</li> <li>• Adjustments are needed depending on the experience one has with working with sounds.</li> </ul>
Opportunity	<ul style="list-style-type: none"> <li>• Allows for environmental storytelling.</li> <li>• Can be used to set the tone or mood of the game.</li> </ul>
Threat	<ul style="list-style-type: none"> <li>• If something is only detectable through sound, it can exclude players.</li> <li>• If too many sounds are played at the player could be overstimulated.</li> </ul>

Table 6.1: SWOT table describing the usage of a variety of sounds.

Not using sounds can make a game appear unfinished. Although not always necessary for the gameplay, it is important for things like immersion and setting the overall tone of the game. As mentioned in Section 2.2, sound is a part of the aesthetic and can be an important part what makes a appealing. In the context of making an applied game about the topic of visual impairment, it seems even more important. As hearing is used to help navigate in the real world for many with visual impairment, it is something which could strengthen the representation in the game. Especially if it is implemented in such a way that the player can also use the sound to help themselves in their navigation.

In *Fabian and Fables* the players could learn to navigate partially through sounds. As described in Section 5.2.8, there were for example different sound effects for when the player would walk on different materials. With these sounds it could be possible for players to navigate and recognize their location more easily without having to use visual elements. It seemed some players were able to make use of these sounds which we had added specifically for navigational purposes. Some noted that the background music changed depending on the area. Some noted that there were environmental sounds such as water, or an NPC which played music. Some players noted that sounds were especially useful at times where sight was even more limited than usual, such as at night or in foggy areas.



Figure 6.11: One of the NPCs playing music, which the player can find.

In our game all sound effects, environmental sounds, and music were recorded and created by other people, as mentioned in Section 5.2.8. Although we were able to modify some of them slightly, we were restricted by the sounds we could find available for use. Still, with our limited knowledge we were able to make use of the available resources and create something we deemed sufficient.

Although we did not manage to implement much of it, sounds can be used also for environmental storytelling. A simple example we considered was to change the sound effects played in the forest depending on the time of day. During daytime we could use bird song, and at night we could use crickets. Another example we considered was for the Bear River area. Here we considered having two sets of background music, one for the area with the beavers, and one for the area with the bears. Both tracks would be more simple, almost seemingly incomplete. Once the player had resolved the conflict between the bears and beavers, the two tracks would be played together throughout the whole area. Indicating that the conflict had been resolved.

With *Fabian and Fables* we specifically aimed to create a game with a relaxed atmosphere. We did not want to create overly negative associations, as might happen if we made a horror game, nor overly positive associations as discussed in Section

3.2. We believed the background music played an important role in giving the game the right mood. As many had said during the playtesting, the game seemed to be a “cozy” game.

Something to consider that the usage of sounds can also be excluding. Although it might be expected that a game will use sounds to some extent, if it the only tool utilized to communicate something it could be excluding certain players. Those who are hard of hearing or deaf might not be able to play the game if there is no other way to communicate information to the players. To also consider is that the player can only make sense of a number of sounds played at the same time. Sounds can be difficult to distinguish if too many are used at the same time. The amount of sounds which might be played at the same time should be considered, as it might become overwhelming otherwise.

### **6.2.2 Using No Visual Elements**

As mentioned in Section 3.3, some, or perhaps the majority, of the games related to visual impairment are audio games. This means that they essentially only use sounds for the game itself, and sometimes also for parts such as the menu and other non-game parts. A reason for this might be that many of these games are also intended specifically for those with visual impairments, as also mentioned in Section 3.3.

Strength	<ul style="list-style-type: none"> <li>• Might be more obvious to players what the game is about.</li> <li>• Might provide a more realistic experience. Closer to a simulation.</li> <li>• Players would have to rely on other senses provided in the game.</li> </ul>
Weakness	<ul style="list-style-type: none"> <li>• Is not representative for a large portion of those with visual impairment.</li> <li>• Requires better design of sounds.</li> <li>• Might severely limit the amount of inputs that the player can receive.</li> </ul>
Opportunity	<ul style="list-style-type: none"> <li>• Could be easier to receive feedback from those with visual impairment.</li> </ul>
Threat	<ul style="list-style-type: none"> <li>• It might not be appealing to play as a sighted person.</li> <li>• Could reinforce stereotypes that the majority of people with visual impairment are completely blind.</li> </ul>

Table 6.2: SWOT table describing the usage of no visual elements.

To consider here is that it seems to become much more obvious to the players that there is a connection to visual impairment. If there are any visual elements shown at all the players might interpret the limited elements as a part of the format of the game, as opposed as representation of how the character is experiencing the world. This is something we noted during the different playtests of the game, as mentioned in Section 5.3.3.

By completely removing all visual elements the players would have no other choice but to rely on other senses. Sounds especially would be of importance, as other senses might be difficult to include in the format of a digital game <sup>1</sup>. This could create a more realistic experience, or would at least ensure that the players made

<sup>1</sup>It might however be easier to include other senses if one were to make a physical game. Like a board game, or a game in the same sense as hide-and-seek or tag.

use of other senses than sight specifically. Because the players would most likely have to rely heavily on the sounds of the game, this means that they have to be implemented with even more consideration than in other kinds of games.

As mentioned in Section 2.3, visual impairment is a relatively broad spectrum. Total blindness, as implied by a game which uses no visual elements, is not necessarily representative of a significant portion of the population. Therefore it might not provide the kind of representation needed if the goal is to inform about visual impairment. It might even reinforce the stereotype that being visually impaired is the same as not being able to see anything whatsoever.

By using no visual elements at all, the game becomes much more limited in the amount of information that can be provided to the player. Besides sounds, another possible source of information might be by using some sort of rumbling or vibration function, although this depends on the platform and controller that the player is using. This also has a limited amount of information that can be communicated at the same time.

Something to consider is that because the spectrum of visual impairment is relatively broad, if the game can be played by those with total blindness, then it can be played by others as well. Because it would be more inclusive to some, it might be easier to receive feedback from those with visual impairment. People would be able to play the game for themselves, rather than needing to have someone describe it to them as we had to in Section 5.2.5, and provide feedback based on this description.

In *Fabian and Fables*, we decided to use of visual elements. Partially, as mentioned in Section 5.1.13, this was because we had such limited experience working with sounds. Partially, because using visual elements seemed to be a less explored method. But also because we, as people who are sighted, enjoy and usually play games which use visuals.

As far as we have found, games without visual elements are rarely played by people who have the option to play games with visual elements. Although audio games can be played regardless of whether one can see or not, those games are seemingly rarely played by people who are fully sighted. Unless there are certain circumstances, such as researching this specific topic, it seems players will not actively seek out these kinds of games. Since the goal is to spread awareness to those who are sighted and for them to want to play the game, it seems reasonable to still make use of visual elements if possible. Using visual elements is, as shown with *Beyond Eyes* in Section 3.3, something which others have also done before. By not using any visual elements at all, it might become less appealing to the people we want to play the game.

### 6.2.3 Using Visual Representation of Senses

If one chooses to make a game which does make use of visual elements they might want to take the opportunity to use this for senses which are not related to sight. Examples of senses which were included in *Fabian and Fables* were smell and spatial awareness. Other senses that could also have used visual representation include for example hearing or touch.

In the game *Beyond Eyes*, as described in Section 3.3, they make use of some visual elements. In *Fabian and Fables* we also make use of visual elements, as shown throughout Chapter 5. In both games the player is able to see some representation of the world, although large parts of the screen were simply white. This area we used for UI elements, dialogue, and also to show some the main character's sense of smell, and also his spatial awareness.

Strength	<ul style="list-style-type: none"> <li>• Gives the player more references to navigate and understand the game world.</li> <li>• Provides the player with more options.</li> </ul>
Weakness	<ul style="list-style-type: none"> <li>• Could be difficult to interpret depending on the sense.</li> <li>• Might break the immersion.</li> <li>• If many senses are included, they might have to compete for screen space.</li> </ul>
Opportunity	<ul style="list-style-type: none"> <li>• More senses which are used in real life can be included, making it more representative.</li> <li>• Appears to be a relatively novel concept, depending on the sense.</li> </ul>
Threat	<ul style="list-style-type: none"> <li>• Could overload the visual stimuli for the player.</li> <li>• Could be difficult to implement.</li> </ul>

Table 6.3: SWOT table describing the usage of visual representation of other senses.

By including other senses into the game, the player is given more information about the world and more things to relate to, which could improve their understanding of the world. For example, in *Fabian and Fables* the player is given a sort of visual representation of the characters spatial awareness. Spatial awareness is something brought up in Section 2.3.1. The visual representation of this sense is done partially by showing objects like trees, buildings, and similar once the player gets close enough, depending on your interpretation of the main characters sight. But especially, this sense is supposed to be represented by the trail of footsteps following the player, as seen in Figure 6.1 and as mentioned in Section 5.1.13.

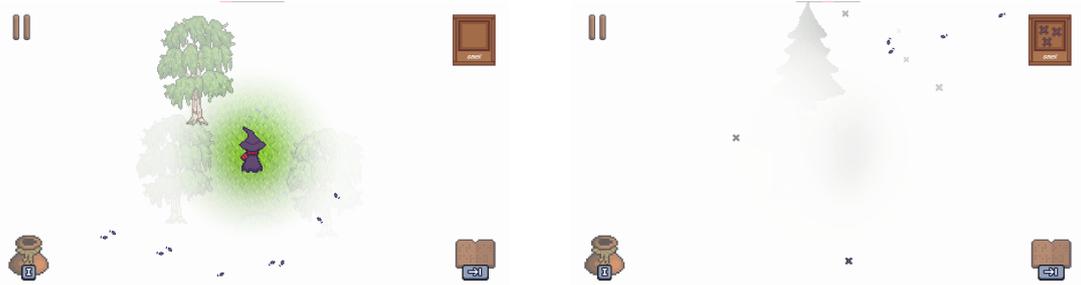


Figure 6.12: Replica of Figure 6.1 for the readers convenience. A trail of footsteps follow behind the main character where he has walked. They remain visible even in foggy areas where other objects disappear, as seen to the right.

In games one might usually navigate not based on which direction the character is moving, but rather how the surroundings are relating to the character. When you cannot see the surroundings it becomes much more difficult to know whether the character is moving or not. In real life one would still be able to tell if they had successfully taken a few steps forward or not, regardless of if they could see their surroundings or not.

By including the footsteps as representation of spatial awareness it could help the players with this problem. There were times where it would be difficult to tell whether one was moving at all, or if one was walking up against a wall. This could happen at night, or in foggy areas where sight was even more limited. The footsteps here could help the players know if they were moving at all and in what direction, without having to show any of the objects in the surrounding area. This would hopefully make the game more realistic, and representative.

Another sense which was represented in *Fabian and Fables* was smell, with the first iteration of particles shown in Figure 6.13. While the footsteps seemed to be relatively easy to understand for most players, smell had some difficulties as described in Section 5.3.5 and Section 5.4.2. Because some senses might not have a previously established visual representation, it can be difficult for players to interpret. And might also be difficult for the developers to create. Another concern here is that because these senses are lacking this established representation and can not be seen in that way in real life, these senses might not be possible to include in a natural way. Because of this, it might break some of the immersion of the game. It might also be unclear how literal one should interpret these senses to be.



Figure 6.13: Duplicated image from Section 5.3.5. Visual representation of smell which the player would see in the game if they were close enough to an object which was supposed to give off a smell.

It seems as if the inclusion of certain senses in games are rare. Perhaps because

there is no practical use for them in some cases, perhaps because they are rarely used and therefore overlooked. It could be of interest to consider incorporating them more often into games in general to further explore the possibilities, and perhaps applied games which are more connected to the human experiences.

Just as with the usage of sound, one should also be considerate of the amount of information, and how that information is communicated through visual elements. If there is too much information the player might get overwhelmed, or have problems learning. While there are games with intricate and complex interfaces which provide a lot of information, these might require a lot of time and effort for the player to get used to and to fully understand. Finding a balance here, and the appropriate level of information should be considered.

### 6.2.4 Inclusion of Dialogue

Dialogues with characters is not something which is always included in games. It can depend on the genre of the game, the target audience, the goals and purposes of the game. In this context, dialogue can represent conversations with other characters in the game, but also monologues from the main character, larger text elements or similar in games.

Strength	<ul style="list-style-type: none"><li>• Could make the characters seem more realistic and interesting.</li><li>• Could increase the immersion.</li></ul>
Weakness	<ul style="list-style-type: none"><li>• Might not be appropriate for all kinds of games.</li><li>• Might not be appropriate for all kinds of topics.</li></ul>
Opportunity	<ul style="list-style-type: none"><li>• Issues and events which are based in interaction with other people can be included.</li></ul>
Threat	<ul style="list-style-type: none"><li>• Could seem dull or too much like a textbook.</li><li>• Some people do not like to read.</li><li>• Writing text that the players will enjoy can be difficult, since it is subjective.</li></ul>

Table 6.4: SWOT table describing the inclusion of dialogue.

Perhaps most important to consider first is if the usage of dialogues and texts are suitable for the topic. If the purpose is to spread awareness about a topic which mostly relates to the interactions with other people, it could be more suitable to include and put focus on dialogue. It could be especially useful for players to gain understanding about the feelings or thoughts of other people. There are certain experiences which might be difficult to convey through other means.

Depending on what kind of game one wished to develop, both the amount of text and the format of the text need to be considered. Including a lot of text might be more suitable for games which feature a lot of dialogue with characters, and games which are more centered around language and interactions between people. Otherwise the game might risk becoming too much like a textbook. Unless the game is specifically made to be used in the context of education, this might be something one wishes to avoid. As mentioned in Section 2.1, there have been problems with combining education and games. Something to consider is that some applied games tend to rely heavily on text in order to deliver their messages. To keep in mind that there is a difference between a textbook and a game. If the game presents all of its information in practically the same way a book would, then what is the purpose of making a game rather than a book?

What kind of game one wants to make sets certain expectations on how much the players are going to read, and also how important it is to play the game itself. For example, one might expect not expect a lot of text and dialogue from a games similar to Just Dance [17] or Counter Strike [97]. However, one might be expecting it from other games similar to, for example, Animal Crossing [88] or Life is Strange [98]. It might be worth deciding what kind of messages and information one wishes to bring attention to first, and then decide on other things like genre afterwards. Related to the expectations the player might have depending on the genre of the game, is that some people simply do not enjoy reading.

For those who enjoy reading, by including more dialogue and texts can make the world seem more interesting and realistic. It could increase the immersion of the game. If a story is enjoyable or not is not something which can be measured as easily, as that is something which is subjective. To consider is if one wants to make use of dialogue in a game, it might require practice or certain skills in writing to make it enjoyable for the players.

### **6.2.5 Directly Addressing the Topic of the Game**

Depending on the topic one wants to spread awareness about, it could be more or less appropriate to directly or explicitly addressing the topic. This should be seen as a more detailed part of the precious section.

Strength	<ul style="list-style-type: none"> <li>• Could make the topic more apparent.</li> <li>• Could make the game easier and more accessible.</li> </ul>
Weakness	<ul style="list-style-type: none"> <li>• Might seem like the players are dumb.</li> <li>• Might make the game less fun and interesting.</li> </ul>
Opportunity	<ul style="list-style-type: none"> <li>• Can reduce unintentional vagueness and confusion.</li> </ul>
Threat	<ul style="list-style-type: none"> <li>• It might be difficult to determine the appropriate level of information.</li> </ul>

Table 6.5: SWOT table describing the factors to consider for providing the player with clear information.

By explicitly addressing the chosen topic it could significantly reduce the risks of players not understanding or learning what the game sets out to spread awareness about. It could reduce the risks of misunderstandings and confusion from the player.

As noted in the development of *Fabian and Fables*, there were times where players did not initially realize the overall topic of the game. There were players who had not considered the limited view of the player as something as part of the main character, as part of his visual impairment, and rather as a unrelated game element.

As described in Section 5.3.3, not understanding what the overall theme of *Fabian and Fables* caused problems for players to understand other parts of the games. However once the realization came other parts of the game were also understood better. By making some information more explicit to the player it might become more easy for the players, and more accessible. Games which are unclear and overly vague can cause frustration and annoyance.

By addressing certain aspects of the game more explicitly it could also help reduce the risk of stereotypes being reinforced. For example, at this point in the development of *Fabian and Fables* it is possible to have different interpretations of the players view. Some players might interpret this as the actual view of the main character. Some might interpret it as a representation of other senses and that the character is actually fully blind, as seems to be a stereotypical assumption to make for every character who is visually impaired.

At the same time, games which are overly clear could also be annoying or frustrating to the player. By being too direct it could also make the game appear more as an

educational tool, rather than an actual game. It could also make the players feel as if the game is treating them as incapable of understanding the topic at a more subtle level. Finding this balance of how much information should be presented could be difficult, especially in the context of wanting to spread awareness and informing the players about a topic.

### 6.2.6 Inclusion of Different Visual Aids

The inclusion of different visual aids and tools is something we considered especially in the beginning of the development, and is something we have not seen much in previous examples. Especially in a way that they might be used in real life. This is also something which might also be more relevant for certain topics, and less for others.

Strength	<ul style="list-style-type: none"> <li>• Could communicate to the player and the game world that the main character is visually impaired.</li> <li>• Increased feeling of safety for the player.</li> </ul>
Weakness	<ul style="list-style-type: none"> <li>• Might be difficult to distinguish between the real uses of the aids and tools, and the game uses of the tools if there is a difference.</li> </ul>
Opportunity	<ul style="list-style-type: none"> <li>• Could make the overall theme of the game more apparent.</li> <li>• Something which might not have been explored enough previously.</li> </ul>
Threat	<ul style="list-style-type: none"> <li>• It might reinforce some stereotypes.</li> <li>• Could be difficult to implement in a way that is both realistic and useful for the game.</li> </ul>

Table 6.6: SWOT table describing the inclusion of different visual aids.

The inclusion of visual aids and tools is something that was also brought up by others during the project. From different tests with players it was something they were expecting or wanted to have included. It seemed that this was something which would make them feel more secure within the game. During a specific test, which

is detailed in Section 5.4.5, the player was allowed to receive additional knowledge about the world with the motivation that they had a white cane to explore with. By including this tool into the test, some players seemed to be more at ease.

Depending on how the game presents these tools and visual aids, it could be difficult to distinguish between what can be done within the world of the game, and what can be done in the real world. What is a mechanic which only works because it is a game, and what is actually true. It can be difficult to include visual aids and tools because of this. Difficult to balance making the aids and tools interesting and useful from the perspective of being a game, and also realistic from the perspective of spreading awareness and knowledge. If the game is made to be played outside of an educational context, this balance becomes even more important. This related to the problems which applied games tend to have, as mentioned in Section 2.1, and 6.2.4, that they become too dull and boring when focusing only on the educational aspect.

By including visual aids and tools it can become more obvious for the player what the game is about without having to explicitly state so, which is also one of the purposes of them in the real world as well, as mentioned in Section 2.3.2. It could also justify within the game world how some NPCs would be able to know that the main character is visually impaired. Which in turn could be used to strengthen the theme through interactions and dialogue with NPCs. For example, it could be used to show the difference in treatment one might receive which depends on the surroundings awareness of ones visual impairment.

In *Fabian and Fables* some tools and visual aids were considered, some tested, and some were implemented. The different aids explored were tactile markings, white canes and guide animals. These were all described first in Section 2.3.2. Guide animals were considered early in the project as mentioned in 5.1.14, but which were not included in the capacity planned. They were also mentioned by players in 5.4.5. The moths which provide the player with a bit of light at night, as mentioned in the description of *Fabian and Fables*, can be interpreted as a sort of service or guide animal. White canes were included in testing of a paper prototype, which is described in Section 5.4.5, but was also not explicitly included in the game. It is possible some might interpret the field of view as a representation of what the main character feels through the usage of a white cane. Tactile markers were included in *Fabian and Fables* as seen in Figure 6.14.

Something to consider when including both visual aids and tools is how the player will use them in comparison to how they are used in real life. A risk being that the game could then create unrealistic expectations regarding these aids and tools. Also to be mindful of is if the usage of aids and tools are reinforcing stereotypes. For example, although it is not shown in *Fabian and Fables*, one could interpret the field of view of the main character to be his understanding of the world through the usage of a white cane.

In order to make it more obvious to the players that the main character is visually impaired we could have included the white cane as a part of the character's sprite. This could be helpful in signaling to the player that the field of view is limited

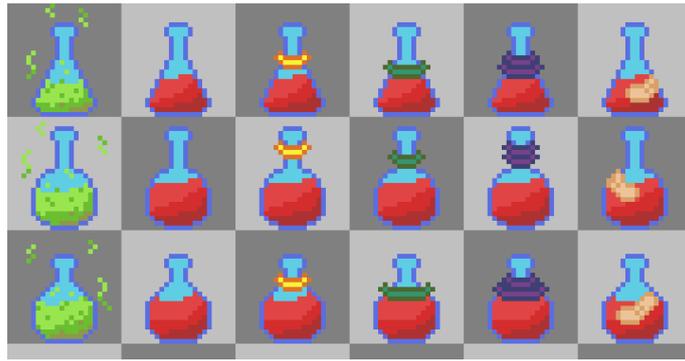


Figure 6.14: A replica of Figure 5.31 for the readers convenience. Shows the inclusion of tactile elements in the design of potion bottles.

because of the character's visual impairment, rather than a limitation set by some unknown rule of the game world. By including the white cane it could also however reinforce the stereotype that those with visual impairment are in constant need of these kind of tools, that they would be completely lost without them. The inclusion of the white cane could also have made the interpretation that the main character can see to some extent less likely from the players, which would work against our goal.

### 6.2.7 Using Player Assigned Markers

Under the assumption that the game does make use of visual elements there are additional things one might want to consider and make use of. Something one might want to include is allowing the player to make choices about how things are represented in the game.

Strength	<ul style="list-style-type: none"> <li>• Allows the player to make their own associations to objects in the game.</li> <li>• Could promote creativity.</li> <li>• Could create a more personal experience.</li> </ul>
Weakness	<ul style="list-style-type: none"> <li>• If the player takes a break from the game they might forget the strategy for distinguishing between items.</li> <li>• Might feel overwhelming for the player.</li> </ul>
Opportunity	<ul style="list-style-type: none"> <li>• Could promote reading comprehension.</li> <li>• Could make the player reflect on how to give descriptions which do not rely on vision.</li> </ul>
Threat	<ul style="list-style-type: none"> <li>• Players might form a weaker connection to the items once a marker has been assigned.</li> </ul>

Table 6.7: SWOT table describing the usage of player assigned markers.

Something which seemed important to include in a game about visual impairment is the need for organization, planning, and routine. One way to include this could be to let the players assign markers for various things. When players have to decide for themselves how objects are represented they need might need to come up with creative solutions in order to remember which objects belongs to which representation. This especially if there are no clear correct options.

An example of this from *Fabian and Fables* is described in Section 5.2.3 and 6.2. The players would receive information about these objects through text, and where then able to assign one marker out of a set. These can be seen in Figure 6.15. Another example could be the design of the potion bottles and how their design in combination with a different inventory system, as mentioned in Section 5.4.1.

Since the markers are the visual representation of objects, text could be the primary method of communicating to the players about these objects. In that case, by letting the players assign markers they would also need to read these texts carefully, which could be beneficial for improving for example reading comprehension. And specifically in the case of the topic visual impairment, it could make the players reflect on the differences of how to describe objects for someone with visual impairment.



Figure 6.15: Replica of the Figure 6.2 for the readers convenience. The markers available to the player in *Fabian and Fables*.

To consider here is if the assigning of markers is helping the player remember because they have to make some logical connection between the objects and their representations. It could also work in opposition, as once the marker is assigned this is what the player uses and forgets other aspects of the object beyond how it looks. There is also a possibility that the player could forget these connections if they leave the game for long enough. To note here is also that what appears as disadvantages could be valuable inclusions, as to make the experience perhaps more representative and realistic.

There are a number of ways which this could be included in a game, and might be of interest also in relation to other topics which deals with planning, memory, and similar. Exactly how this is included also depends on the type of game one chooses to develop.



# 7

## Discussion

In this chapter we will discuss the two results, and other points of interest regarding the project. These include the methods by which the game and SWOT was produced, the validity of the results, ethical concerns, and also potential future work.

### 7.1 Result: Fabian and Fables

Aesthetics as we defined it mentions visuals, sounds, and text. Regarding the topic of visual impairment, everything relating to visuals was especially difficult to consider. Making the game both appealing and playable to players who are fully sighted was challenging, especially when it came to the visual elements in the game. There were problems with the interpretation of the world, which was also a problem at times within the development team. Although what was shown on screen was meant as the the main characters interpretation of the world, it ended up being interpreted as what the main character actually saw.

Perhaps if we had created a more abstract looking world, or a more simplified world, it would have been easier for people to interpret the world as a representation from the main character, rather than what the character actually sees. It could also have been better have a more narrow scope in what kind of visual impairment this game would represent.

Making a game about total blindness would probably have worked against the fact that visual impairment is a relatively wide spectrum. Having a character who can still make use of their sight to some degree we can only hope will broaden the understanding that visual impairment is a spectrum. However, having limited sight can by the players be interpreted differently. During testing some players thought that the main character was fully sighted, and that all other limitations was part of the game, rather than as a part of the character that they are playing as. Others thought that the main character had no vision at all, and that what was shown was instead only some kind of representation. Since the initial goal was to have players be able to interpret this differently, we saw this as something positive.

Through the story of the game the player could get to know more details about the exact condition of the main character. Work had been started on other stories and quests which could have expanded upon the main characters condition. Time was a constraint that limited many parts of this project, including the writing and

implementation of these stories.

In Section 5.4.2, a survey was conducted to improve upon the design of the smell particles. A concern we had was that the participants in the survey did not have anything to refer to other than the words themselves for the smell. In other words, they did not have something specific to smell and make a judgement on. Although we could have set up a physical test with actual smells that each participant could smell we did not have the time for such a test due to how late in the project this topic was investigated. This could have made it more difficult for the participants to answer the questions properly. Related to this, we were also concerned that people would make the association based on how the object looks, rather than the smell by itself. Because we used words that refer to real objects, such as leaves, the participants might think of what the object looks like rather than what it smells like.

Even though a smell by itself does not necessarily tell us anything about the object which it originates from, using what the object looks like could be a good way to represent it. When we think about the smell of leaves, we might think of the green leaves of summer. When we think about the smell of medicine, we might think of hospitals, the packaging of the medicine, and pills, which are often mostly white. As mentioned several times, the game is intended for those who are not visually impaired. As such, perhaps the way most people associate smells is with how we believe the original object itself to look like.

## 7.2 Result: SWOT Analysis

The number of suggested aspects that one could consider could probably be increased. There could be other aspects that we have missed, which could perhaps be of more importance. For each of the aspects of the SWOT, there could also be more strengths, weaknesses, opportunities, and threats worth considering that we have missed.

Parts of the SWOT analysis might not be relevant to applied games about other topics. For example, the usage of no visual elements might only be relevant specifically in the context of making a game related to vision in some way. It might not be relevant to consider for other kinds of applied games.

Perhaps it could have been interesting to create a large SWOT of Fabain and Fables itself, rather than individual aspects. On the other hand, this might have made the results even more specific and difficult to generalize .

Something we noticed while developing the SWOT was that at times it was difficult to separate them from gameplay. It was difficult at times to focus solely on the parts which we consider to be aesthetics. Perhaps this was because it was also difficult at times in the work of the project to distinguish what exactly was purely aesthetics, what was purely gameplay and what was a combination of the two. As brought up in [24], aesthetics is something in research which is either glossed over, or forgotten entirely. It is something that we, even with the specific focus on aesthetics, at times

struggled with distinguishing and keeping focus on.

### 7.3 Methods

Something which we realized especially in the latter parts of the project was the lacking involvement into the game's development. By this we mean that we had focused primarily on creating things for the game, while the majority of the actual coding and implementation was handled by the students focusing on the gameplay. Because of this, there were times where struggling to have something included to the game the way we would have liked it to be. Whether something could be done depended on whether it would also be beneficial to the gameplay, and how much time the other students had to spare. The opposite scenario was also true to some extent. If the other students wanted some graphical asset they would sometimes have to adjust their expectations to what we deemed reasonable.

Perhaps if we had been more involved we would have been able to try more things, and make them precisely as we had imagined it to be. On the other hand, involving ourselves in this we suspect could have made it even more difficult to keep the focus on specifically the aesthetic elements of the game. It would also have meant that there would be less time to develop the different aesthetical assets.

We could have also tried to make use of other existing works, as we did with sounds where we relied on freely available assets. For other parts of the game such as character designs, tile-sheets, and other visual elements, we could perhaps have also made use of freely available assets. If changes were needed, we could have been able to make the adjustments. On the other hand, perhaps it was easier to make what was needed completely by ourselves from the start. Reworking other peoples assets still meant work, and it could have been difficult to find parts which would go well together.

The majority of the structure for how we worked was based on a previous project. Some adjustments were made, and some parts were improved upon. For the development of the game itself this workflow seemed suitable. Weekly meetings and checkups, as well as the usage of a scrumboard helped keep track of the development. However, more adjustments might have been needed in the context of also conducting research at the same time. As described in Section 5.4, there was a shift in focus. At this point we realized the workflow needed to change in order for us to be able to focus on conducting other parts of the project than just the game itself. As mentioned in that Section we conducted some testing of a prototype and also a survey, which we thought could be of interest in creating a better final analysis.

As mentioned previously, our involvement in the concrete implementation of the game was relatively small. As we did not write much of the code, we also did not make use of Github as much, as this was primarily used to work with concrete implementations and gameplay aspects. One of the authors still found use in the scrumboard located on Github, in particular for its organization and help with noting down future tasks. The other author instead found the scrumboard to be

more taxing to uphold and maintain than it initially seemed, and therefore found it less useful.

When it comes to playtests, these provided useful insights, especially so when we were able to write well formulated questions relating to the aesthetics of the game. Often we found it difficult to formulate specific useful questions during these tests. Sometimes we were able to receive feedback directly, and sometimes indirectly, through the players comments as they played. As with the workflow, we feel the tests might have been shaped in a way more appropriate for the development of a game. Perhaps we could have made versions of the game which were more focused on comparing aspects of the SWOT. Although exactly how that could be done we are unsure of.

### 7.4 Validation

Validation of the project came through a number of different means. It happened partially through the various playtesting sessions held throughout the project. To some extent it also happened through interviews with people with visual impairments.

From the playtesting sessions we were able to get a sense of if players would be able to understand what we were trying to present to them through the game. We were able to test whether the core topic of the game would be understood by those playing for the first time, and we were able to ask players about their interpretations of different parts of the game world.

Although relatively few, we were able to conduct some interviews with people with visual impairments for a total of five interviews with three different participants. From this we were able to get a sense of if what we were doing would act as a good representation or not. If what was included was something they found important to highlight. In last two interviews we held, it seemed as if the project was moving in the right direction. A summary of these two interviews can be found in Appendix C. There was room for improvement in certain aspects of the game, examples being that certain descriptions for items could be more focused on texture, that certain sounds could perhaps be included, and more. But other parts seemed to have been very accurate, such as the event where a character moves the player unprompted.

To consider for both the playtests and the interviews is that the amount of participants were relatively small, with a total of 22 participants. Perhaps if we had had other people play the game we would have received very different feedback. And perhaps if we had interviewed other people they would find the game to be inaccurate, and to be promoting the wrong kinds of experiences. As mentioned, while there might be some experiences which are more universal than others, people with visual impairments might experience the world vastly different to each other.

When it comes to the SWOT itself, what we can say about the validity is that to some extent we were able to test some things through the creation and testing of the game. It is something which is difficult to validate by itself. We do believe that

there are no particularly problematic claims. Perhaps some points listed within the tables could be changed in some way. It is however just meant to serve as a tool, something one might want to consider when developing an applied game. There are no claims that there is a right or wrong ways deal with certain issues, or that what is mentioned is the only things that one needs to consider.

When it comes to the generalizability of the SWOT this varies between the different aspects. For example, using no visual elements might be something more specific to consider when the topic is also related to vision or other senses. It might not be as relevant to consider, for example, if one makes a game about the effects of fossil fuels has on the environment. Or a game about the importance of insects for agriculture. Perhaps some of the aspects can be more generalized than others, such as Focus on Dialogue. And others might be applicable to other adjacent areas, like Visual Representation of Other Senses, or Inclusion of Different Visual Aids. In a game about deafness perhaps one could include hearing aids in some way, to which the SWOT might be applicable as well.

## 7.5 Ethics

Although the intention of the SWOT and the game itself are meant to bring forth a positive change we considered if it was possible to misuse either, or if there were any other considerations we might have missed. Perhaps the analysis could be used to make a game that intentionally misrepresents topics, and in particular the topic of visual impairment. How the SWOT are used and viewed by others is something that is out of our control.

As for the game itself, it is of course not made with the intention to be used for unethical purposes. One of the most important concerns is whether the game affects those who play in the intended way or not. Does the player learn anything at all, and if so, are they learning the things we intended for them to learn? Is the game reinforcing harmful stereotypes? Did they gain any awareness about the topic after playing, and if so, what did they become more aware about? These are things which we have not been able to evaluate on a larger scale. We also know that we had a limited amount of input from those who are more knowledgeable about the topic. Perhaps the game is far too skewed or narrow.

Before being released to the public as a finished product, these concerns would need to be addressed. Although the game might never be representative every person with visual impairment, receiving more input at this stage from those with visual impairment would most likely make it more representative, and also help catch major and minor flaws within game.

## 7.6 Future Work

If the project continued, we would have liked to do a number of things. We would have liked to redo the design of the smell particles to be more in accordance to how

people expect them to be. Perhaps more in line with the results from the survey conducted, which can be seen in Appendix A. We would also have liked to include more events and stories with focuses on the common experiences people with visual impairments might have. There were several other ideas of stories and quests which were related to the topic of visual impairment that were not finished, and therefore did not make it into the game. For example, including an older character which has developed a visual impairment later in life, and how this differs from Fabian who is a relatively young person. As we have not experienced these events ourselves we would have liked to receive input from people who has experienced them.

In the design of the world with the other students we had restricted the scope of the project to a small portion of the imagined world. Other areas of the world would include different environments which could present different challenges based on the real world to the player. For example, so far in the game the player could often find relatively clear landmarks, or would be able to follow along the walls in order to navigate. A different area could have been more open with less landmarks. Perhaps there could have been an area where the sense of smell is difficult to use, or sounds could be more difficult to distinguish.

Overall the game could include more content, both general content and content specific to the topic. Finding an organization related to visual impairment would probably be helpful if one wished to continue the development of the game. Both to ensure that the game focuses on the things they find important, and to help developers gain knowledge and insight into the experiences.

In terms of the SWOT analysis, more aspects could be added and analyzed. These aspects could be for applied games in general, for applied games about visual impairment, or for applied games about a different topic. Iterating further the aspects that are included in the SWOT could also be of interest. Perhaps the SWOT could also be used to create a completely different game, that still is an applied game.

# 8

## Conclusion

For this project we posed the question “What should be considered when designing aesthetics to promote awareness through an applied game?”. Aesthetics in this case primarily referring to visual, audio, and text elements of a game. To answer this question, we made a SWOT analysis covering different aspects that could be considered. The different aspects which we considered were as follows:

- Inclusion of Sounds
- Using No Visual Elements
- Using Visual Representation of Senses
- Inclusion of Dialogue
- Directly Addressing the Topic of the Game
- Inclusion of Different Visual Aids
- Using Player Assigned markers

Each of these we examined and described in more detail, with examples from both other games and the game we ourselves created.

The game we created together with our sister thesis is called Fabian and Fables, and was used for testing of the different aspects. The plot of the game surrounds a visually impaired character called Fabian. He tries to help others in the game by making potions from ingredients in the different areas. The game includes elements and stories related to the topic of visual impairment. Some of the aspects in the SWOT were more specific to the topic of visual impairment as well.

Examples of further work that could be done include exploring other aspects to be part of the SWOT analysis, or adding more events and stories to Fabian and Fables. Further work could be done on both the SWOT and the game itself.



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# A

## Survey results

As mentioned in section 5.4.2, a relatively small survey was conducted regarding peoples association between smells and visuals. This survey was conducted anonymously online, and had a total of 24 participants. None of which reported having any problems relating to distinguishing between color or similar.

The first question asked the participants to choose which of the shapes, as seen in A.1, they most associated with smell generally. The participants were allowed to pick a maximum of six shapes. Each shape was selected at least twice but both A.1b and A.1c got a total of 18 votes each, meaning that 75% of the participants agreed that these shapes looked like a smell. The second most voted smells were a tie between A.1i and A.1m with 11 votes each.

The next question asked the participants to choose which of animation they most associated with the movement of smells in general. The participants were only allowed to select one animation. A sketch of these animations can be seen in Figure A.2. The most popular animation was A.2a, with 20 out of 24 participants. None of the participants chose A.2c, leaving it with no votes.

In the questions that followed the participants were given a word which can describe a smell. The participants then had to choose which color and shape which they associated with that smell.

The first smell introduced was **flowery** smell. The top picked colors were A.3a with 15 votes, A.3o with 14 votes and A.3d with 11 votes. The only colors getting no

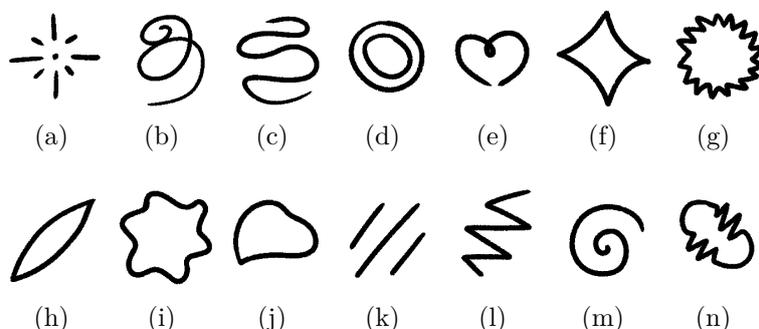


Figure A.1: A replica of Figure 5.36 for the readers convenience. The shapes which were available in the survey.

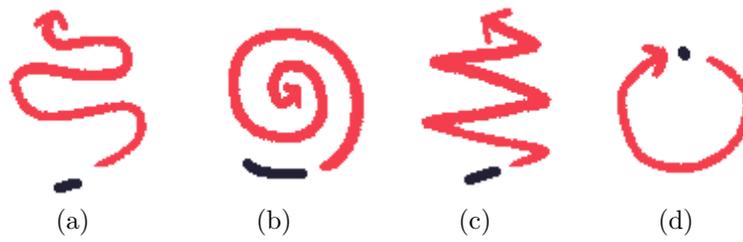


Figure A.2: A replica of Figure 5.37 for the readers convenience. A sketch of how the animations moved.

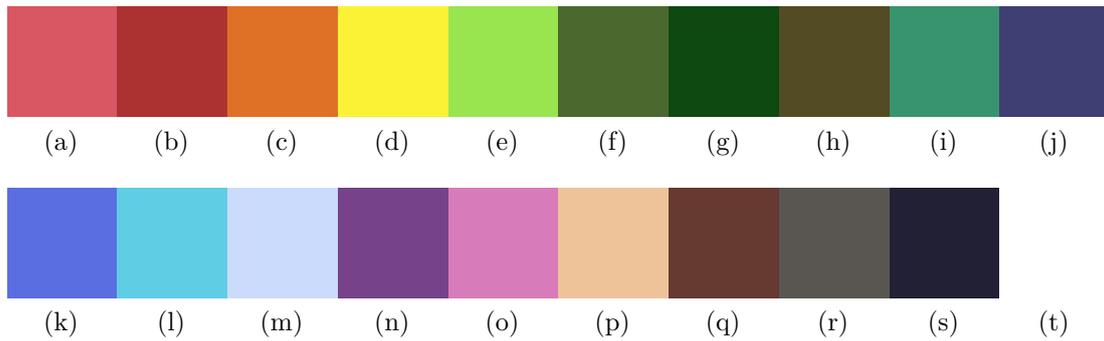


Figure A.3: A replica of Figure 5.35 for the readers convenience. The colors which were available in the survey.

votes were A.3r and A.3s. The most picked shapes for the flowery smells were A.1b and A.1j with 11 votes each and A.1e with 8 votes. However A.1d, A.1k and A.1l all received no votes.

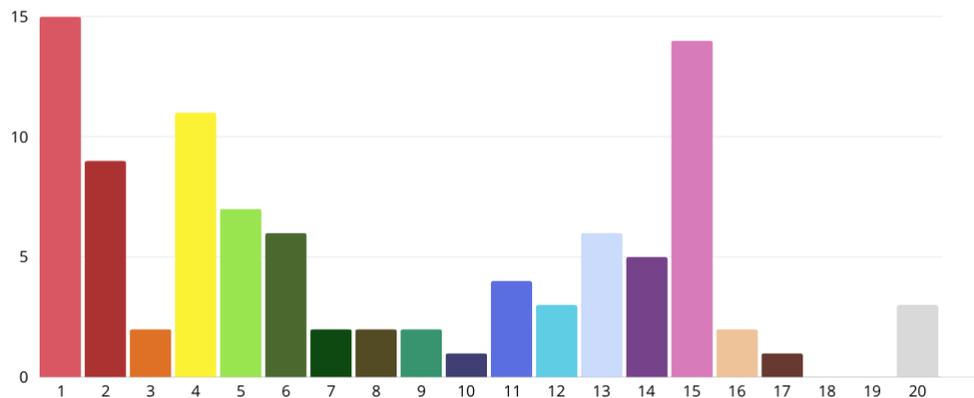


Figure A.4: Graph over the selection of colors associated with the flowery smell. Note that bar 20 is showing the results of the color white, but represented for readability with a light gray.

Next the participants were asked about the smell of **medicine**. The colors with the most votes were A.3t with 10 votes and then A.3l and A.3m both got 8 votes each.

Overall each color was picked at least once but most colors got at least 2 votes. The top shapes associated with the A.1a were smell with 9 votes, A.1l with 8 votes and A.1c with 7 votes. Both shape A.1h and A.1j were never picked to be associated with the smell.

Thereafter the participants were asked about the smell of **leaves**. The colors with the most votes were A.3f and A.3g with 19 votes each, and A.3e with 17 votes. Overall all the votes were really similar with the other participants where 6 colors were never picked and four colors were only picked once. For the shapes A.1h got 15 votes, A.1l got 13 votes and A.1j got 11 votes. The votes were overall more scattered than the color options with all shapes getting at least one vote.

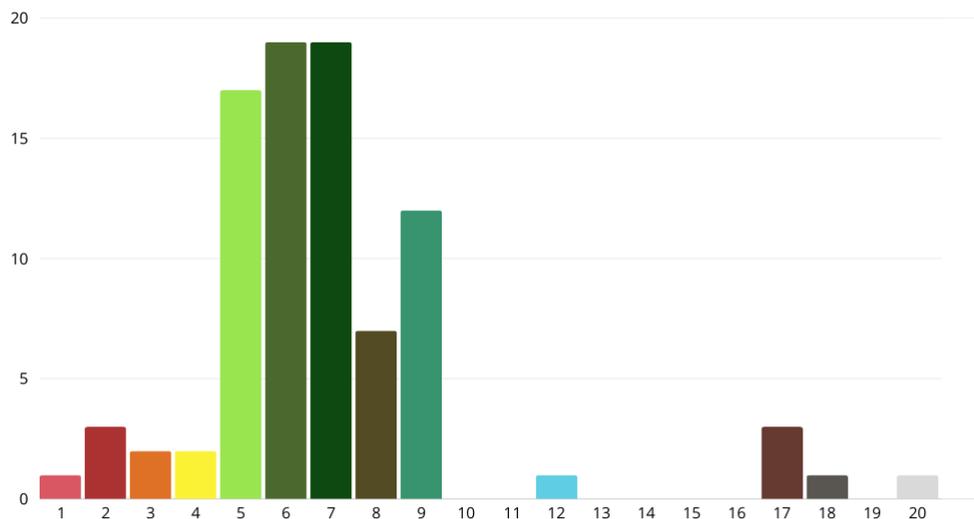


Figure A.5

Next the participants were asked about a fruity smell. The colors that the participants associated most with a fruity smell were A.3a with 18 votes, A.3c with 15 votes and A.3d with 13 votes. Many of the participants chose the same colors here as well as a total of 6 colors got no votes and 4 colors only got one vote. As for the shapes the results were a lot more scattered. The top shapes were A.1b with 10 votes, A.1e with 9 votes and A.1m with 7 votes. Only A.1m got no votes and A.1k got one vote.

## A. Survey results

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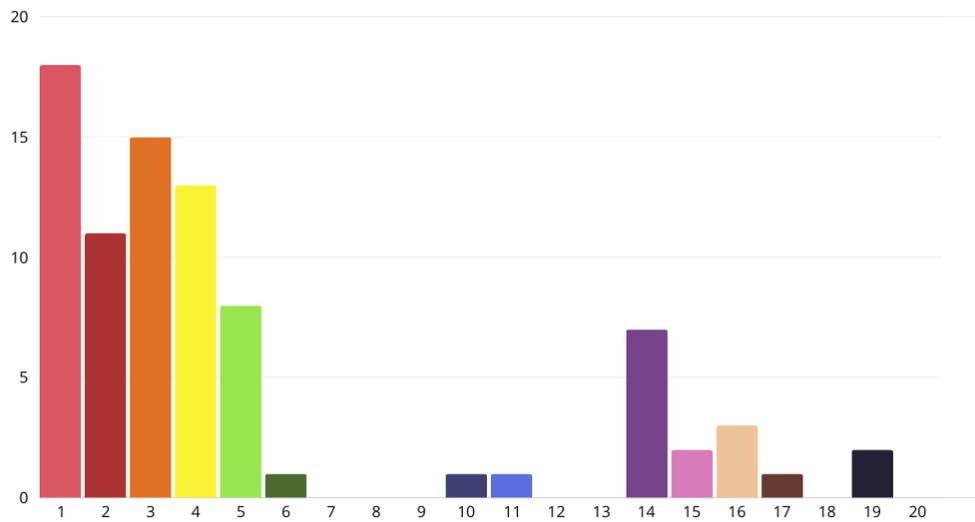


Figure A.6: Graph over the selection of colors associated with the flowery smell. Note that bar 20 is showing the results of the color white, but represented for readability with a light gray.

The following question asked about the smell of mushrooms. The colors for mushrooms were highly concentrated where A.3q got 17 votes, A.3p got 16 votes and A.3h got 14 votes. The answers between the participants were highly similar as a total of 10 colors were never picked. As for the shapes A.1d and A.1i got 12 votes each and A.1c got 10 votes. Overall these votes were a bit more scattered as only A.1e and A.1l got no votes while 3 shapes got one vote.

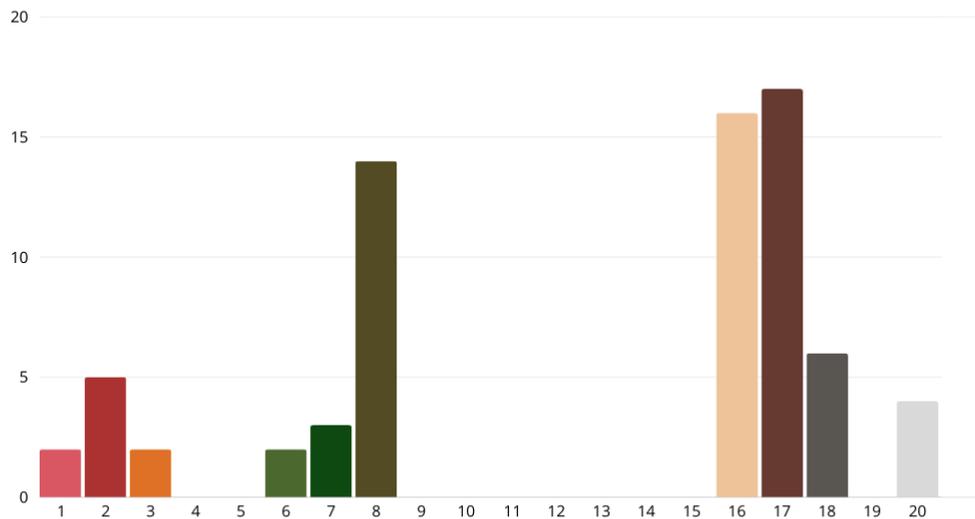


Figure A.7: Graph over the selection of colors associated with the smell of mushrooms. Note that bar 20 is showing the results of the color white, but represented for readability with a light gray.

For the next question the participants were asked about an old smell. The colors

with the most votes were A.3r with 18 votes, A.3q with 14 votes and A.3h with 11 votes. The votes were very similar between participants as 7 colors got no votes and 5 colors got only one vote. As for the shapes, A.1c got 14 votes and A.1g and A.1i got 7 votes. Overall the shapes were more scattered than the colors as only two shapes got no votes.

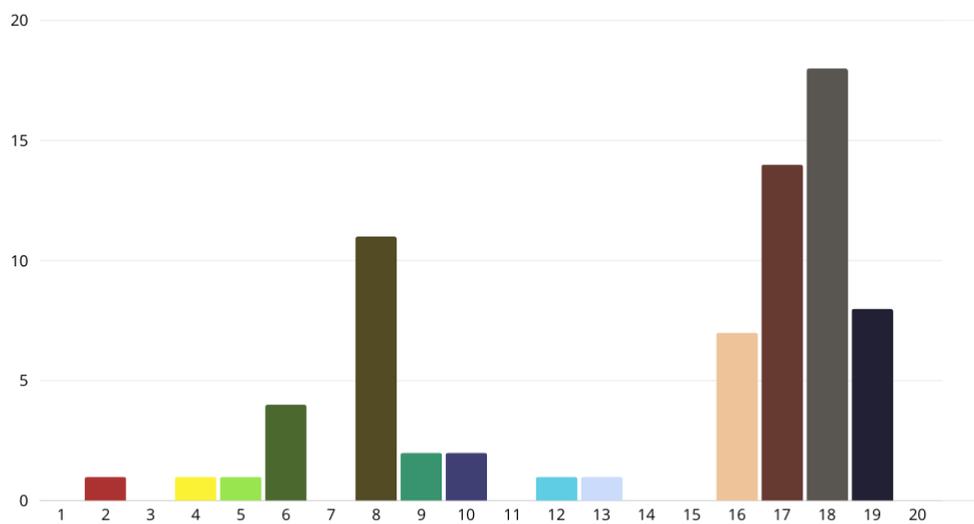


Figure A.8: Graph over the selection of colors associated with the old smell. Note that bar 20 is showing the results of the color white, but represented for readability with a light gray.

Thereafter the participants were asked about an earthy smell. The participants highly agreed on the color of the smell as both A.3h and A.3q got 19 votes followed by A.3f with 12 votes. Again the participants have very concentrated votes as 8 colors got no votes and 3 colors got one vote. As for the shapes the participants were again scattered as A.1c and A.1i got 9 votes each and A.1m got 7 votes. Only 2 shapes got one vote each.

## A. Survey results

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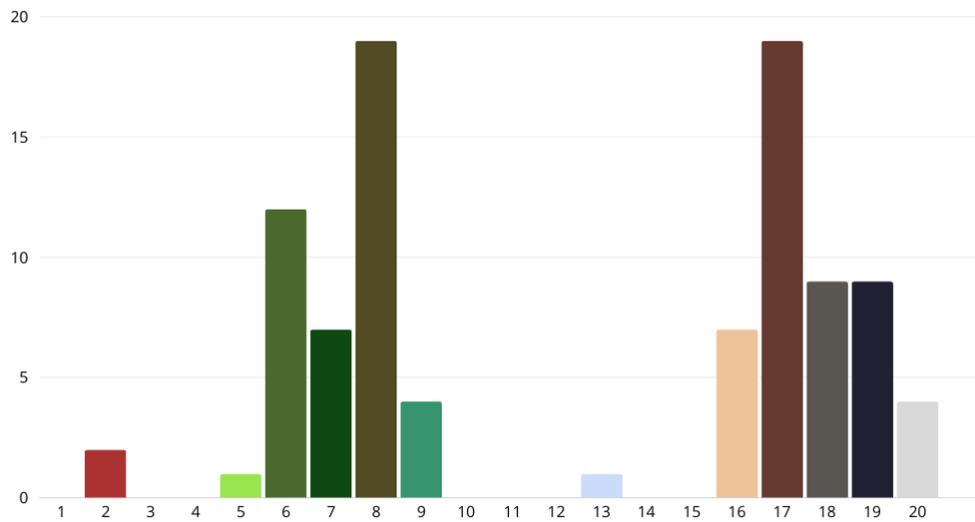


Figure A.9: Graph over the selection of colors associated with the earthy smell. Note that bar 20 is showing the results of the color white, but represented for readability with a light gray.

Lastly the smell the participants were asked to associate with a color and shape what the smell of compost. This smell has the highest agreement between participants with A.3h getting 20 votes followed by A.3q with 14 votes and A.3r with 10 votes. The shape of the smell was overall more scattered but one of the smells with high agreeance between the participants. Therefore A.1c got 16 votes, A.1i got 10 votes and A.1b got 7 votes. Two of the shapes got no votes while 3 shapes got 1 vote.

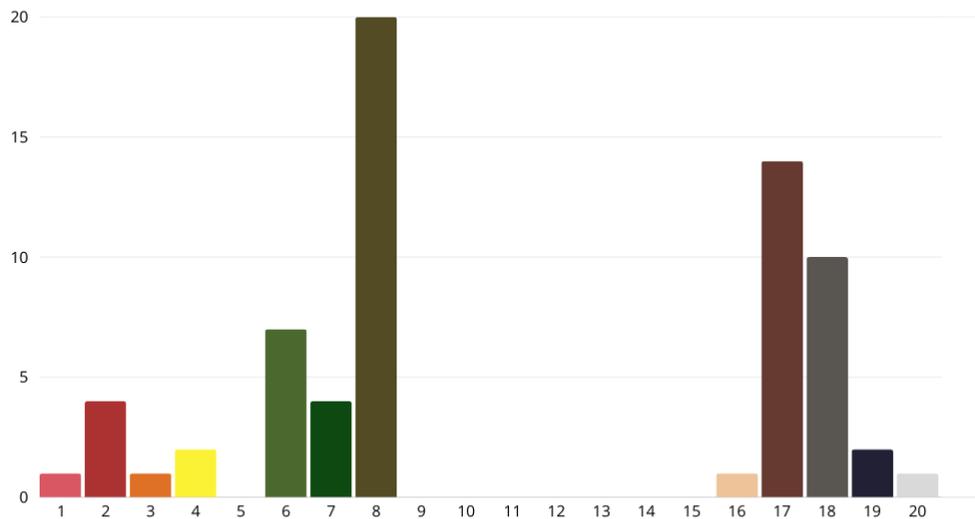


Figure A.10: Graph over the selection of colors associated with the smell of compost. Note that bar 20 is showing the results of the color white, but represented for readability with a light gray.

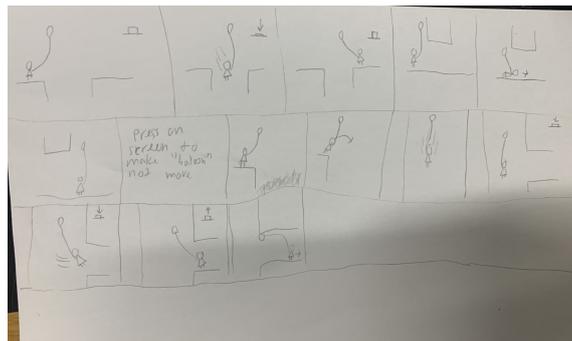
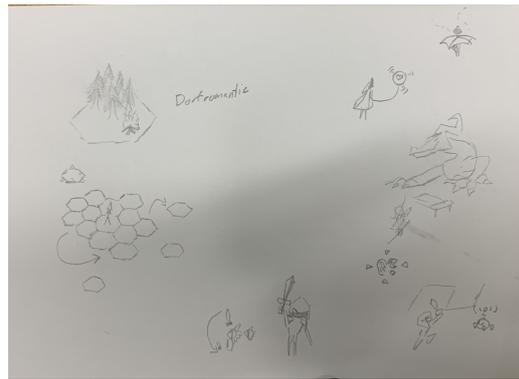
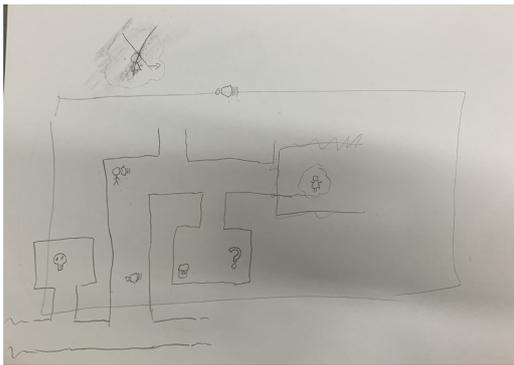
The final question the participants were asked was a feedback question asking if any

answer options or questions felt missing from the form. A total of 8 participants provided an answer to this question as it was an optional one. 5 of the participants felt that some shapes were missing, more wavy lines both vertically and horizontally were asked for. One of these participants noted that the current options for shapes felt a bit restricted. Two of the participants felt that some colors were missing as options. One asked for more gray/brown colors while one asked for a lighter blue. Lastly there were 3 participants that talked about the different smells. One of them asked which fruit a fruity smell refers to, if it is a red, yellow or green fruit. The other two participants asked for more smells to have been included in the questionnaire. Some of the smells suggested were abstract concepts such as happiness and sadness. The other suggestions were sour and spicy smells, but also a more pungent smell as it felt missing.



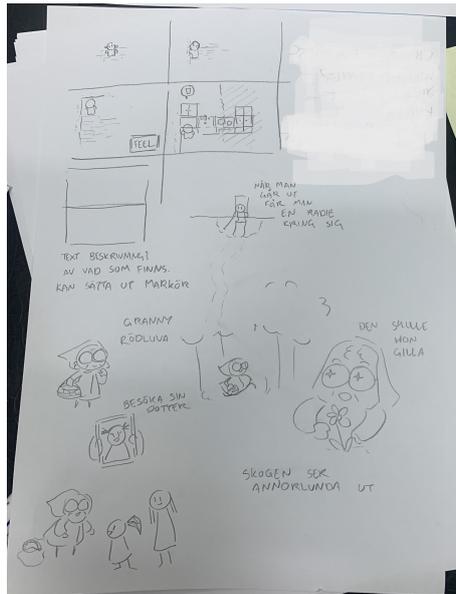
# B

## Images



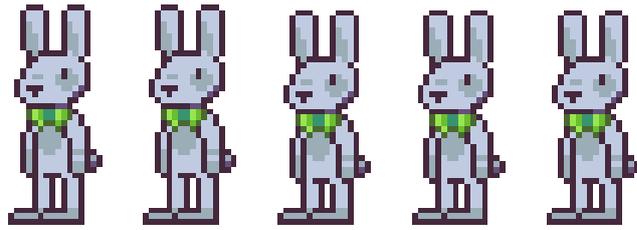
## B. Images

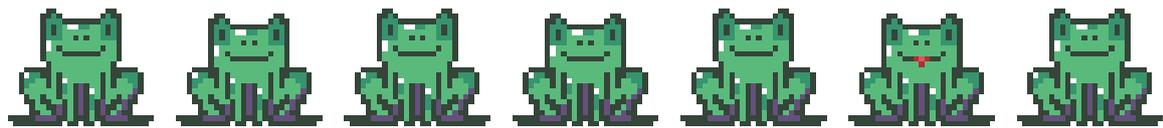
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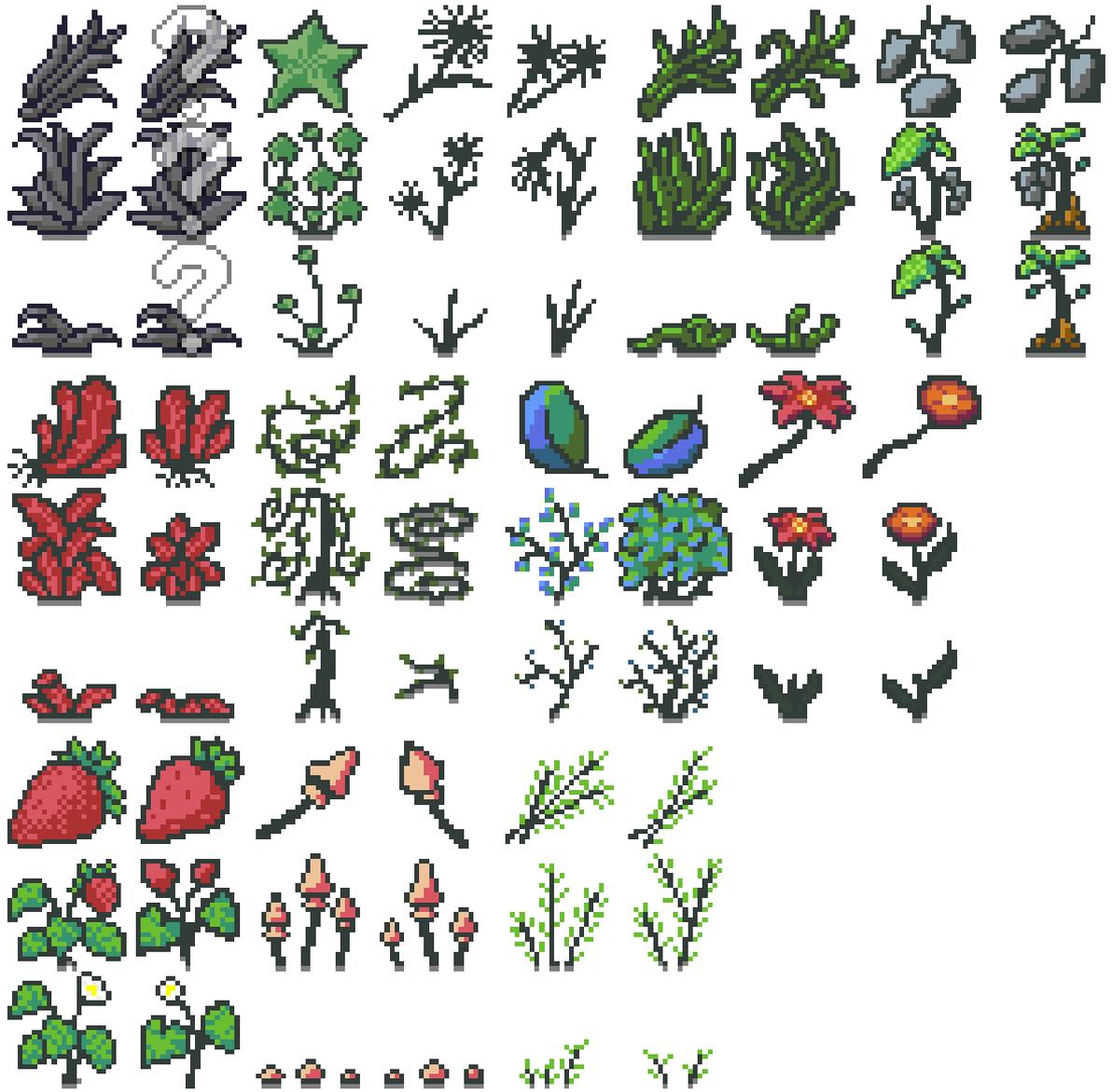




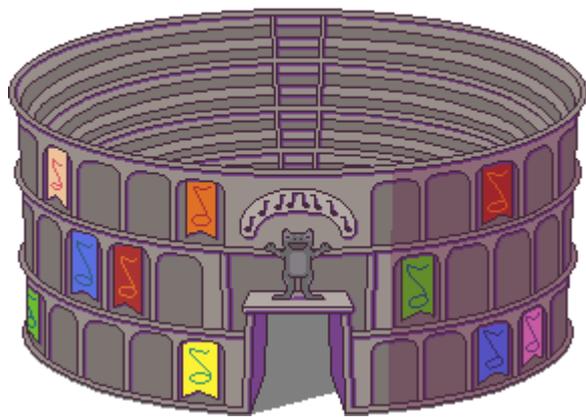


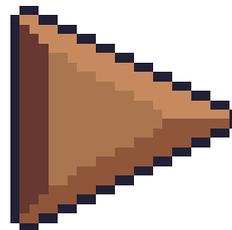
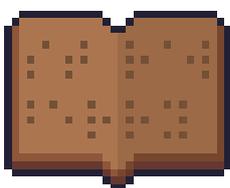
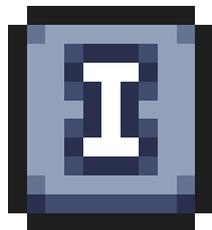
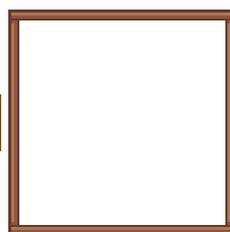
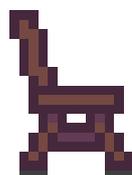
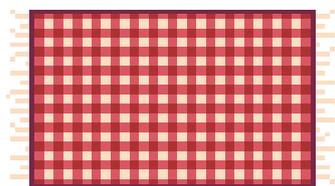


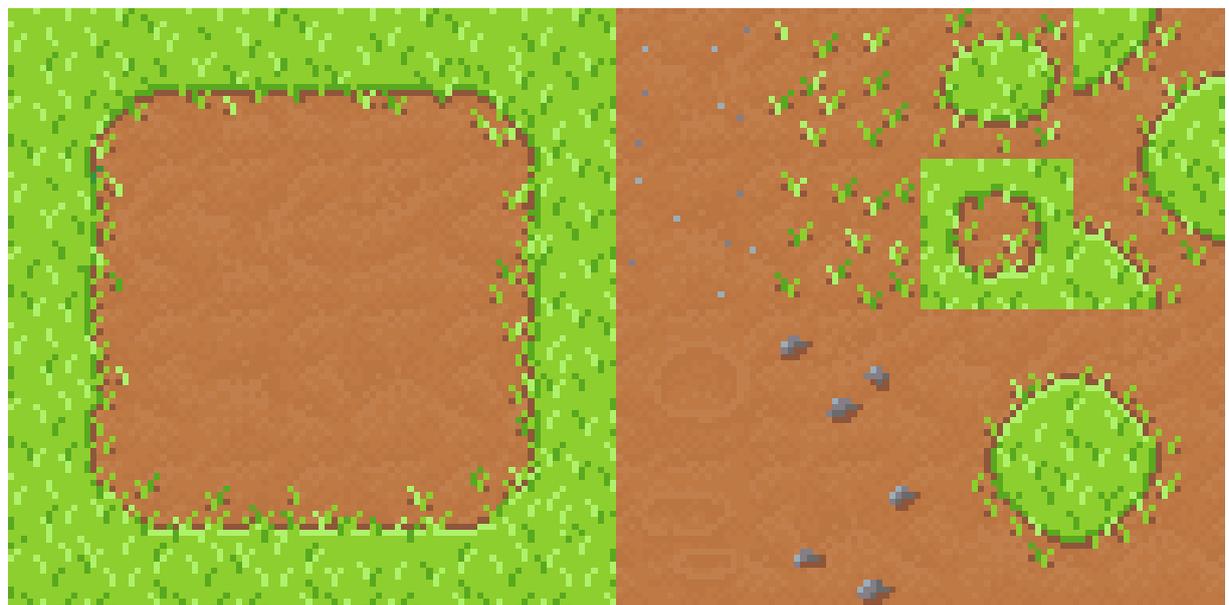
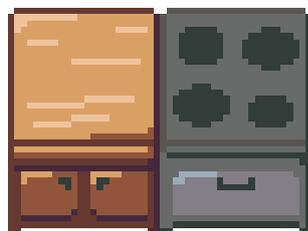
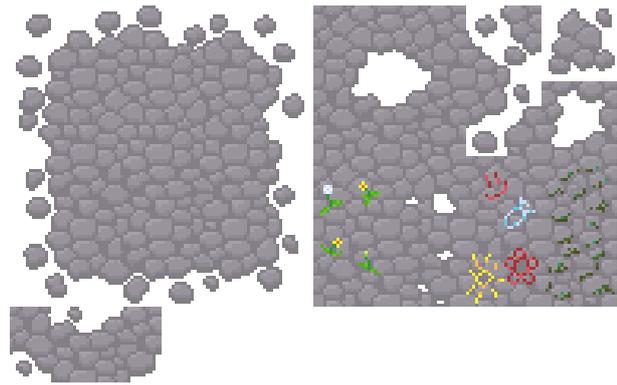
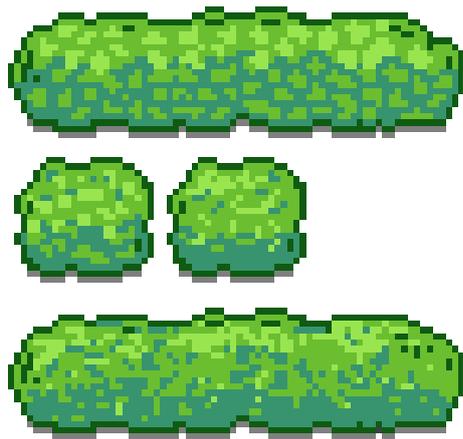


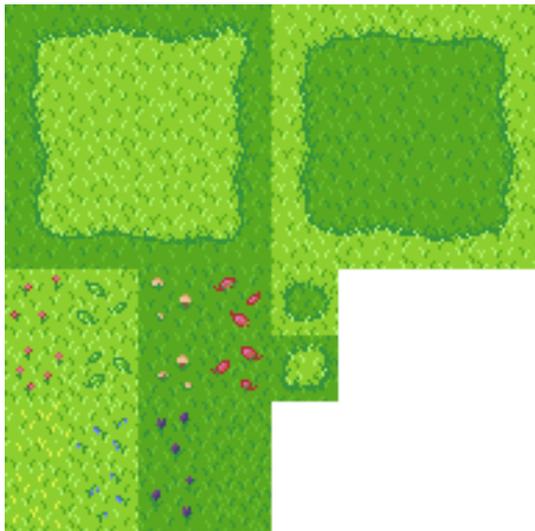
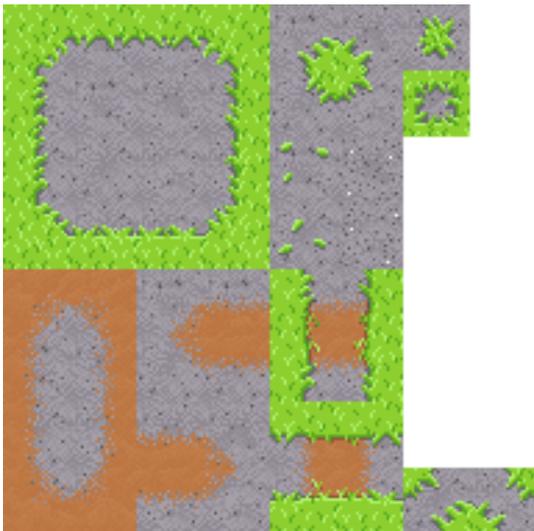
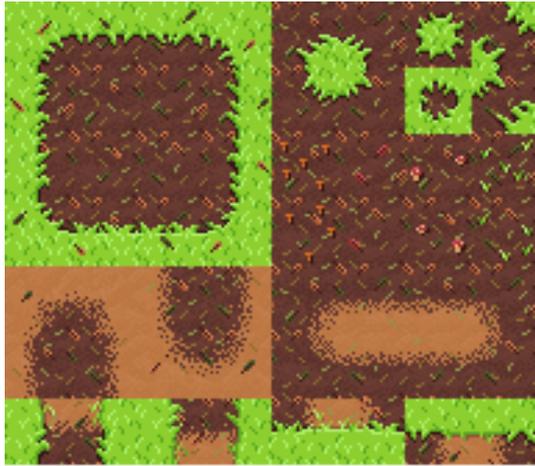
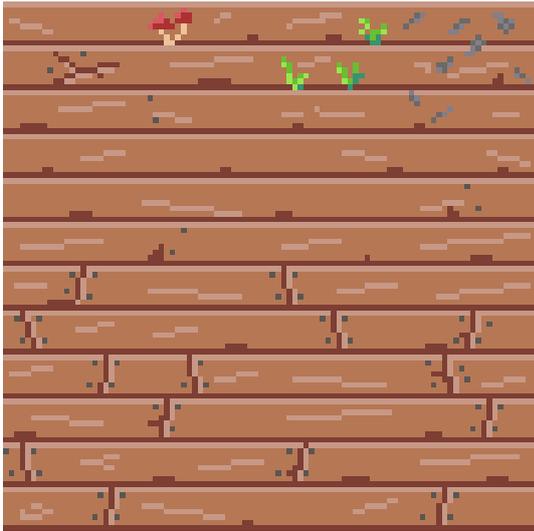


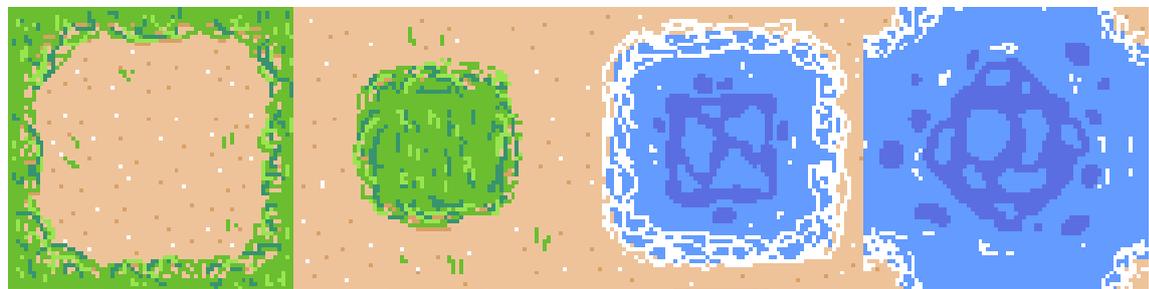
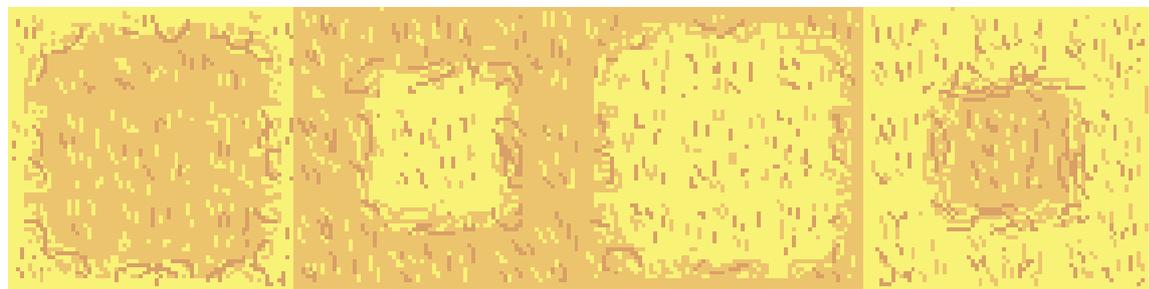
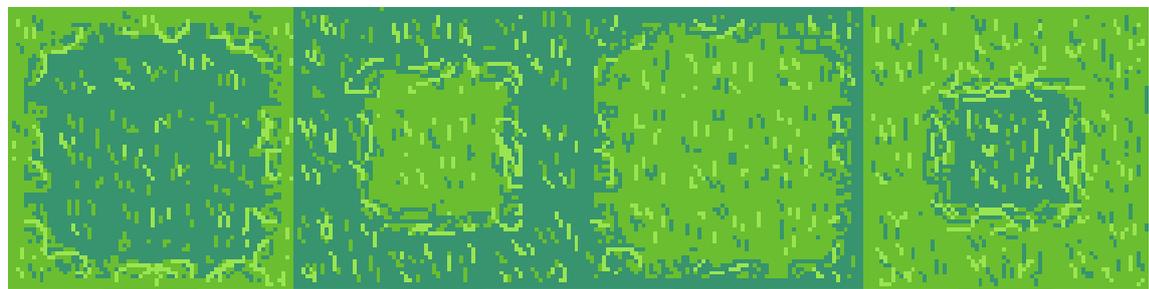
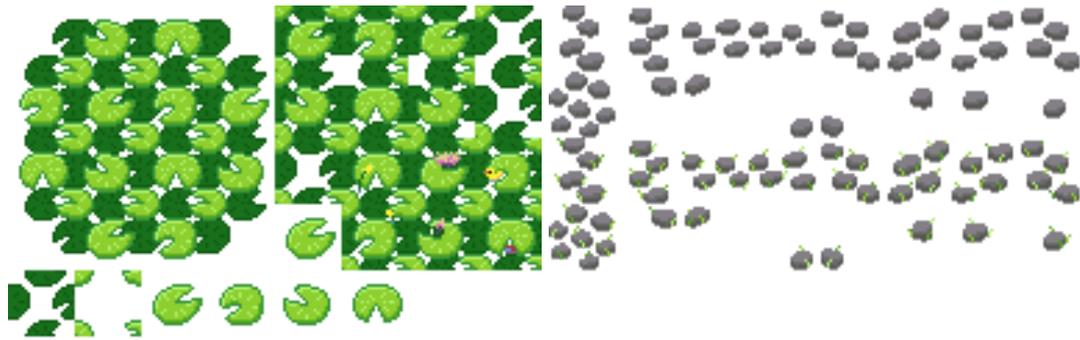


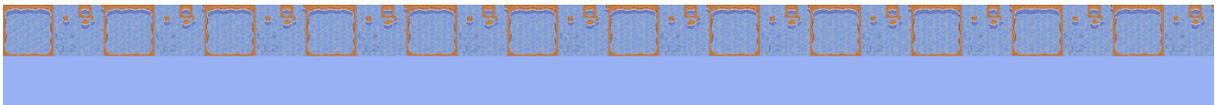
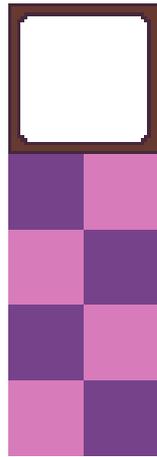












C

**Interviews**

# Evaluation Interview Summary

This document contains the summary of the two evaluative interviews conducted. The documents only contain the notes taken about the answers in the interviews, and it should not be considered a 1:1 transcription of the interviews themselves. Some answers are also compressed. Names and personal information have been removed. Both the questions and answers have also been translated from Swedish to English. The two interviews were conducted separately on two different occasions.

The facilitator started the interviews by showing the final game to the participants. A screenshare was shown and the gameplay was also described during the showcase, as the participants were visually impaired.

**Question 1:** What do you think about the player's view in the game? Is it reasonable to represent someone that is visually impaired?

Answer:

The distance that the player can see seems reasonable. It looks pretty good, it is good that the game also has smell and not only sound. It is good that things disappear relatively fast when moving away from them, that seems reasonable. It is good that the player doesn't have many footsteps.

*Answer from later in the same interview, but it is regarding visual mask:*

One thing that could be improved is that even if the player has a limited view distance. The things within the player's view are very clear. This is usually not the case, however it might be true for some people. Generally visually impaired people have bad vision of things they can see.

Answer:

I think it seems reasonable, it does however depend on what type of visual impairment you have. It is reasonable that you can see larger buildings from a distance. When I am walking outside I can miss small objects that are really close to me, but I can detect trees and buildings because of their size.

**Question 2:** *Is it representative to need to compare your own experience of an unknown object with the external description to try and determine what the object can be?*

Answer:

Yes that can be the case. It is something that occurs in reality. The descriptions you had in the game were also pretty good. However, some details felt as they were missing in the descriptions from Fabian (the main character).

Answer:

Yes, you need to have something to compare with when you investigate something. It is good to have that feeling. From what I can hear it seems logical and fits what I think and what I would have done.

**Question 3:** *Are these descriptions representative of what you would detect if you found an unknown object?*

Example 1:

*Hmm, this feels... a little rubbery. Or maybe spongey?  
There are multiple of them, and they are all small and thin.  
At the end there is a hat? It seems to be some kind of mushroom.  
And it smells.. more than edible. It smells delicious!*

Answer:

I think that you could describe the shape a bit more. You are describing the consistency but not the shape. You can also describe if it has different textures and for example if the play grows from the ground could be interesting.

It is also important to note that for some people, if they feel something unpleasant they don't want to investigate and touch it more. That can affect how much information they can get from feeling the object.

Answer:

I guess it is a mushroom? Yes you can describe it like that.

Exempel 2:

*Hmm, this feels... wet!  
It seems to be shaped like a spiral.  
But it is not hard like a shell. It's soft and flexible, and I can stretch it out.  
A few of them have been tangled together.  
And I can hear... the rushing waters.*

Answer:

The description does not say that much. You could for example describe where it is growing, if I remember correctly it grows in the water. You can feel not only that the plant is wet, but you can also feel that it is growing in the water. The description could be more detailed.

Answer:

Good description because I could start to identify myself with it. It feels as this is how you would describe it and how I would describe it in day to day life.

*Follow up question was asked regarding if the word spiral is commonly used:*

I have my own perception of what a spiral is, and I think it fits this description.

**Question 4:** *Is it reasonable that external descriptions of objects describe things such as what the object looks like for you?*

Answer:

Yes, that is reasonable. Generally things are described with the perspective of someone that can see. That the description includes the look is a part of the experience.

Answer:

Yes.

**Question 5:** *What do you think about the sound of the players footsteps? Is it representative to use the sound of footsteps for navigation?*

Answer:

Yes, it is very representative and reasonable. There definitely exists people who use that. Feeling the ground is important, but people do absolutely use the sound as well.

Answer:

Yes, I hear the sounds of my footsteps and feel the material under my feet. Because this is a videogame it might be reasonable to use the sound primarily. You can use the material to know where you are.

**Question 6:** *Is navigation through the other sound effects representative? Right now you can detect what region you are in depending on the background music, is this something that would make the game less representative?*

Answer:

Yes, these are absolutely things that can be used for navigation. One thing that you could add is the sound of different quest givers. The different NPCs should be detectable by sound.

The use of the background music is not a problem. You do not have background music in real life but depending on where you are in a city you can have different sound images. The background sound would for example be different in a shopping mall and an industrial zone. The music could be a representation of that.

Answer:

Yes, that is similar to when you are outside. There are a lot of sounds, and they can help you know where you are. If you are walking in the forest you can hear the sounds that you and animals are making. You can also hear the forest rustling.

**Question 7:** *Is it representative to explore unknown areas by yourself? What is your opinion about this game presenting visually impaired people that explore areas by themselves?*

Answer:

Hard question... Of course it happens but it differs between individuals, differs in their confidence and the like. Maybe you would want to be able to ask which way to go, perhaps ask the quest givers about the way as it occurs in a limited area. Perhaps people have different strategies.

*We described that playtesting showed that people often follow paths, roads. People also follow edges; for example the forest and water.*

It sounds like the experience matches pretty well, interesting.

Answer:

Yeah, that would be how I would do it if I was in the forest and exploring, you feel yourself forward and such. In real life you choose yourself when you want to explore and are the one doing it.

**Question 8:** *Is the smell system representative of people with visual impairment? Is it representative to note things that are close by through smell?*

Answer:

That's tricky, it depends on where you are and if it's windy it's harder. But you can localize it if you get closer. Smell is indeed something you actually use.

Is that black particles for trash and blue for plants?

Answer:

Yeah that is something you use, almost so that you are over sensitive to some smells.

Wonder where it's coming from, but it is not that often it is used to navigate. If you recognise the smell you could perhaps use it, but it is not that common.

*Can you suspect the direction from a strong smell?*

Yes, you can follow it, if it becomes stronger it means you're on the right track and if it becomes weaker you're walking in the wrong direction. Depending on what it is you might suspect if it's flowers, trees or a chanterelle forest. I think i'm pretty good at telling if chanterelle is close by or not.

**Question 9:** *We received feedback that the main character was too stereotypical as a bat and so we changed it to a human, was this a reasonable change in your opinion?*

Answer:

That sounds wise and I think it sounds good. Bats and moles are absolutely the stereotype of being blind. It is better and resonates better with reality to change it to a human.

Answer:

The character itself shouldn't matter, either way a human or an animal can be visually impaired and the main point is to get the experience of being visually impaired. But for some that might be sensitive.

**Question 10:** *We have discussed representations for NPCs. When you are supposed to meet someone, say in the city how do you identify that person?*

Answer:

Most often identifies people through phone calls, or large gestures. It also depends on how many people are there. If it is in a big crowd it can be very hard to identify someone through sight. If there are specific markers, such as an orange reflective vest it can become easier to identify people.

Answer:

It is usually through voice. If you are in school and not supposed to meet someone special you can usually say something to get a reaction and know if someone is there. It is common

that people forget that you don't see and then you might need to shout out yourself. Sometimes it is enough with their sounds though like breathing or something else.

**Question 11:** *What is your opinion on this quest?*

*Fabian being pulled away: A child grabs hold of Fabian and walks away somewhere. The idea is that you end up somewhere you might not recognise straight away*

Answer:

I thought it was really good. It was spot on and a bit humorous at the same time, which also mirrors reality. The quest also marks that it is not okay. What I'm reflecting on is that it would have been nice to use the reflection system to reflect the quests themselves.

*Potentially we would want Fabian to be pulled away multiple times and that Fabian becomes increasingly irritated about it.*

I'm a bit unsure if that might be a bit too much, at least if it's the same NPC every time. Perhaps it could be different NPCs each time?. Maybe you don't need to ramp it up all the time, I think it's nicely done as it is currently.

Perhaps you could bring up other things as well, such as people pulling you on the subway. You get help you don't want, Forced help.

Perhaps you could also portray the opposite and have situations where Fabian needs to ask for help as well. It could create more balance and also mirror situations in reality.

Answer:

What is described is precisely something that could happen in everyday life and is not uncommon. It is often that you might feel yourself forward and it is common that someone then just pulls you away with them. And if you are put in a new environment it can be scary especially if there are no people around. There is also the risk of stumbling while you are being pulled away which creates a lot of stress.

**Question 12:** *Overall, what things in this game do you think make up the best and worst representation of visually impaired people and how you rate the game as a whole?*

Answer:

The best thing is the game as a whole in how it includes several parts and perspectives. You have for example managed to get in smell, sounds and restriction of things. It is great how things disappear as you move away from them.

A challenge is that inside the radius of the mask your vision is incredible. This is not fully representative, it can be correct for some but generally even inside this radius your vision is bad.

*Answer from another part of the same interview, but regarding the game as a whole and future potential improvements:*

This thing when the players themselves reflected and wrote, it would have been cool if we already could show answers from people with visual impairment who answered the same question.

Another reflection is that it feels like the game would be a pretty interesting game you could use in education for younger people. Perhaps you could show the The National Agency for Special Needs Education and Schools, SPSM <sup>1</sup>.

Overall great game, it looks good.

Answer:

From what you have told me it sounds like it's on a good path.

You could add that if you stumble and fall and get hurt if you're not careful. Maybe you stumble into a hole. What you have presented is the most relevant and what I have taken part of seems good. There are always things you could do better but it mirrors how I feel when I am thinking from my own perspective. For example all the sounds in the forest you need to have to understand how to orient yourself. In reality it's perhaps not music bit there are a lot of other sounds in the forest. I do however not know how a seeing person would experience the game, as I can't see myself. Are you more cautious or adventurous? I am personally very adventurous of myself when I'm out but there are people who are more careful. It would be fun to have a personality on the main character.

What I have taken part of today is reasonable and I think it works for representing people with visual impairment, But it is also very individual how you experience your own visual impairment.

I get a feelgood feeling in my stomach of the world you have painted up.

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<sup>1</sup> SPSM: Our task is to ensure that children, young people and adults – regardless of functional ability – have adequate conditions to fulfil their educational goals. This is done through special needs support, education in special needs schools, accessible teaching materials and government funding.