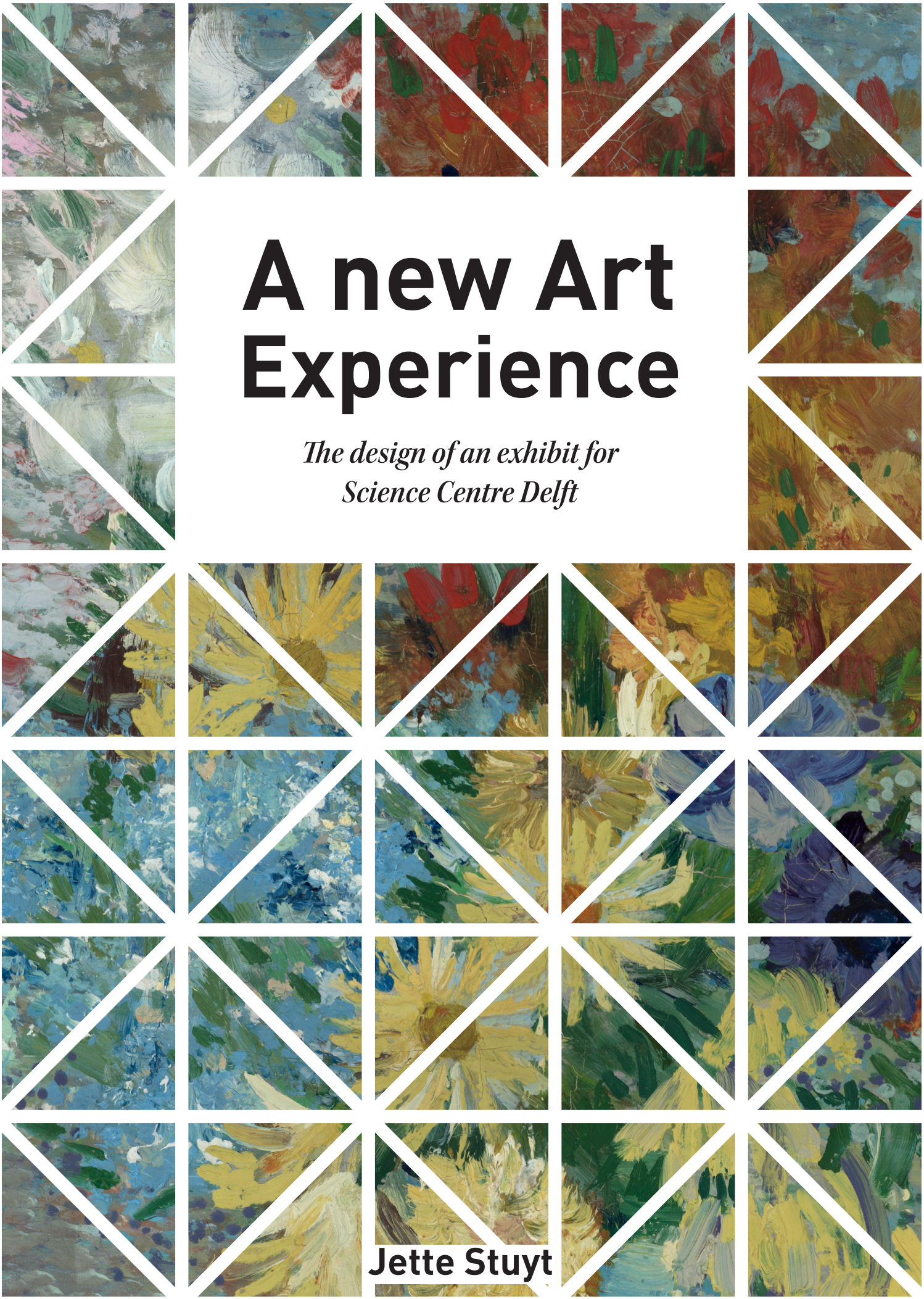

A new Art Experience

The design of an exhibit for Science Centre Delft

Jette Stuyt

Colofon

Master thesis
A new Art Experience: the design of an exhibit for Science Centre Delft
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A new Art Experience

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Executive summary

Creating a new exhibit for Science Centre Delft

The aim of this project was the design of a new exhibit for Science Centre Delft, using lifelike reproductions of historic paintings created by the research project "3D fine art reproductions". Using reproductions of paintings opens up doors to interact with paintings like never before. The main challenge was researching how the use of these reproductions of paintings can create an added value in experiencing art for the young audience of the Science Centre (7 to 12 years old), and finding a way to incorporate the research outcomes in the design of an exhibit.

Experiencing art is different for everybody. Although the content of the aesthetic experience is personally dependent, a general structure of the experience can be identified (Csikzentmihalyi & Robinson, 1990).

The viewer can be involved with the art on multiple dimensions: the *perceptual* dimension, the *intellectual* dimension, the *emotional* dimension and the *conversational* dimension. For an **engaged** aesthetic experience, it is important that the challenges of the work of art on one or more of these dimensions are **in balance** with the skills of the viewer.

If these two are not in balance, the viewer should be facilitated in the process to enable him/her to have an engaged experience.

How this facilitation should look like and on which of the dimensions of art it should focus, depends the interests and skills of the user.

Research showed that because of the young audience of the Science Centre, the focus in this project should be on the **perceptual** dimension: facilitating the process of exploring the canvas and consciously looking at the art. This fits best with the aesthetic development of the target group and will enable the Science Centre visitor to have an aesthetic experience relevant to them (Housen, 2008).

The final design of this project makes the aesthetic experience into a **tangible** experience, by providing the user with clear goals and tools to explore the painting. This way, an engaged aesthetic experience can arise that fits well within the Science Centre context.

The design consists of three parts, combining different goals and stances.

1. The first part focusses on the formal elements of art: the building blocks of an artwork. Small pieces of the painting are printed separately, for the user to find back in the painting (Figure 1). All search pieces are based on one of the formal elements, making the user aware of their existence.

2. For the second part, flowers from the painting are printed separately. The visitors can create extra flowers onto the painting (Figure 2). Doing this, the user can experience how the formal elements are used, and how their actions have effect on the composition and balance of the painting.

3. The third part evolves around a personal question. The painting is split into a grid, and the visitors are asked to choose and vote for their favourite piece (Figure 3). This question functions as a probe to look at the painting from a personal point of view.

The design was evaluated in a thorough user research. The research showed that the exhibit enabled the Science Centre visitor to have an engaged aesthetic experience, in which they consciously explored the painting.

Figure 1. In the first part of the exhibit, users are challenged to find the location of little pieces of the painting

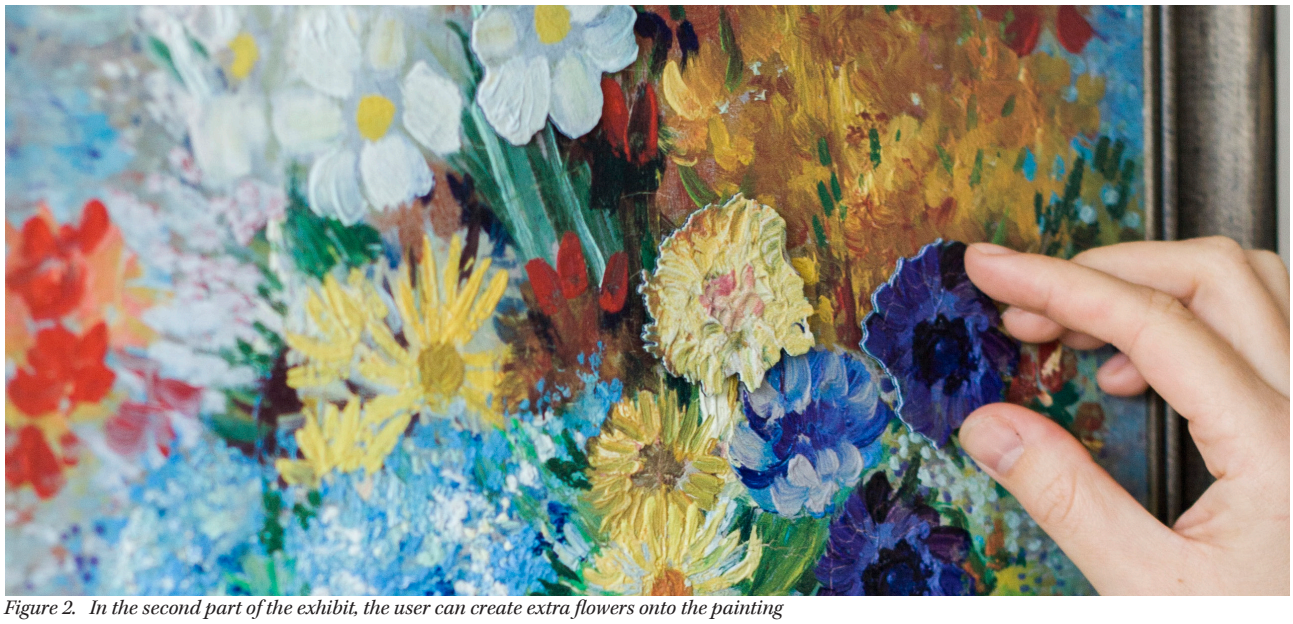


Figure 2. In the second part of the exhibit, the user can create extra flowers onto the painting

Figure 3. In the third part of the exhibit, the user is asked to vote for their favorite piece of the painting that is split into a grid

Thanks!

To my supervisory team: Arnold, Tessa and Michael, for your guidance and flexibility during this project.

To all my family and friends for the endless conversations about art. This helped a lot in getting a grip on this complex subject!

To Vince for your help and support, and for still loving me despite all my crankiness.

To all others that helped and supported me during this project.

I hope you enjoy reading this thesis!

Content

1. INTRODUCTION

[1]

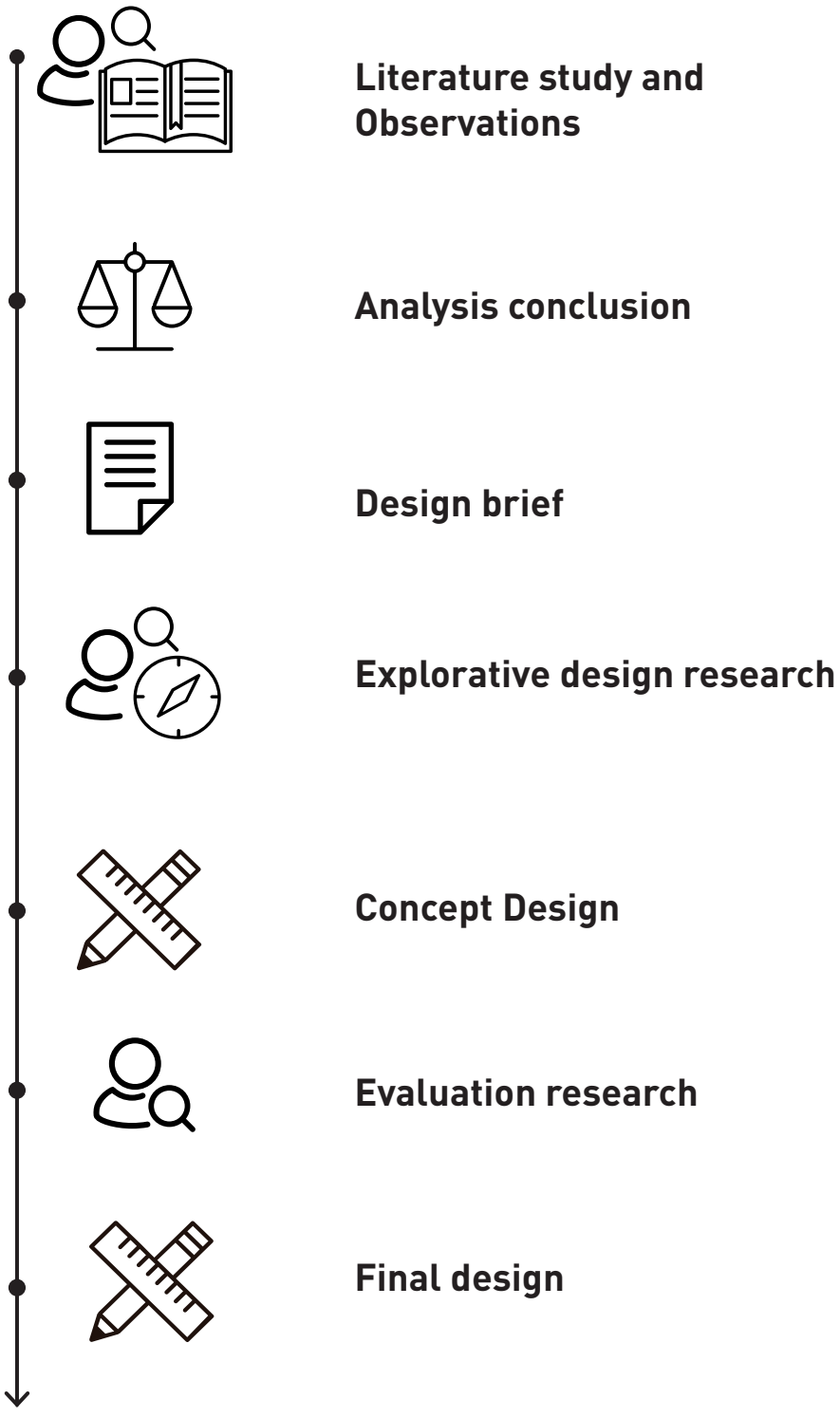
1.1 This Project

Creating a new exhibit for Science Centre Delft

The aim of this project is the design of a new exhibit for Science Centre Delft, using lifelike reproductions of historic paintings created by the research project 3D fine art reproductions.

The main challenge is researching how the use of these reproductions of paintings can create an added value in experiencing art for the young audience of the Science Centre (7 to 12 years old), and finding a way to incorporate the research outcomes in the design of an exhibit.

The first chapter will introduce Science Centre Delft and the research project 3D fine art reproductions. After that, a theoretical framework of the aesthetic experience will be introduced. Analysing the framework using literature, research and observations finally results in a Design brief for the next stage of the project. Through an explorative design process, a final concept was developed that was evaluated in a thorough user research.


Literature study and
Observations
Analysis conclusion
Design brief
Explorative design research
Concept Design
Evaluation research
Final design

1.2 Science Centre TU Delft

Bringing Science closer to the public

1.2.1 History

The Science Centre Delft is a science museum exploited by the TU Delft. The museum was founded in 1976, when a group of engineers wanted to display science to a broader audience. Therefore, "Technisch Tentoonstelling Centrum" was born. In 1993, the museum was re-established as "Techniek Museum Delft". Under this name, the historical collections of the TU Delft, as well as two expositions were housed until 2010. Then the museum moved to another location and improved the set-up, transforming into Science Centre Delft. The location changed to the old mining faculty at the border of the TU Delft campus, and the expositions got a more interactive set-up; displaying recent research projects of the TU Delft.

1.2.2 Goal

The goal of the Science Centre is to bring science and technique closer to the public. With interactive and engaging exhibits, the Science Centre wants to spark interest in science and technique. Since the Science Centre is linked to the TU Delft, projects from TU Delft researchers and students are shown in the expositions and exhibits.

Visitors are encouraged to investigate the exhibits, stimulated to ask critical questions and feel like a real researcher. This way, the Science Centre represents the TU Delft and makes recent research projects visible to the public.

Exhibitions

The museum is split into several exhibition spaces, which each contain multiple different exhibits. The floor plan of the museum can be seen in Figure 5.

When entering the museum, the first exhibition space is the 'Amazing Technology' hall. This is the main hall of the museum, which contains many exhibits related to TU Delft research. There are several simulators in which you can experience driving a car or flying a plane. There is a superconductivity train, a ball catching exhibit (Figure 6) and installations about radioactivity and lighting.

The museum continues in a hallway, giving access to multiple rooms each addressing a different theme.

First there is the GameLab, where several 'serious games' are put on display. Next to the games, there are two installations about art: the 'animated Vermeer' and the 'Vermeer in 3D'.

The next room is the LegoLab, where plenty of white LEGO bricks are provided for the visitor to build their own structures.

Room 3 is about biotech; displaying a large wall sized machine producing bio gaz.

Room 4 is a 3D simulator in which the visitor can fly around the world and see himself in 3D. Room 5 is the Senzlab, where the visitor can learn about aerodynamics (Figure 7). The last room is about building dynamics: there is an earthquake simulator which enables the visitor to test how strong their self build constructions are (Figure 8).

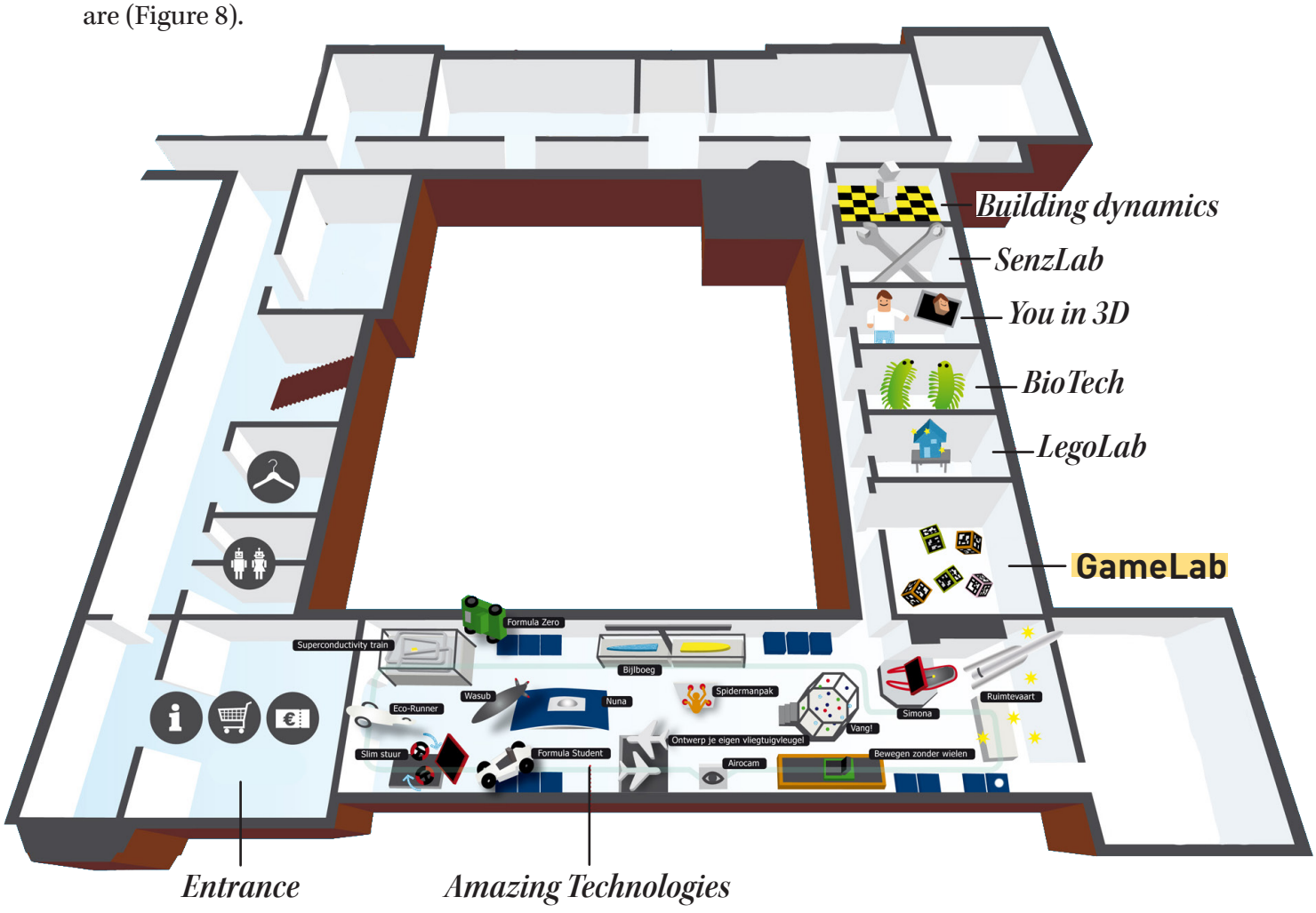


Figure 5. Floorplan of Science Centre Delft.

Exhibits

There are many different exhibits in the different expositions, each addressing different learning goals in different styles. All the exhibits have a technical and industrial look. They invite the visitor to come and manipulate the structure to see what it can do for them. All exhibits are informative and interactive at the same time.

1.2.3 Visitors

The Science Centre is open every day of the week, except for Mondays. During weekdays, the museum is mostly visited by school classes and group visits. These groups come to have workshops, and get a tour through the museum before or after the workshop. Although the museum is open for private visits during the week, these mostly happen during the weekends and school holidays.

The average Science Centre visitor is between the age of 7 and 12 years old, accompanied by supervisors.

Figure 6. The ball catching machine [4]

Figure 7. The wind turbine in the Senzlab [3]

Figure 8. The earthquake simulator [4]

1.2.4 Art in the Science Centre

There are two exhibits in the Science Centre that have an art related topic. Both exhibits are located in the GameLab.

Animated Vermeer

Animated Vermeer is an installation which displays an animation of Vermeer's famous 'Gezicht op Delft' (Figure 9). The painting is broken down into large pixels, which each are replaced by a photograph in the same colour scheme. The visitor can send a photograph to a database, which will be featured in the installation. Using kinect technology, small figures from the middle-ages move in the painting as the visitor moves in front of the installation.

Vermeer in 3D

On a television screen in the GameLab, a few Vermeer paintings are shown in 3D (Figure 10). Using 3D glasses, the visitor can experience the paintings in the third dimension.

The exhibit that results from this graduation project will also be displayed in the GameLab, accompanied by the other two art related exhibits.

Figure 9. Animated Vermeer

Figure 10. Vermeer in 3D

1.3 3D Fine Art Reproductions

Creating lifelike reproductions of fine arts

New developments in 3D printing have opened up opportunities to influence all aspects of the material appearance in 3D printed objects. Not only colour printing, but also surface texture, gloss and translucency. This has inspired the research project 3D fine art reproductions to use these techniques to make accurate reproductions of valuable historic paintings (Elkhuizen, et al., 2014).

1.3.1 Reproducing oil paintings

According to Elkhuizen (2014), paintings are objects with very diverse material characteristics. When digitizing or reproducing a painting, the object often is approached in 2D, ignoring the material presence and texture of the paint. Accurate 3D digitalizations and reproductions of paintings can offer the field of cultural heritage multiple opportunities. Not only can they support art historic research, art study, restoration and conservation, the reproductions can also be used for commercial and educational purposes. However, digitalizing and reproducing paintings in 3D makes a high demand on scanning and reproducing colour, gloss and texture. Being able to accurately reproduce paintings, means having full control over the 3D scanning and printing technology.

How does it work?

Before being able to make a 3D reproduction of a painting, it is necessary to have a detailed data map of the visual characteristics of the work of art. Therefore, a 3D scan is made (Figure 12), which can be translated into data maps from the colour, surface texture and gloss variations of the work (Figure 13). The data maps are printed by OCÉ, a company specialized in printing techniques (Figure 14). The process results in a reproduction including the impasto and texture of the original painting (Figure 15).

The build-up

The reproduction is build up in several layers: A base layer, a relief layer and several layers of coloured ink. Important to notice is that the reproduction is not build up in the same way as the original, where the relief is build up from layers of paint. Despite the different build up, the original and the reproduction are perceived the same (Figure 11).

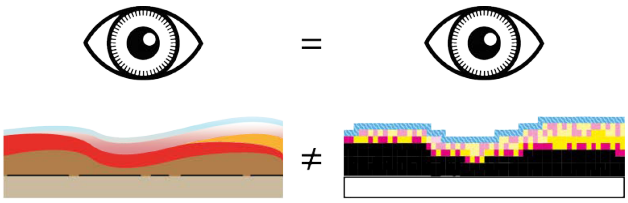


Figure 11. Difference in build-up between the original (left) and the reproduction (Elkhuizen, et al., 2015)

Although the way the painting is *perceived* is the same, the difference in build-up has implications for the possibilities in using the replica. For example, it is not possible to print underlying layers of the paintings (e.g. sketches beneath the surface).

The result

Although the replica's already look real to a novice, art experts in the evaluation research of Elkhuizen et al. (2014) said that the reproductions "approach the original closely, but remain a copy that is not there yet". This is due to differences found in colour, texture and gloss.

In the 3D printed reproductions currently available gloss variations are not yet present. The reproduction of the gloss of the paintings and a more accurate scanning of the colours of the painting are still in progress and will be available in the near future. In this graduation project, reproductions with only colour and surface relief will be used.

Figure 12. The scanner used for scanning the painting

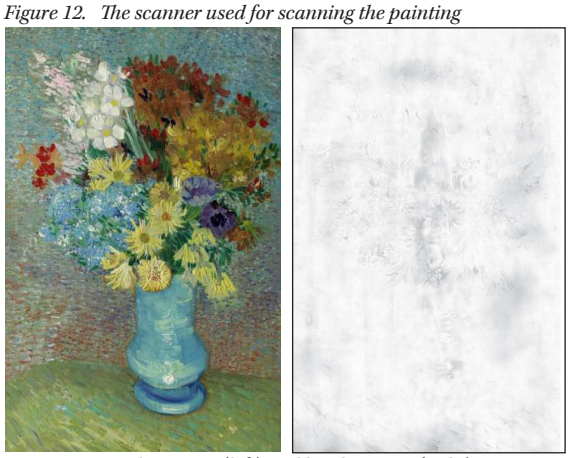


Figure 13. A color image (left) and height image (right)

Figure 14. The Océ printer builds the painting up in layers

Figure 15. The result is a reproduction that includes the impasto and texture of the paint.

1.3.2 Works reproduced

To be able to evaluate the scanning and reproduction technology, several paintings were selected to be reproduced. The paintings chosen were selected because of the pronounced impasto (texture of the paint, see Figure 16) (Elkhuizen et al., 2014).

Figure 16. Details of the impasto on Rembrandt's Jewish Bride

Rembrandt - Jewish Bride (Figure 17)
This painting dating from ca. 1665 - ca. 1669 displays a couple that had themselves portrayed as characters from the bible. Rembrandt made their tender loving embrace central in this painting (Rijksmuseum, 2018)

Rembrandt - Self portrait (Figure 18)
According to the Mauritshuis (2018), this self portrait may be the last Rembrandt has painted sinces it dates from the year he died. "The way he painted the face with strong brushstrokes is remarkable. With thick layers of paint that are almost modelled, Rembrandt suggests a man of flesh and blood".

Van Gogh - Flowers in a blue vase (Figure 19)
Van Gogh painted Flowers in a blue vase during his time in Paris (ca. june 1887). There, he got to know the impressionist and these influences are clearly visible in his painting style.

Unknown- Sunflowers (reproduction of original, Figure 20)
A reproduction of the Sunflowers of Van Gogh made by a street vendor. This painting is reproduced to have easy access to the original.

Since scanning and reproducing a historic painting is a time and money consuming process, the above mentioned works are the only works available for the exhibit design.

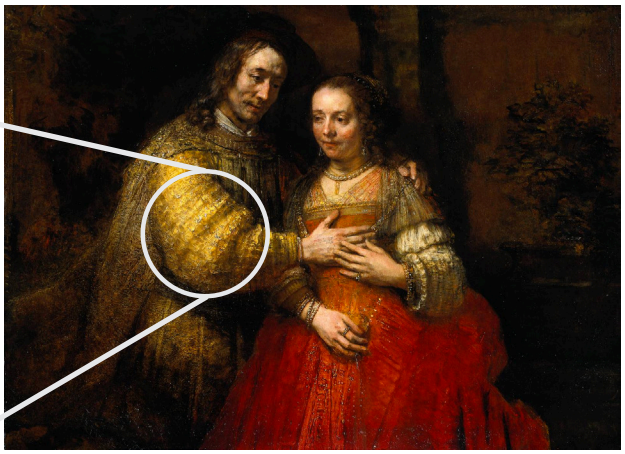


Figure 17. Rembrandt - Jewish Bride [5]

Figure 18. Rembrandt - Selfportait [6]

Figure 19. Van Gogh - Flowers in a blue vase

Figure 20. Van Gogh - Sunflowers

[7]

2. EXPERIENCING ART

2.1 The Aesthetic Experience

A scientific approach to experiencing art

To define how the 3D printed art replica's can be of use in the process of experiencing art, a literature research is done to define a theoretical framework of the art experience.

2.1.1 Framework for the aesthetic experience

The process of encountering a work of art can be described as an 'Aesthetic Experience'. This experience occurs when information from a work of art interacts with information that is stored in the mind of the viewer. This interaction will be processed by the brain, resulting in an expansion of the consciousness and a variety of emotional responses such as delight, joy, or awe.

This Aesthetic experience is not a universal reaction (like for example the blinking of the eyelid under strong light), but is very much dependent on the person having the experience. However, Csikzentmihalyi & Robinson (1990) describe in their book "The art of Seeing" that unlike the personal nature of the *content* of this experience, the *structure* of the experience can be described in a universal manner. By interviewing art and museum experts in an extensive research, they were able to create an image of this structure, which will be discussed here.

The interaction always starts with something that makes the viewer curious and interested. This is called the 'hook'. The viewer should not only attend, but also *want* to attend the artwork.

There are several dimensions on which the viewer can be involved with the art. The four major dimensions can roughly be described in the following way:

The perceptual dimension, which concentrates on the physicality of the work of art.
The emotional dimension, which contains reactions to the (emotional) content of the work and of personal associations to it.
The intellectual dimension, which focusses on theoretical and art historical background of a work. And finally ***the communicative dimension***, which can be characterized as a dialogue with either the era of the work of art, the artist or within the viewer itself.

Of these four dimensions, only the perceptual dimension is **essential** and always present, because if there is no perceptual dimension there can't be an aesthetic experience. The other three dimensions are 'optional' and can enrich and deepen the aesthetic experience.

Which of these dimensions within the content of the aesthetic experience interests the viewer is personally dependent. One may become interested in the emotional qualities of a work and later become interested in the art historical context of the work. But another person could be sensitive to the personality of the painter and later on become interested in the emotional qualities of the work.

In the process of an aesthetic experience, it is important that there is a balance between the challenge of the work of art and the skills of the viewer. When these are in balance, the process can result in an *engaging* encounter with a work of art. If the challenges are too large for the skills, only a superficial interaction can occur.

In the framework in Figure 21, a framework of the needed elements for an engaging aesthetic experience is displayed. This framework is based on Csikzentmihalyi's & Hermanson (2014) framework for a flow experience.

In the next sections, all the dimensions of art will be discussed in further detail. The description of every dimension will start with a theoretic part as described by Csikzentmihalyi & Robinson (1990), where after other practical research and useful observations will be discussed.

The Hook

This first part of the aesthetic experience is of crucial importance, because it indicates the viewer *wants* to attend the artwork, making it possible to result in a flow experience. This part of the process will be discussed later on in this report.

The Content

Which part of the content the viewer is sensitive for or interested in has a very personal nature. However, due to the visual nature of paintings, the aesthetic experience is not possible without the perceptual dimension.

The Balance

A balance between challenge and skill is an important part for an **engaged** aesthetic experience. As explained before, when the challenges a work brings outgrow the skills of the viewer, only a superficial interaction can take place.

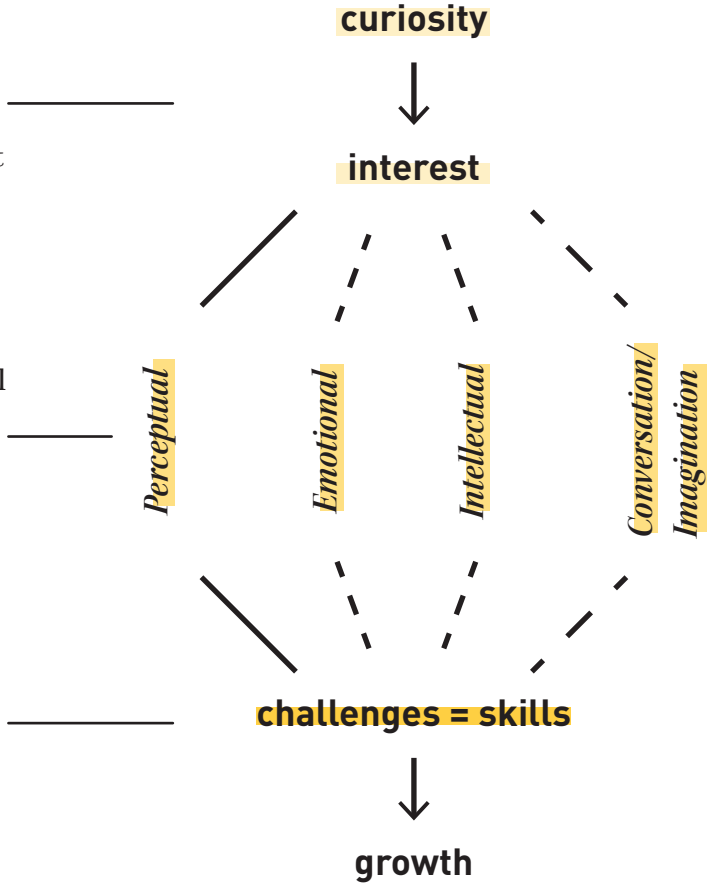


Figure 21. Framework for the aesthetic experience

2.1.2 Perceptual dimension

Theory

Based on the book Art of Seeing (Csikzentmihalyi & Robinson, 1990).

Museum experts interviewed by Csikzentmihalyi & Robinson, mentioned that in those experiences with art that were personally salient, they were drawn to and visually engaged by the features of the art object immediately. The encounters start off with an overall sensing of the physicality of the object in one way or another, and the appreciation of the elements forming the work (line colour shape etc.), and the beauty within these elements (harmony, balance, order). The physical work of art can also provide direct access to the art making process. One can see the hand of the artist in the work of art; and how the hands created the object. This can cause a feeling of connectedness with the artist.

The physicality of the object brings qualities itself, but can also function as a carrier for the less tangible aspects of the art which will be described in the other dimensions of art (emotional, intellectual, conversational) on the next pages.

-

Without the perceptual dimension, there can be no aesthetic experience. But the extent to which the aesthetic experience is present can vary enormously. With one quick glance on a work of art, all sorts of responses can be aroused. However, by taking a longer time to observe a work of art, a different experience can arise.

Multiple researches focussed on the time museum visitors spend looking at works of art. The result of these researches show that visitors tend to look at the paintings for only a matter of seconds, of which most of the time to the caption besides it (Smith & Smith, 2001 and Batcha et al., 2012). A common pattern in this quick process is that the viewer takes a few seconds to look at the painting, after which he turns to the caption, and finally to the painting again for confirmation of what is read in the caption (Elkins, 2017). This is confirmed by Walker et. al (2017), who showed with their eye-tracking research how the vision is channelled to the items mentioned on the caption after reading it. Reading the caption thus can prevent the viewer from exploring the object by himself.

Writer and Art historic T.J. Clark argues that this way of looking at paintings is like treating the paintings like words: we 'read' them. By this he means we only look as far to identify the content, but pay little attention to the physicality of the object after the content is identified. Clark argues that by doing this, we lose the ability to attentively look, and miss the point of looking at art (Hofstede, 2016).

Worts (2003) describes the behaviour of the museum visitor as 'grazing': wandering through the galleries and typically spending less than 30 seconds per work of art. He theorizes that this behaviour may be the result of a mismatch between the goals of the curator and the visitor.

This mismatch between the curator and the visitor is something Johan Idema seems to agree with: as a self proclaimed advocate for innovation in the cultural sector, he frequently experimented with innovative set-ups to create a better fit for the visitor, and enable them to pay closer attention to the artworks (van Lent, 2014). Idema: "Averagely, visitors only look at an artwork for about 9 seconds. That's a shame, isn't it?" (ver Elst, 2014).

In the Science Centre

Method

A research in Science Centre Delft was done to get an impression of how the Science Centre visitor looks at paintings within the Science Centre context, to define a 'baseline' for the painting in the Science Centre. Are the same patterns present that are described in literature for the regular art museum?

The reproduction of the sunflowers of Van Gogh was taken to the Science Centre, and set-up as part of the exposition in the GameLab (Figure 22). During 2 hours, observations were made to see the natural behaviour of the visitors and their responses to the painting. Next to that, 12 children (aged between 6 and 12 years old) were interviewed in an informal manner.

Results

Almost no attention of the visitor was grasped by the painting. During the two hours of observation, around 25 visitors entered the GameLab. Of these 25 visitors, only one adult took a closer look at the painting. The painting seemed to become decoration rather than part of the exhibition.

Although no natural attention was paid to the painting, children were willing to be involved with it when asked to do so. The children were asked to take a look at the painting, and talk about what they see. All children identified quickly the painting is a vase with sunflowers. Asking about their favourite/least favourite parts of the painting in all cases resulted in 'the vase' or 'the flowers' and no answers related to the formal elements of the artwork like the colour or composition. A few quotes mentioned by the participants can be found in Appendix A.

After talking about the painting, the children were allowed to touch the painting to see if this would change their perception. None of the children were interested in doing this: when the process of looking at the artwork is motivated by their own will, touching the painting did not bring extra value.

"I see a vase with flowers. I don't really like the painting because it looks like the flowers are very old."

- Participant (11 years old)

Figure 22. The painting was set-up in the GameLab

2.1.3 Emotional dimension

Theory

Based on the book Art of Seeing (Csikzentmihalyi & Robinson, 1990).

The emotional response to an artwork is for many people one of the most important modes of interaction with art. Some are even convinced that if art is not able to arouse emotion, it can not be considered art.

There is a very broad range of emotions that art can arouse. Positive emotions from joy and awe to inspiration and love, but also negative emotions like anger, hate and frustration. One can be affected by a work of art that is surprising, but one can also be affected by a familiar work of art that evokes nostalgia and comfort. Most of the time, there is a connection to personal feelings, associations and experiences. Emotions can be aroused by the emotional content of the painting, but also by personal associations with a painting (for example when something looks like a work of art your grandparents owned). The emotional dimension, just like the perceptual, can be present in every encounter with a work of art, and it can transform the experience in important ways if one is open to it.

-

According to Sitskoorn (2017), there are two separate systems in the brain that process emotions. The first is the 'quick' Lymbic system, the latter is the 'slower' neocortex. The quick system most of all processes automated responses to triggers, which result in emotional responses without having to consciously put effort in. This part of the brain is responsible for an immediate response like being attracted to or repelled by the painting.
The neocortex, or the slower system, is about transcribing the emotional content of a painting. This is a slower process, which requires consciously taking in the painting and analysing what is seen.

The emotional responses caused by quick lymbic system are automated responses which will occur naturally and do not need to be facilitated. In contrast, analysing the emotional content of a painting with the neocortex requires a close analysis of the painting. The viewer has to attentively look to identify the content, and reflect on the content. This process can be facilitated.

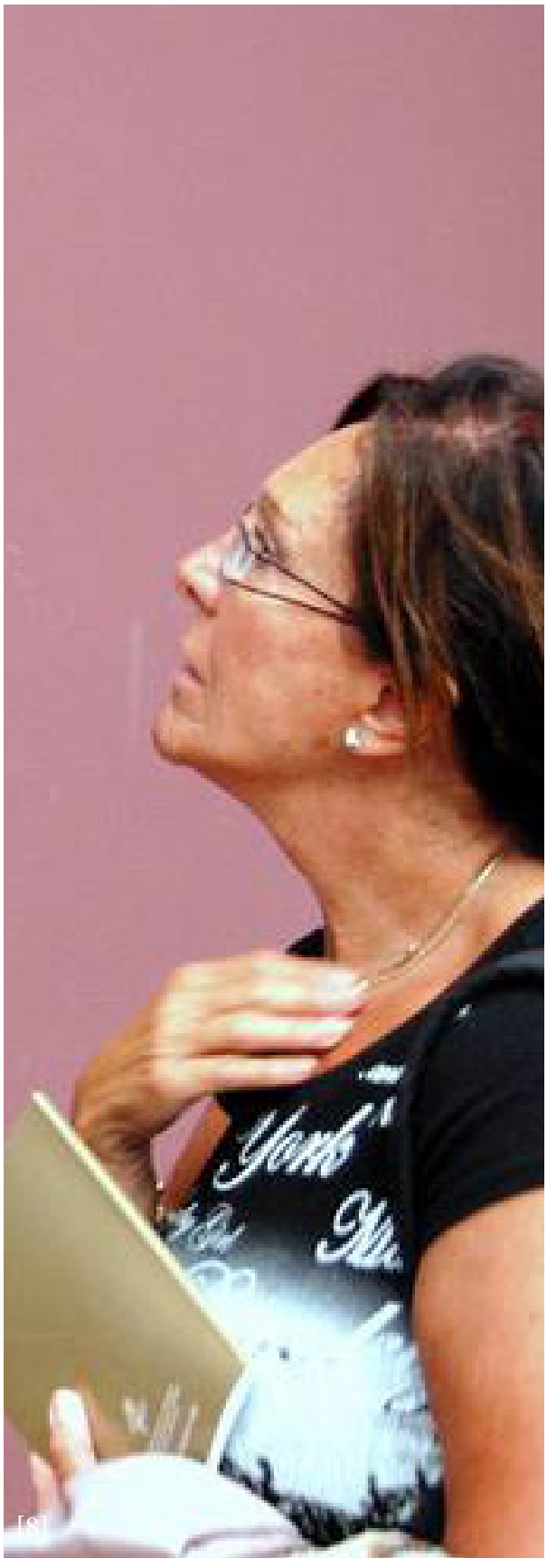
Alain de Botton and John Armstrong (2013) argue that being aware of the emotional benefits that looking at art can have, will change the interaction between works of art and the viewers for the better. Your response to an artwork can tell you underlying principles about your mind, it can offer you comfort and confirm your sorrow. Art thus can offer you a form of therapy. In their book Art is Therapy, they argue that 'looking into yourself in response to what you see' is the crux in this process. In their manifesto 'Art As Therapy', they try to facilitate the viewer by providing them with textual captions and hints about emotions displayed in the art, and how to interpret them.

The arousal of emotions by the neocortex (the non automated system) is highly dependent on the life experiences one has had. Csikzenmihalyi & Robinson (1990) argue that for example a painting about a tender loving couple can only be thoroughly understood on an emotional level when one has had a love before. Likewise, when one didn't have that many life experiences (like children), there are less works of art that one can relate to on the emotional dimension.

Applying this information on the works of art reproduced and thus available to use in this project, Rembrandt's painting 'Jewish Bride' will be less suitable for the target group of the Science Centre.

"The emotional content of a painting can only be thoroughly understood when one has experienced the emotion himself before"

-Csikzenmihalyi & Robinson (1990)



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2.1.4 Intellectual dimension

Theory

Based on the book Art of Seeing (Csikzentmihalyi & Robinson, 1990).

The intellectual dimension is characterized by categorizing works of art based on historical, art-historical or biographical context, in order to get a greater understanding or appreciation of a work. By looking at art more often, a framework of knowledge is being build. This framework of knowledge can be used to 'solve the puzzle' an artwork brings. To fully understand the artwork and where it comes from. This dimension of art requires a framework of reference information, in order to be able to identify and characterize the works of art.

-

Having more intellectual knowledge about art changes the aesthetic experience: experts evaluate art differently (Hekkert & Wieringen, 1996), have different emotional responses to art compared to non experts (Locher, Smith & Smith, 2001) and also physically look at art in a different way according to eye-tracking research (Locher, 1996). Although the intellectual dimension can provide richness and deepen the aesthetic experience, the aesthetic experience can also occur without the intellectual dimension (Csikzentmihalyi & Robinson, 1990).

Desmet, Hekkert and van Erp (2009) describe how visitors of the Rijksmuseum have the feeling that their general art knowledge, and knowledge about the expositions was not sufficient enough to be able to appreciate and understand the works of art exposed. This is a reoccurring theme in the museum experience, undermining what a work of art can offer by the feeling that one would not be able to see it. Paradoxically, the historical context for some art experts can also be seen as an obstacle rather than an essential part of the aesthetic experience. Having all these thoughts about how an object fits in time and history can distract from perceiving the actual work itself (Csikzentmihalyi & Robinson, 1990).

In the Science Centre

Method

A small research was set up to get an impression of how much intellectual knowledge the Science Centre visitors already have about the art and the context of the art.

The reproduction of the 'Sunflowers' (Figure 23) was set up in the museum. 12 children (aged between 6 and 12 years old) were interviewed in an informal manner. This interview was combined with the interview concerning the perceptual dimension.

The children were asked if they knew the painting, and who painted it. An informal conversation about the painting and their knowledge around it was started. Questions asked can be found in Appendix A.

Results

The results of the research were very clear, indicating that there is not yet any form of intellectual framework about paintings important to the Dutch culture. None of the participants knew the painting, or who painted it. The name 'Vincent van Gogh' was sometimes sparking a few thoughts, but not all the children had heard this name before. The importance of the painting within our culture was not clear to any of the participants.

Because the children were not aware of the value of the painting, the children were not motivated to further explore it after identifying the content of the painting. More quotes mentioned by the participants can be found in Appendix A.

"I have never heard of the name van Gogh"

"I don't know this painting or who made the painting"

"I have heard the name van Gogh before, but I don't know who he is"

- Participants

Figure 23. The replica of the Sunflowers

2.1.5 Conversation-al dimension

Theory

Based on the book Art of Seeing (Csikzentmihalyi & Robinson, 1990).

The Conversational response to art is a multidimensional experience that integrates the visual, emotional and intellectual dimension. The encounter with a work of art can be shaped like a dialogue. Within the conversational dimension, there are three general categories:

1. Conversation with a time/era

2. Conversation with the artist

3. Conversation within the viewer

Important to see is the difference between the first two categories and the third. In category 1 and 2, the work of art is seen as a vehicle to communicate through space and time, with the art(ist) as a mediator. In the 3d category, the artist is not seen as a mediator, and the work of art is used as a vehicle for stimulating fantasy and imagination.

In general, this dimension of art is not one of the primary responses in an aesthetic encounter, but could enrich the process.

-

According to Munley (2012), using the imagination makes young children (0-5 years old) respond especially well to the museum experience. Incorporating the imagination in stories and play can thus help to suffice their needs in a museum.

Observations

Observations were performed at Villa Zebra: an art museum for children. The visit of one family with two children and two parents was accompanied from start till finish.

The museums core focus is stimulating the imagination and fantasy of their visitors. The expositions are set up in a way that children enter a world deep in the forest, where all kinds of unfamiliar creatures live.

Although the whole physical environment is designed to help the children to enter the imagination and use their fantasy (Figure 24), it is clearly visible that this does not happen in the blink of an eye. Observations showed that at the beginning of the exposition the children are less expressive and are participating only a little bit. They slowly start to come loose as the exposition continues, assisted by parents and museum guides that help the children to think about and reflect on what they see by asking questions.

Because Villa Zebra is solely focussing on stimulating the imagination and fantasy, the artworks presented become part of the environment they are in rather than separate objects created by different artists. The works of art seem to function more as a probe to stimulate the imagination rather than a product created by an artist. The intentions of the artist are not taken into account, and neither is the meaning intended by the artist.

After the observations, an interview was conducted with Jolanda Bouman, designer of all expositions in Villa Zebra. The findings of the observations were discussed and confirmed by her. A transcript of the highlights of the interview can be read in Appendix B.

“At Villa Zebra, the whole space is dedicated to supporting the children to get into the mode of imagination”

- Jolanda Bouman (Villa Zebra)

Figure 24. All elements in the Villa Zebra expositions are designed to enable the children to enter the mode of imagination [9]

2.2 Balancing challenge & skill

Facilitating the aesthetic experience

To be able to have an engaged aesthetic experience, it is important that the challenges that the work of art brings over the four major dimensions, are in balance with the skills of the viewer (Figure 25).

In this chapter, challenges within the art will be discussed as well as the skills of the viewer and the possibilities to facilitate the interaction between the two.

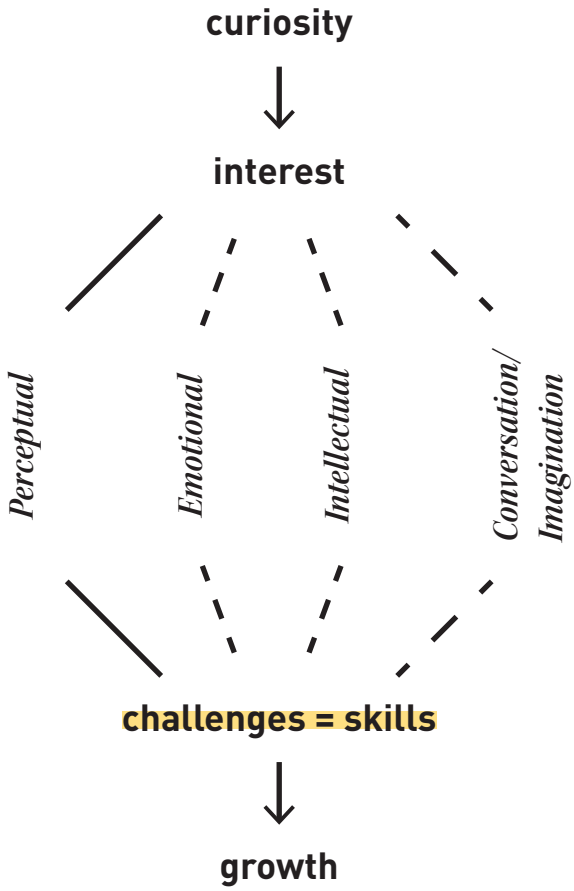


Figure 25. Structure of the aesthetic experience

2.2.1 Challenges within the art

Depending on the type of painting, every work brings its own challenges. These challenges have different natures, depending on the dimension of art they are based on. Although there are countless types of paintings which thus bring countless types of challenges, there can be made two major distinctions.

Abstract vs. Figurative

There is a big difference in challenge between abstract art and figurative art. Abstract art (Figure 27) requires a lot of imagination, knowledge or frame of reference, and thus is harder to satisfy the beginning viewer; especially without any context information. Figurative art (Figure 26) displays recognizable representations of reality, which makes it easier to identify the content of the painting and construct meaning.

Narrative vs. Non Narrative

A narrative artwork tells a story (Figure 28). The visual elements of the artwork are very much related to each other, which makes it relatively easy to keep looking, as your eye can follow the line of the story that is displayed. Because the narrative is inside the painting, less contextual information or knowledge is needed to be able to create that narrative to understand the painting. Generally, narrative paintings are considered as a good type of art for less skilled viewers because constructing meaning is easier due to the story inside the painting (Housen, 2008).

Figure 26. A figurative, non narrative artwork [10]

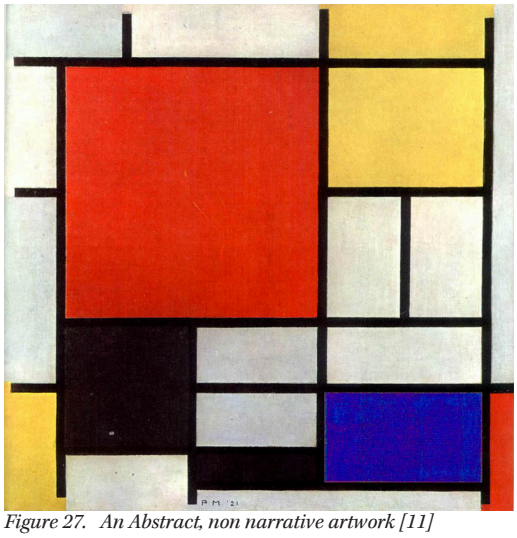


Figure 27. An Abstract, non narrative artwork [11]

Figure 28. A figurative, narrative artwork [12]

2.2.2 Skills of the viewer

The skills that a viewer has in looking at art develop over time. With more experience in looking at art, different stances and approaches are common.

According to DeSantis and Housen (2000) The development of aesthetic skills consists of five stages:

1. Accountive Viewers
Accountive viewers are making lists and stories, by summing up concrete and simple observations about the content of the art (e.g. "it's a vase with flowers"). The style of the accountive viewer is characterized by an egocentric perspective: judgements are based on what is known and what is liked. If one for example likes sailing, a painting of a boat will appeal for that reason.

2. Constructive viewers
A framework for looking at art is being build, using tools like their own perceptions, knowledge of the natural world and their morals and values. If a work of art does not look the way it is 'supposed to' (e.g. a tree being orange instead of brown), the work of art will be considered lacking and of no value. Viewers sense of what is realistic or standard often determines what value the art has to them.

3. Classifying Viewers
Classifying viewers are taking a more analytical and critical approach to art, adopting the stance of an art historian. There is a need for categorizing the art to place, school, style, time, etc. Works of art are 'decoded', using the intellectual framework that is already there, but the viewer is eager to expand this framework. The classifying viewer believes that when properly categorized, the meaning of the art can be explained and rationalized.

4. Interpretive viewers
Interpretive viewers are looking for a more personal encounter with a work of art. They explore the canvas accurately, appreciating subtleties in the formal elements of the art. Critical skills are used to let the underlying meaning of the work unfold. Each encounter with a work of art is seen as a chance for new insights and experiences.

5. Re-creative viewers
The re-creative viewer is very experienced in viewing and reflecting about works of art. The viewer knows everything about the work of art: from the history to the travels it has made. Paintings are treated like an old friend: known intimately but still full of surprises.

Important to note is that one can only grow in the stages when more experience in viewing art is gained. The aesthetic development thus is not determined by age, although it is of course related to it. A striking finding in the research is that the majority of the museum visitors is a stage 1 or 2 viewer (Housen, 2008), and might thus be called beginner viewers. Although being in a higher stage will result in a richer aesthetic experience, that doesn't mean aesthetic experiences of people in the lower stages are less valuable. As all development theories, development should occur naturally and no stage can be skipped.

The characteristics of Housen and DeSantis' development theory fit well with Parsons' (1976) findings of the aesthetic development of children. He identifies two very clear stages (the first till the age of 7, the second from 7 till about 12) where the first stage is characterized by the egocentric perspective and the second stage is characterized by the forming of certain rules.

The Science Centre Visitor

Children in the target group of the Science Centre (aged 7-12) most certainly all fall within the first two categories of the development theory (Housen, 2008).

In art education, it is important to offer developmental appropriate strategies fitting to the stage of the viewer. Developmentally inappropriate concepts will not 'stick', and will have no effect or even a negative effect on the aesthetic experience and on the aesthetic development on the long term (Desantis and Housen, 2000). Therefore, facilitating the aesthetic experience of the Science Centre visitor should not focus around providing intellectual information, as this does not fit with their development level.

2.2.3 Facilitating the experience

For an engaged aesthetic experience, it is important that the challenges of the work of art are in balance with the skills of the viewer. If the theory of the challenges of art is combined with the theory about aesthetic development, an image can be created to see how these two can brought to balance for the Science Centre visitor.

As discussed previously, the challenges that a work of art brings are very much dependent on the type of art. Choosing an artwork appropriate to the skills of the viewer can thus help to balance challenge and skill. However, challenge and skill can also be balanced by creating 'bridges' between the artwork and the viewer (Csikzentmihalyi & Robinson, 1990). Currently there are several types of bridges already available in the museum environment. These bridges close the gaps between the challenges of the art and the skills of the viewer on the different dimensions of art.

Because of the very personal nature of the content of the aesthetic experience that the visitor is sensitive to, and the very different level of skills that visitors of a regular museum have, creating the right bridges in a museum context is a difficult task. Ideally, there should be bridges available on all possible dimensions of art, for all different levels of skill of the viewer.

The advantage for the exhibit that is to design in this project, is that the level of skill of the Science Centre visitors are much more alike. Children are most certainly all in the first skill level of the Housen model (Housen, 2008).

There are several types of bridges already available in the museum context. Think of captions next to paintings, audio-tours and museum guides helping to optimize the aesthetic experience. In this chapter, current bridges relevant for this project will be analysed to see on which dimension they focus, and how they facilitate the viewer.

Captions

The most commonly available 'bridge' is the caption on the wall next to the painting. Although the caption takes only a small part of the wall space in a museum, innovations in facilitating the viewer focus around it.

This caption is regularly filled with intellectual information, about the painter, the style, the era etc. This intellectual information is not very relevant for the beginner viewer, but aims more for an intermediately skilled viewer who already has an intellectual framework.

Although most of the time the caption is facilitating the viewer looking for intellectual information, advances are made by different museums. The text is adjusted to support the visitor in decoding the emotional content, or story-based information is provided to help the visitor construct meaning.

No matter what dimension the caption facilitates, the text influences the way that people look at the painting. The vision is channelled by what the caption says, confirming the text with the eye (Walker et al. 2017). Captions thus could be disabling the viewer to explore the work for themselves.

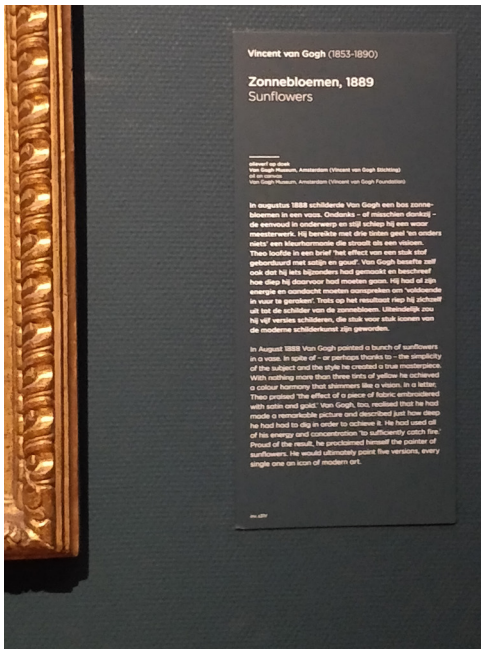


Figure 29. The caption next to "Sunflowers" of Van Gogh

Figure 30. Visitors listening to an audio tour [13]

Audio tours

An audio tour is a second very common way that museums use to bridge the gap between the work of art and the viewer. This audio tour often contains intellectual information in more story based forms, explaining background information about the life of the painter and the context of the painting. In the same way as the caption, the vision of the viewer will be channelled by what the tour describes (Walker et al., 2017). However, the story-based information can help the viewer to look at the painting from other viewpoints, and provides the opportunity to let the artist explain the work of art. Having an audio tour can lead to more immersive experiences. However, one pitfall of the audio tour, is visitors 'listening' to an exposition rather than seeing (Csikzentmihalyi & Robinson, 1990). This means the audio tour can distract the viewer from the actual work itself.

Children's Booklets

For children specifically, there almost always are little booklets available to guide their way through the museum. Depending on the sort of exposition, the booklet stimulates the children to look at the artworks by letting them perform little tasks. Moving through the museum is made more enjoyable by making it more like a scavenger hunt.

The children's booklet of Boijmans van Beuningen was analysed. This booklet is build up as a travel through time, explaining the children how the paintings relate to how the people in that time lived. The booklet lets the children focus only on elements of a painting rather than a whole painting, by for example making them count the amount of dragons or letting them search for a specific item in a painting. The overall focus of the booklet is making the museum visit an enjoyable time, rather than concentrating on looking at artworks.

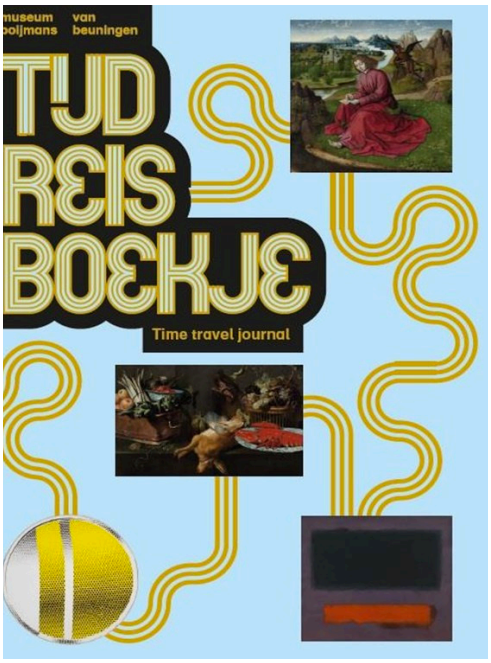


Figure 31. Childrens booklet of Boijmans van Beuningen [14]

VTS

Visual thinking strategies is a method that Housen (2012) developed to teach visual literacy, thinking, and communication skills. It specifically aims for the beginner viewer of her aesthetic development theory as described in the previous chapter. The method is dependent on three questions:

1. What's going on in this picture?
2. What do you see that makes you say that?
3. What more do you see?

These questions are asked in a group session, carefully guided by a facilitator. The facilitator explicitly is not providing any contextual or intellectual information, keeping the focus on the perceptual dimension and the training of visual literacy. Although the method focusses on the perceptual dimension, it merely is about reading the content of an image rather than exploring the physicality of the object itself: because VTS is practised in group sessions, the distance between the art object and the viewer is large (Figure 32). VTS merely uses narrative art, enabling the viewers to create stories from the elements within the painting without the need for contextual information.

Figure 32. A VTS group session [15]

Teekenen

The Rijksmuseum launched their 'hier teekenen' campaign in 2016, stimulating their visitors to stop photographing and start drawing what they see in the museum (Figure 33). They use drawing as a way to make you see more, as you have to take a closer to be able to draw what you see. This bridge thus helps the viewer to focus on the perceptual dimension of art, inviting them to explore the painting and discover elements that you don't see by taking a quick glance.

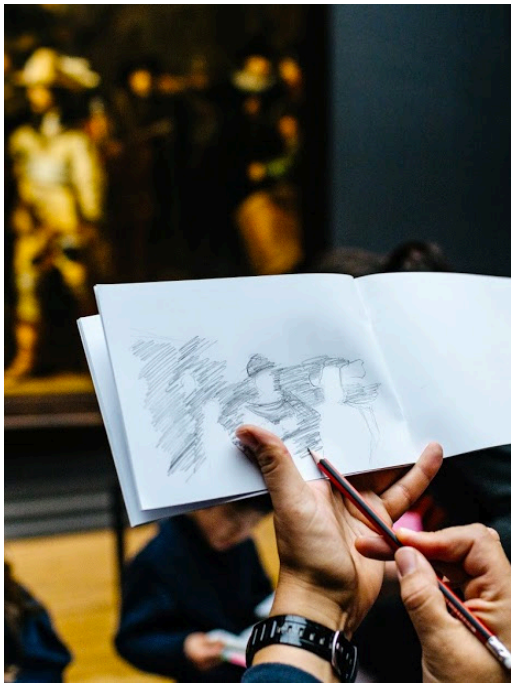


Figure 33. A visitor drawing in the Rijksmuseum [16]

Slow art movement

The slow art movement stimulates to take the time to look at an artwork (Figure 34). To force yourself to look at one piece for at least 15 minutes. This forcing results in looking more carefully, and noticing more details than you would with a quick glance. After a while of looking in the 'reading' mode, one will (out of boredom) shift to a more exploratory mode of looking which will enable you to discover more details in the painting.

Figure 34. A group of people performing Slow Art [17]

Conclusion

Although the two most commonly used bridges, captions and audio-tours, focus merely on intellectual context information, advances are made by museums to innovate the information provided to make them more immersive and suitable for different types of visitors. However, the fact remains that the methods do rely on providing more information (regardless whether it's intellectual, contextual, story based or in any other form) to facilitate the aesthetic experience.

The other bridges discussed (VTS, Teekenen, and the Slow Art movement) focus on the perceptual dimension, facilitating the viewer to be able to see more in the painting. However, the process of using these bridges either requires effort and time or a facilitator. A bridge that focusses on the perceptual dimension in an effortless and non forced way is not yet available, and could thus be an opportunity for this project.

2.3 The Aesthetic experience in real life

Phenomena and observations in the museum

With the theory in the previous chapters, the aesthetic experience can be described. But how does the aesthetic experience look in real life? The go-to place for the aesthetic experience is the art museum, and plenty research is done to see how this aesthetic experience is in real life. Two interesting phenomenon are spotted often, and described in literature.

Time spent watching

As already discussed in the previous chapter at the perceptual dimension, multiple researches indicated that a large part of the museum visitors only looks at paintings for a matter of seconds, of which most of the time goes to the caption next to the painting (Smith & Smith, 2001; Worts, 2003, Batcha et al., 2012) . These superficial interactions (Figure 35) thus can be a sign of the challenges of the work being to big for the skills of the museum visitor. Reading the caption next to the painting is a way to make the challenges smaller, and gives grip on how to look at the painting.

Museum fatigue

Another phenomenon often seen in the museum is called 'Museum Fatigue'. The view of people tired of everything they need to see (Figure 36). Museum fatigue can also be related to the aesthetic experience theory, as the museum visitor does not clearly know what to see or experience in order to be 'done'. To be able to leave with a satisfied feeling, the visitor wants to see the whole museum. A task simply impossible since museums are generally quite large.

Both phenomena indicate that there is room for improvement in engagement concerning the aesthetic experience.

Figure 36. *Museum visitor suffering from Museum Fatigue [18][19][20]*

Figure 35. *Museum visitors 'grazing' through the gallery [21][22]*

2.4 Conclusion Aesthetic Experience

Decisions made for continuing the project

Because the Science Centre visitor is a beginning art viewer, facilitating the aesthetic experience should not be focussed around intellectual information as this information does not yet fit with their level of aesthetic development.

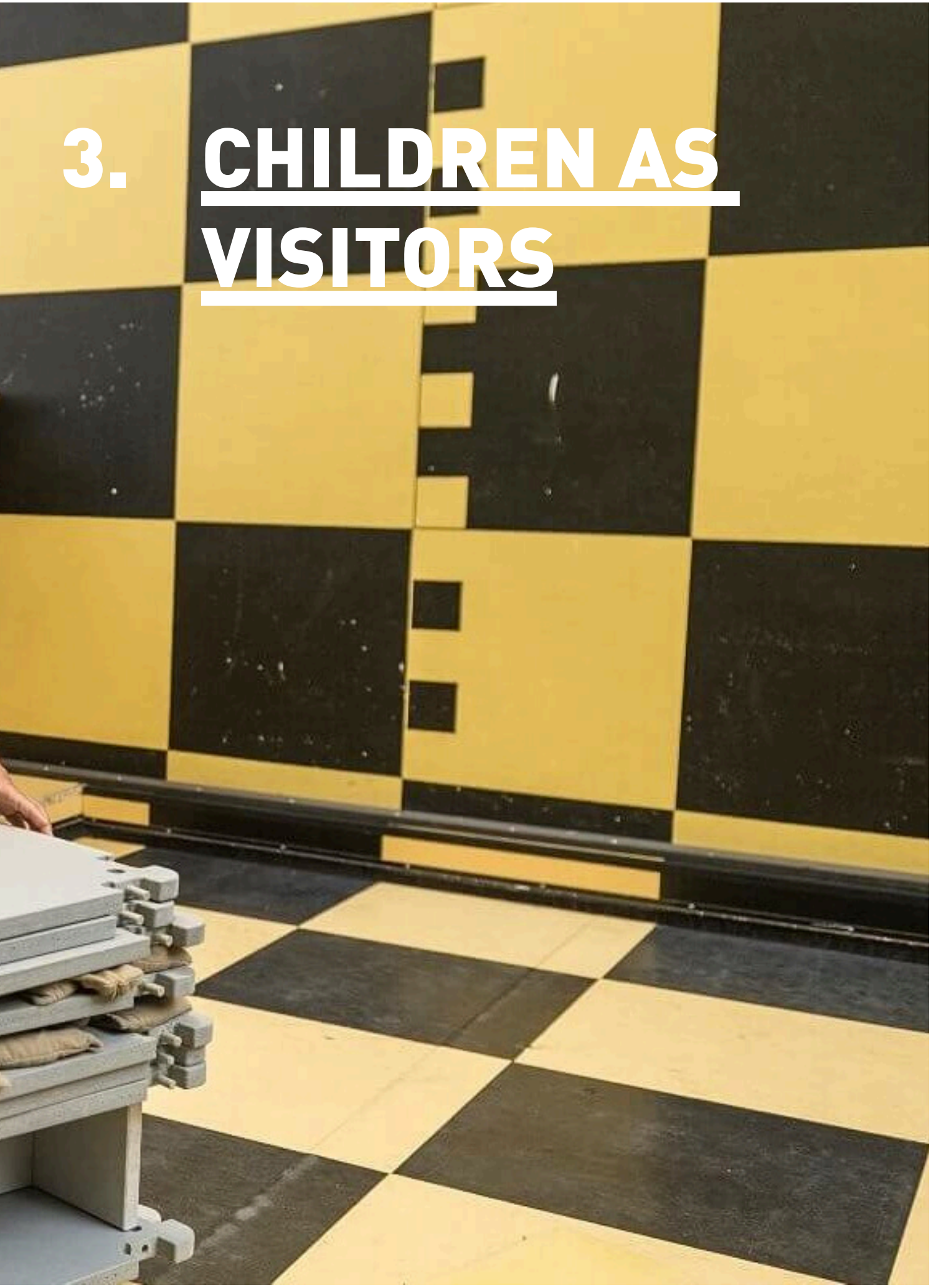
Regarding the emotional dimension, paintings reproduced and thus available for the exhibit to design in this project are not all coherent with the life experiences the children have had before, disabling them to fully understand and experience the emotions displayed in the painting. From the four available paintings, "Flowers in a blue vase" has the highest chance to be appealing to the target group on this level.

Since it will require a lot of effort dedication of the children to get into the mode of imagination, focussing on this dimension will have little chance for success in the Science Centre due to the many distractions that other exhibits will cause.

For this project, the focus thus should be on the **perceptual** dimension: facilitating the process of exploring the canvas and consciously looking at the art. Of the works of art reproduced, “Flowers in a blue vase” (Figure 37) will suit best to this goal since it’s a painting with very interesting formal elements perfect for exploring. Next to that, this painting has the highest chance of appealing to the target group on the emotional dimension.

Figure 37. "Flowers in a Blue Vase - Van Gogh

3. CHILDREN AS VISITORS



3.1 Children's Museum Experiences

Design rules and strategies that can be applied

This chapter will go into the theory of designing expositions for children. This mainly benefits the first step of the aesthetic experience structure (Figure 38), but is of course also of great importance in the general design of the exhibit.

To be able to create an engaged aesthetic experience out of which growth can follow, it is important that the interaction starts with *curiosity* and *interest*. These two knowledge emotions are the basis for a valuable process, and indicate that the viewer not only attends the artwork but also *wants* to attend.

According to Csikzentmihalyi & Hermanson (2014), human actions can be motivated by two types of rewards: extrinsic and intrinsic. When an action is extrinsically motivated, the anticipation is on a reward that lays outside the activity. For example to avoid punishment, to get a degree, or to live up to societal standards. An action is intrinsically motivated when the act itself is worth doing for its own sake, without the need for external rewards. For example most sports are intrinsically motivated, as only few players are professional and thus there is no reward for the sports except for the experience itself.

In visiting museums and looking at art, for children extrinsic rewards are mostly the motivation. Children go to the museum because their parents made them go. They look at paintings in class because they have to.

Figure 38. The structure of the aesthetic experience

This effect was also seen during observations that were performed with a painting in the Science Centre. There was no natural curiosity and interest for the paintings in the children, but they were willing to look at it when asked to do so (see the previous chapter in the perceptual dimension and the intellectual dimension). Since curiosity and interest are important for an intrinsically motivated process, it is important to create curiosity and interest by design.

In this chapter, literature is reviewed to see how curiosity and interest in children can be generated. Observations at the Science Centre were performed to see how the children behave there, and how their attention and curiosity is attracted now.

Relevance & Interest

Topics that children can relate to their everyday experiences have a big positive influence on their impact (Anderson et al., 2002; Munley, 2012). The link between the exhibit and the visitor's life needs to be made clear in order to inspire motivation for involvement with the exhibit and further learning (Csikzentmihalyi & Hermanson, 2014). Especially concerning art, this is an interesting phenomenon.

As Moore described in his book 'Care of the Soul' (1992):

> ***"The fine arts are elevated and set apart from life, becoming too precious and therefore irrelevant. Having banished art to the museum, we fail to give it a place in ordinary life."***

Making art relatable to the daily life of the Science Centre visitor thus can be an opportunity for more engagement and enriching interactions between children and paintings.

In her book 'the Art of Relevance' Nina Simon (2016) describes the importance of creating an experience relevant to your intended visitor. This means creating an experience that the visitor can relate to their daily life. Logical as this seems, it requires extensive knowledge of the people you want to address to be able to create an entry point to the subject that suits them. By focussing on the perceptual dimension as concluded in the previous chapter, having a relevant aesthetic experience will be possible for the target group.

3.2 Behaviour in Science Centre Delft

How does the Science Centre visitor behave?

Observations in Science Centre Delft were done to get an impression of how the visitors behave in the museum. How do the visitors move around in the museum? Which exhibits are popular? What elements attract attention? Observations were done during 2 hours, following multiple families during their visit. Useful observations are discussed here.

Level of effect
Children tend to move criss cross through the museum, led by what attracts their attention at that point. Exhibits resulting in clear visual effects seem to be best in attracting attention. Two very popular exhibits have large visual effects: the earthquake simulator and the ball catching machine (Figure 39).

Sometimes the children observe how someone else interacts with an exhibit before trying themselves. This guides the interactions with the exhibits making it easier to know what to do. Especially for exhibits with large scale effects this is the case: boats falling in the water simulating gulf effects, airplanes reaching for the ceiling and the ball caching cage. Children see how others reach the large scale effect, and want to reproduce and experience this by themselves.

Manipulation
Exhibits that offer no manipulation are less engaging. For example the 3D Vermeer; because the interaction contains only looking, the children are not very interested.

Collaboration
The children often move along with their brother/sister or friend: in small groups. Some parents take a supervising role, only assisting when necessary. Other parents are more involved in using the exhibits. Exhibits were the children can collaborate with either friends or parents are more popular than exhibits that can only be used by one person at the time.

Duration
Interaction times with exhibits differ enormously. Some games take 10 to 15 minutes to complete, some take only a few minutes. When an exhibit takes collaboration with peers or family, it seems that the activity can take longer. Single player exhibits that take a long time are not popular.

Expectations
Children build expectations from how an exhibit or exposition room is called. Especially for the Game Lab this was very apparent. During the two hours of observation, multiple children entered the GameLab screaming enthusiastically about the games they were going to play. The other two exhibits about art related topics were paid less attention to.

Video's

Some exhibits use video's for explanation, but problems occur with the attention span of the children. Attention needs to be grasped quickly, and because the chance that the video starts exactly at the moment the attention is grasped are very small; the video's are often not watched.

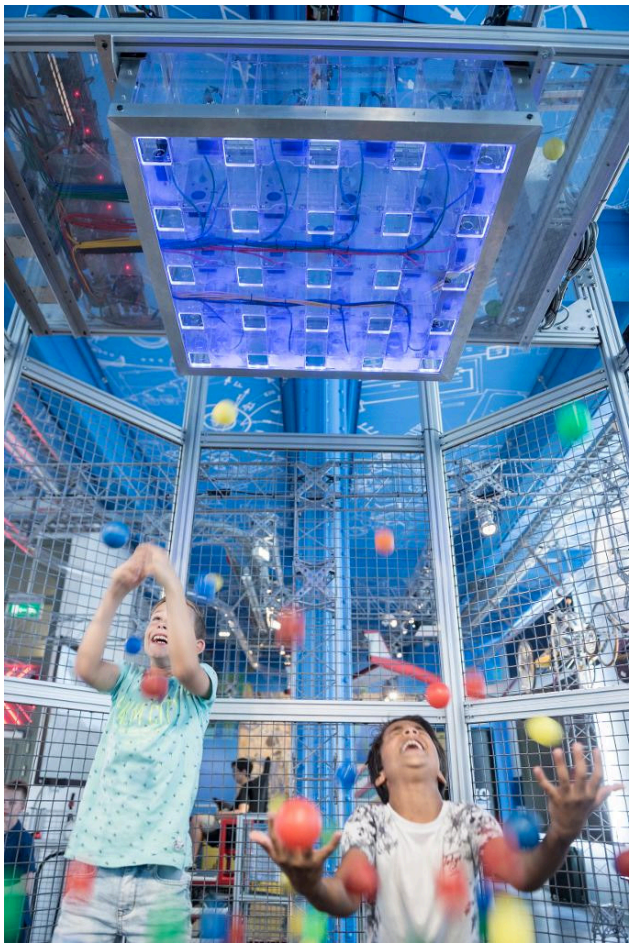


Figure 39. The earthquake simulator and the ball catching machine have large visual effects [23][24]

3.3 Preferred Exhibit Characteristics

Design rules and strategies that can be applied

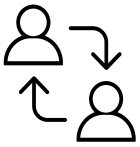
Literature studies and observations are combined in this overview, displaying important characteristics that can be used to design an optimal functioning exhibit.

Experiential learning

Experiential learning and learning by doing is something Science Centres commonly use as a strategy to make complex subjects suitable for children (Piscitelli, 2001). Through explorations, children learn with trial and error. The design of the exhibits helps here to enable the children to learn and stimulates to ask critical questions. In art, these techniques are generally only used in the form of *creating* art, but experiential learning is not yet applied to *viewing* art made by other artists. As Edeiken (1992) describes, children's learning is promoted by direct contact with objects, enabling them to have open ended explorations lead by their own curiosity. Having these opportunities is crucial to create a sense of wonder.

Attention grabbing

Research repeatedly indicated that large scale or other strong visual aids grabbed the attention of the children, leading to engaged interactions with exhibits (Anderson et al., 2002). Where some exhibits attract attention for their fearful subject without the actual danger (dinosaurs and mummies), exhibits can also attract attention with bright colours, interactivity, light and sound, and other stimuli that provide the necessary interest to attract attention (Csikzentmihalyi & Hermanson, 2014).



Collaborative

Children don't move through the museum alone, but with family or friends. Exhibits where they can collaborate with their parents or friends are preferred. This is also seen in the Science Centre, were popular exhibits also require working together. Communicating with parents, guides or peers can enrich the learning process and cause a more fruitful learning process (Piscitelli, McAdle & Weier, 1998). This is also seen in the context of looking at art, where looking together and talking about what you see enables you to see more (ver Elst, 2014). As well as Piscitelli & Weijer (2002) who describe that social interactions such as adult guidance and peer collaboration are key in the process of learning about art.

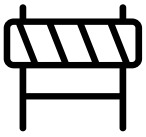
Multi sensory

Children are naturally active and explorative learners. Multi-sensory exhibits thus are attracting children and sustaining their interest (Piscitelli, McArdle & Weier, 1998).

The way paintings are regularly displayed does not fit with this natural behaviour, forcing them to only use the eyes. Using replica's of paintings thus can be an opportunity to make the learning of paintings more suitable for the target group.

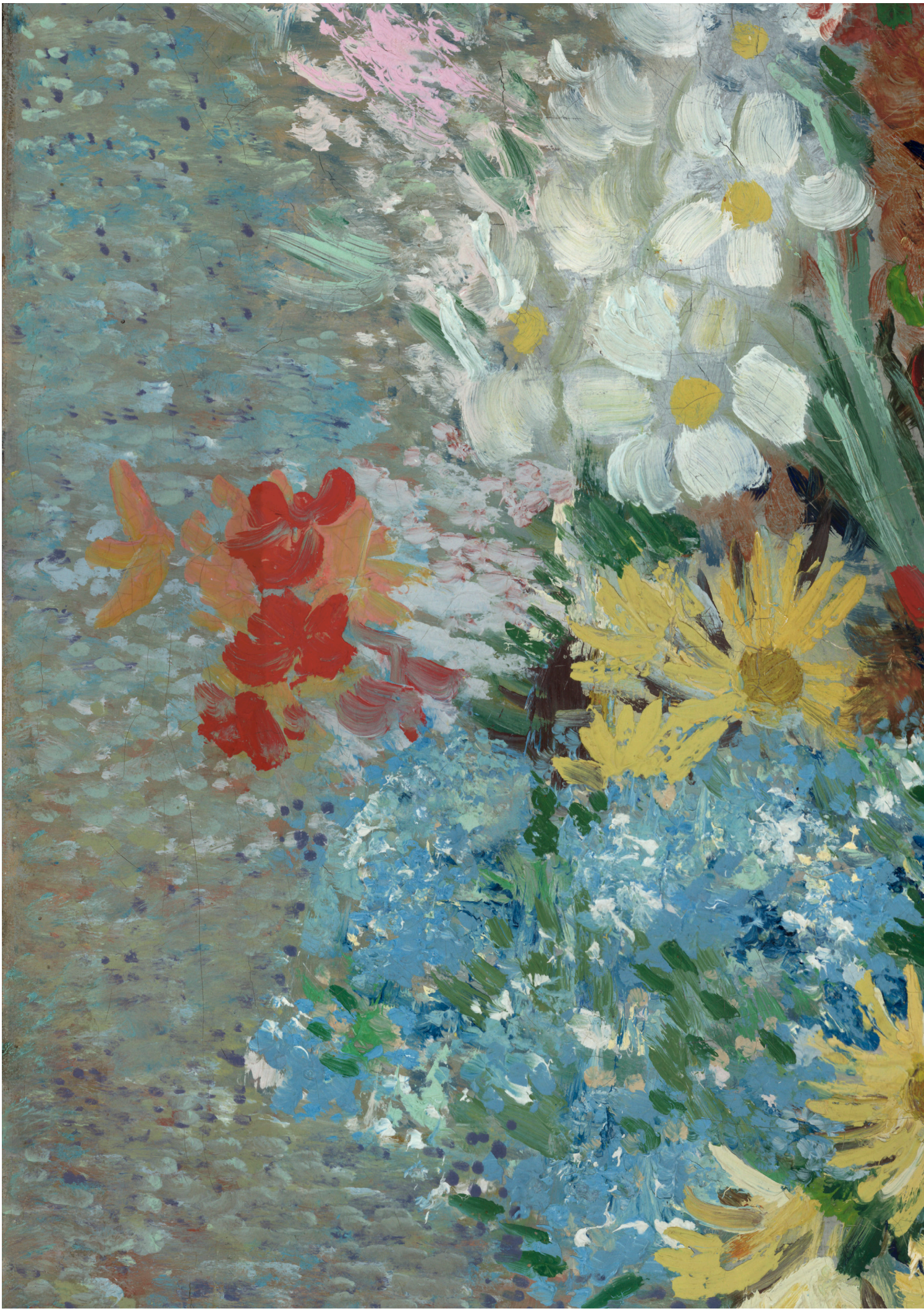
Make it Personal

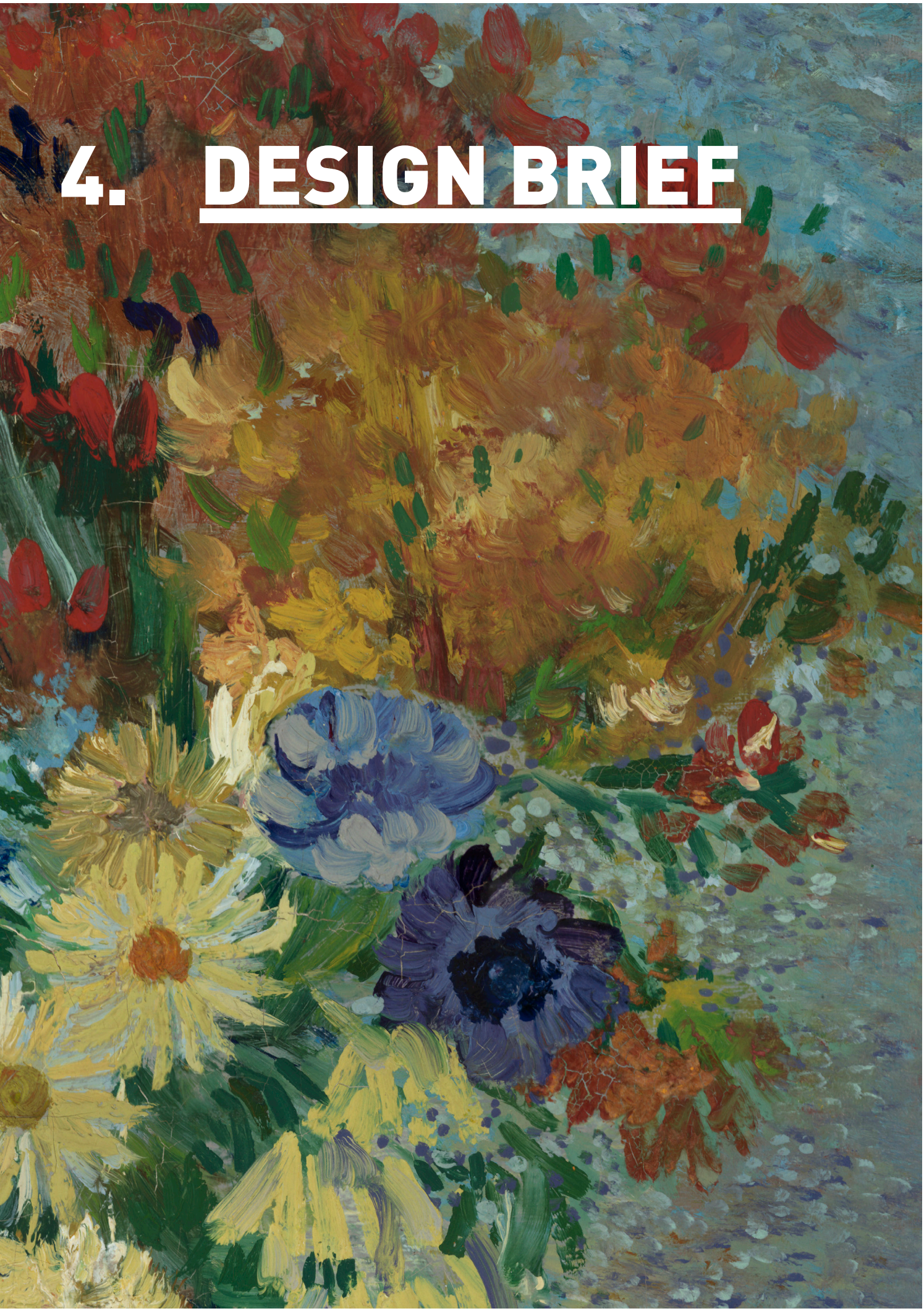
Piscitelli & Weijer (2002) describe that the visitor should be empowered to reflect on a work of art in a personally meaningful way, in order to help the visitor to relate to the work of art. Hereby, works of art that otherwise would be 'difficult' can create personal meaning.



Low threshold

Things that you need to crawl in/under are not popular. Being comfortable is important when wanting an engaged interaction with the exhibition.





4. DESIGN BRIEF

4.1 Design Brief

Defining the design goal and vision

Designing an exhibit for Science Centre Delft, using replica's of historic paintings. The exhibit should balance the challenges of the artwork with the skills of the viewer on the perceptual dimension of art, enabling the Science Centre visitor to have a relevant aesthetic experience.

By focussing on the perceptual dimension, having a relevant aesthetic experience will be made possible for the Science Centre visitor; without the need for any contextual, intellectual or emotional knowledge and experience. By balancing the challenges on the perceptual dimension with the skills of the visitors, looking at art will turn into an enjoyable experience that can be compared to a flow experience. Using the exhibit and exploring the artwork should be intrinsically motivated. Therefore, curiosity and interest for the paintings should be generated by the design of the exhibit.

Target group

The exhibit should focus on the average Science Centre visitor aged between 7 and 12 years. These children are in stage 1 or 2 of Housen's aesthetic development theory, making them beginning art viewers.

Characteristics

In designing the exhibit, the preferred exhibit characteristics should be taken in consideration:

Learning by doing, attention grabbing, multi-sensory, collaborative, personal and a low threshold

Interaction vision

An interaction vision represents the characteristics and qualities of the experience that the designer intends to accomplish with a design. The vision and accompanying qualities can be used as a guideline throughout the project, and as a way to communicate about the nature of the interactions. The interaction vision formulated for this project is:

I want looking at the artwork to feel like stargazing

Stargazing is a conscious way of looking. Consciously taking the time and effort to look at the sky and discovering constellations. The sky is explored in an unforced way. The process is engaging. It involves looking at separate stars and constellations as well as appreciating the whole clear night sky. You don't need to know exactly what your looking for, but you do find something. Having knowledge can enrich the experience, but it is not of vital importance to be able to enjoy the experience.

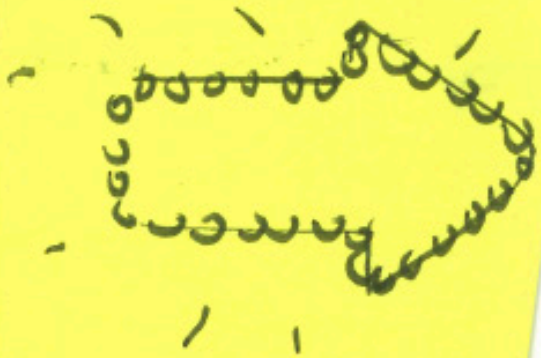
Qualities

Qualities derived from the interaction vision are:

Engaging
Rewarding
Conscious
Explorative
Unforced

DYNAMIEK:
bewegend beeld,
licht.

neon lichten



iets dat beweegt

licht

groot!

iets wat niet kan

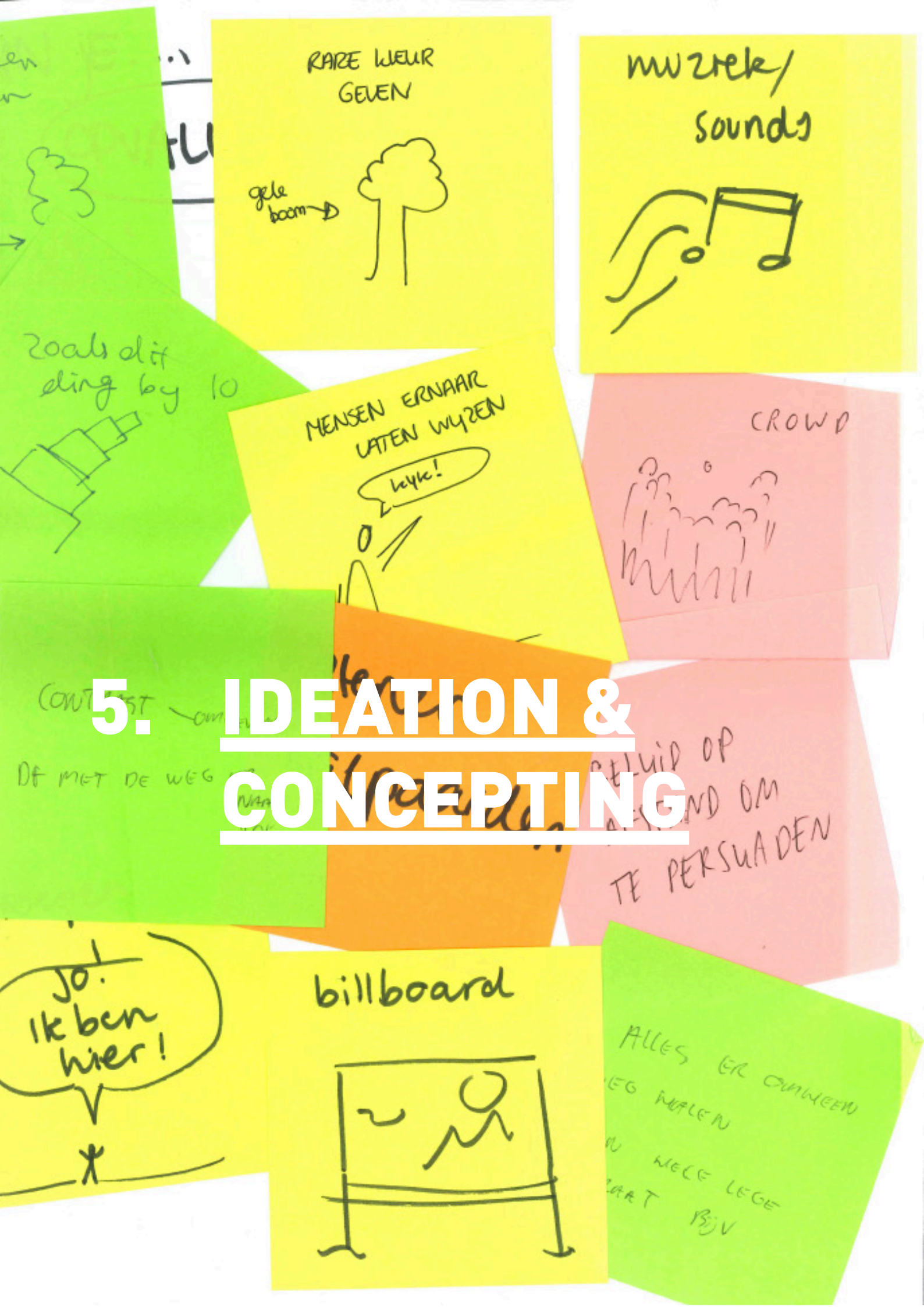
iets wat er "niet hoort"

DINGEN DIE NIET BIJ ELKAAR KLOPPEN

2e fata morgana: ander reflectie in water dan echt

GUY OP STELTEN

onver



5. IDEATION & CONCEPTING

5.1 Ideation process

The development of idea's

Since this is not a problem focussed project, the ideation process had a very experimental nature. After defining the design brief, an exploration was started to investigate the perceptual dimension of art and how the perception can be influenced. By diverging and converging, a design idea and concept got shape. A visualisation of the design process and the phases in this process can be seen in Figure 40.

After the explorative design phase, the concept will be validated with a thorough user test.

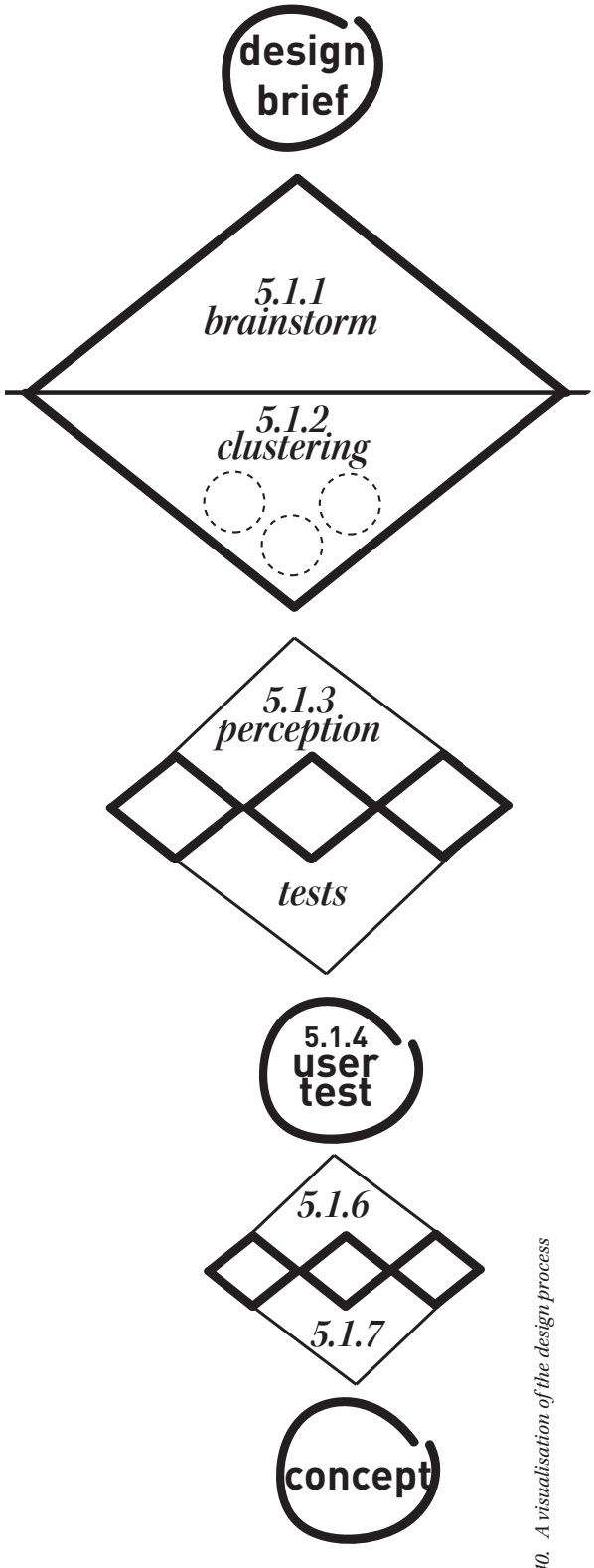


Figure 40. A visualisation of the design process

5.1.1 Brain-storm

After defining the design brief, the perception was explored. In the analysis phase, the goal of balancing the challenges with the skills of the viewer on the perceptual dimension of art was defined. Therefore, the perception was explored in a broad sense. To be able to facilitate the perception, more knowledge and feeling should be gained about what is the perception and how can it be influenced.
I expected that by providing the viewer with certain tools, specific elements or levels of the painting could be emphasized and highlighted. Combining different tools thus could result in the effect aimed for.

A brainstorm was set-up with four participants with a background in industrial design to create idea's on how to influence the perception.

Using different brainstorming techniques first general idea's on how to influence the perception were generated (Figure 41). Questions used were:

1. How can you make something stand out?

2. How can you guide the eyes

3. How can you change the perception

4. How can you look at something with fresh eyes?

In the next phase of the brainstorm the idea's on perception were projected onto the context of this project, resulting in idea's how to change the perception of the painting.

5.1.2 Clustering ideas

In the next step, the results were clustered to find patterns. This resulted in four clusters:

1. Tools for the user to inspect the painting as is

2. Adjusting the users' viewpoint

3. The user adding to the painting after print

4. Adjusting the painting before print

Within these clusters, several ideas were selected to continue with during experiments.

Figure 41. An example of idea's that resulted from the brainstorm.

5.1.3 Exploring the perception

Idea's that resulted from the brainstorm were taken into practise. Small explorative experiments were set up to get an impression of how participants would perceive the painting and behave with the painting using the tools provided.

Idea's from all previously mentioned clusters were tested. The interactions the experiments resulted in were reviewed with the defined interaction qualities in mind (engaging, rewarding, conscious, explorative, unforced).

Results

All ideas helped the participants to look differently at the painting in a certain way, but some of the ways felt more natural than others. None of the tools gave a result completely satisfying all interaction qualities.

The painting was explored more than without the use of any tools, but the exploration in most cases felt a bit 'lost' and clueless: it did not result in a *rewarding* feeling. The participants did not know where to look at, and when they were 'done'. An important side effect of this missing goal is that the participants never felt completely satisfied at the end of the process.

A few specific experiments with useful outcomes for the continuation of the project are discussed here, other experiments that lead to the general result described above can be found in Appendix C.

Looking through a tube

By letting the participants look at the painting through a tube (Figure 42), their vision was minimized to only a small part of the painting. This enabled them to take a closer look at the details, and seemed to take a way distractions from the rest of the painting.

Magnifiers & a flashlight

Using magnifiers and a flashlight (Figure 43 & Figure 44) were interesting because the participants used them very intuitively. One immediately knows what can be achieved by using these tools. Also, because paintings normally can not be inspected so closely, the participants were very interested in seeing in this detail. However, by looking at the reproduction using magnifiers, shortcomings of the reproduction are clearly visible.

The grid

One experiment that worked especially well was splitting the painting into a grid of 3 by 3 cm squares and a little space between the squares (Figure 45). This grid gave the participants more guidance in looking at the painting, and helped them to look at the details. By splitting it up, attention is subtracted from the content of the painting: every little piece of the grid becomes a work of art itself. Next to that, colour gradients and combinations and composition were emphasized.

Adding to the painting

Painting over the painting was feeling a bit awkward, depending on the level of confidence in painting of the participant. The participants were asked to paint extra flowers on the painting in the style of Van Gogh. Although the interaction felt a bit awkward, it made the participants carefully look at the brush-strokes and how they were combined to form flowers.

The way of looking thus was stimulated in the right direction, but the whole process felt forced and did not result in an engaged and rewarding feeling.

Conclusion

You can influence the perception in countless ways, but for a pleasant process and a satisfied and rewarding feeling, a clear goal is necessary.

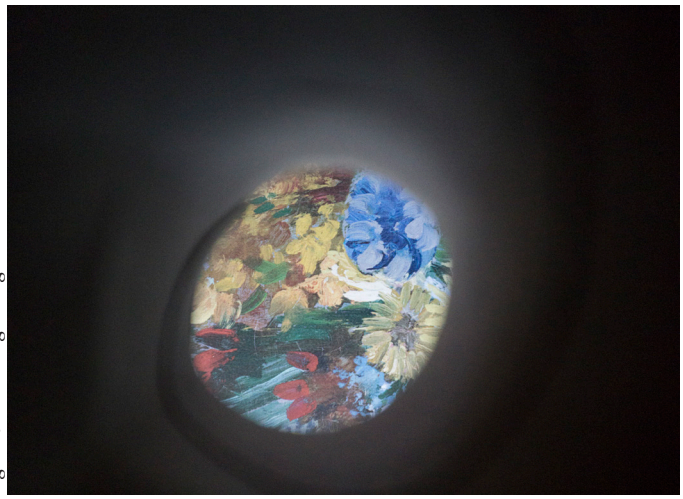


Figure 42. Looking through a tube

Figure 43. Using magnifiers

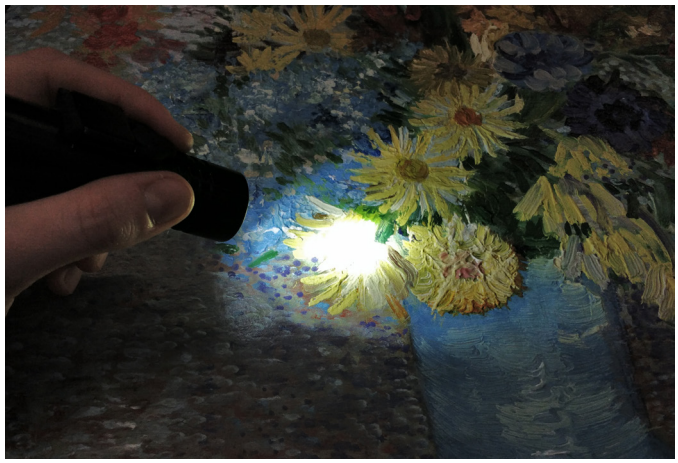


Figure 44. Using a flashlight

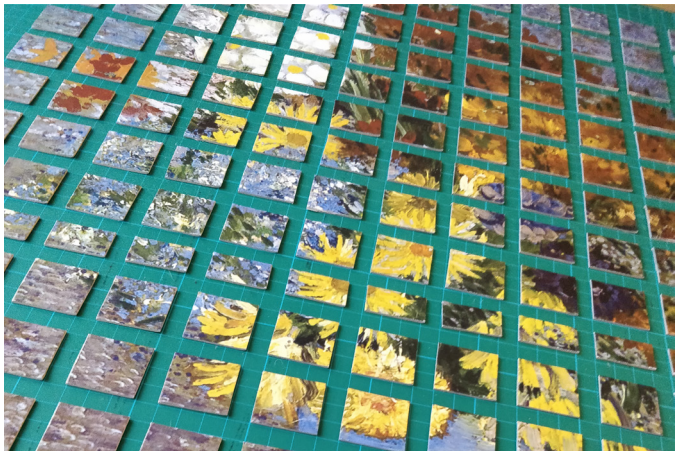


Figure 45. The painting in a grid

“You can influence the perception in countless ways, but for a pleasant process, a goal is needed to clearly start and end the interaction and leave with a satisfied feeling.”

5.1.4 Initial user test

The fist exploration showed that the interaction with the painting missed a clear goal. Therefore, a new exploration was started to see how certain goals influence the process of looking.

Formulating this goal is finding a balance between guiding and leaving enough room for exploration. Therefore, Experiments with different types of goals to see how these different goals influence the way the participants looked at the painting. Experiments were done with:

1. Closed goals (e.g. a goal with only one possible outcome)

2. Open goals (e.g. a goal with a personal outcome)

The difference between these types of goals is the manner in which the participant is focussed on a specific part. If the participant is given a specific piece to find within the painting, the perception is focussed on the area with the same visual characteristics and the specific piece given to the participant. This area is explored extensively, but the rest of the painting is ignored in the process.

Giving the participant an open goal allows for the whole painting to be explored, but requires more dedication by the viewer.

Because the first exploration research was conducted with adults and young adults, an initial user test was set-up in the Science Centre, to see how the idea's behave in the actual context and target group.

The test consisted of two parts, combining several idea's from the clusters mentioned in the last paragraph with the types of goals mentioned above.

Part 1

The visitors were given small pieces of the painting (3x3 cm) to search for in the painting. Divers pieces of the painting were chosen, to see how the piece that is asked to look for influenced the way the visitor looks at it.

Part 2

In the second part of the test, visitors were presented the painting split up in a grid of squares of 3x3 cm. The children were asked to choose one piece to take home with them.

Results

Part 1 - closed goal

Although the closed goal exploration results in large parts of the painting being ignored, the research resulted in engaged interactions with the painting. Within the Science Centre, the visitors move in groups, which often are family and friends. Exhibits are explored together. The simple game of finding specific pieces within the painting was thus also done together. The participants talked about what they saw, which made them see *more*.

A varying result was seen for the puzzle pieces selected. Pieces with a very recognisable characteristic (like Figure 46) resulted in the scanning of the painting to find the characteristic. Pieces with less recognisable aspects (like Figure 47) are harder to find, and thus required the participants to look closer and actually *see* what they are looking at. Finding where a piece came from resulted in a rewarding feeling.

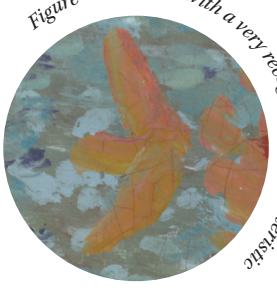


Figure 46. A piece with a very recognizable characteristic

Figure 47. A piece with less recognizable visible characteristics.

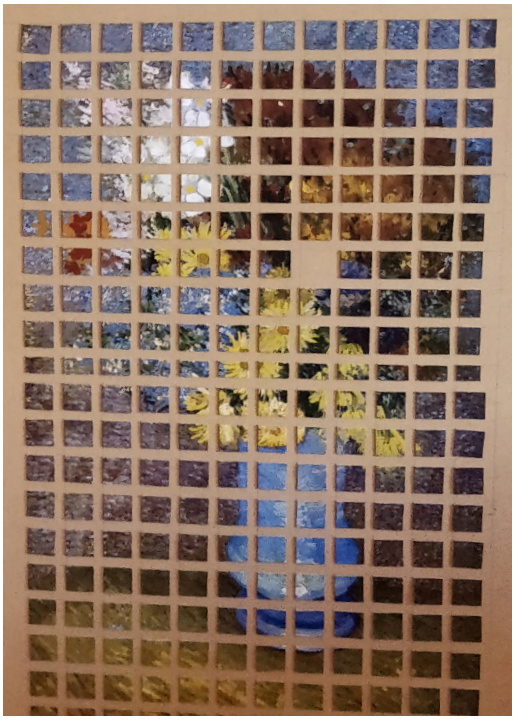


Figure 48. The painting split into a grid

Figure 49. Looking for a small piece within the painting

Figure 50. Visitors doing the activity together

Part 2 - open goal

As for the open goal, the painting was divided into a grid with separate pieces. The children were invited to choose a piece that was their favourite. This simple question made the children reflect on the painting in a personal manner. For the parents it functioned as a probe to be able to talk about the painting and ask the children personal questions on where there decision was going to be based on. This resulted in valuable conversations, and personal view and reflection on the painting.

Conclusion

Having a closed goal focusses the attention around only a small part of the painting, choosing the pieces to search carefully can result in the viewer paying close attention to what is seen.

Especially the closed goal in combination with an open goal seemed to work well, where the closed goal functions as a way to get familiar with the work of art, and warm up to later in the open goal be able to have a personal interaction.

"Talking about what they saw, made the participants see more"

5.1.5 What do you need to see?

During the experiments and explorations it still wasn't completely clear what you need to see from the painting to be able to have seen it properly. It's clear that we very often don't look careful enough. But if you look more careful, what then do you need to see?

It's not about seeing specific details of the painting. You can not make a checklist of details that needed to be seen within a piece of art. I asked myself "what makes this painting with a vase of flowers different than other paintings with vases with flowers?".

This question can be answered by the *Formal elements of Art* (The J. Paul Getty Trust, 2018). The formal elements can be described as being the alphabet of art: the building blocks out of which a work of art is build.

1. Line
Can be thick or thin; long or short; horizontal, vertical or diagonal; straight or curved.

2. Shape/Form
Shapes can be geometric or organic. Shapes are flat and can express length and width. Forms are three-dimensional shapes expressing length, width, and depth.

3. Colour
Colour has three main characteristics: hue (the name of the colour, such as red, green, blue, etc.), value (how light or dark it is), and intensity (how bright or dull it is).

4. Space
Space is the area between and around objects. The space around objects is called negative space. Space can also refer to the feeling of depth.

5. Texture
Texture is the surface quality that can be seen and felt. Textures can for example be rough or smooth, soft or hard.

These elements can be 'composed' in different ways, using design principles (like balance, emphasize, movement, proportion, unity and variety). Similarities in how the elements are composed define different styles.

Flowers in a blue vase

This painting is characterized by the quick and short brush strokes. Shapes are not clearly outlined, only in the vase and the table. For the flowers, the shapes are defined by putting together single brush-strokes. The illusion of space is created in the painting by the differences in the background colour and the colour and shape of the table. The colour of the background is more red in the bottom part against the blue vase, while in the top part the background is more blue against the red flowers. There is a corner in the table, and also the shadows on the table create the illusion of dept. The placement of the flower petals creates depth within the bouquet. By leaving some petals out, layers of flowers are created. How the paint is put onto the canvas creates a texture, which helps to give shape to the flowers.

Influence of knowledge

When you know more, you see more. Generally, this rule is applied. If you have more knowledge about something, you are able to see more nuances because you know what to look for. In the case of paintings, an expert will be aware that this is an impressionist painting, and he/she will know the stylistic rules that are common for impressionist paintings.

I want to turn this around: when you *see* more you *want to know* more. Being aware of the physical traits of the object can make you wonder why they are like that.

The painting is build up from quick and small brush strokes

The flowers are not clearly outlined. Their shapes come from the combination of brush strokes

Leaving petals out, depth is defined within the bouquet

The texture of the paint contributes to the shape of the flower

The colour of the background creates the illusion of space

The shape of the vase is created by the rounded brush strokes

5.1.6 Learning by doing

Because learning by doing is a strategy that fits well with the Science Centre and their vision, explorations were made to see how this could be incorporated in the design of the exhibit.

In the first round, experiments were done with painting flowers over the painting. This resulted in the way of looking intended (close inspection on how the painting is build up) but because not everybody felt evenly comfortable painting, the interaction felt forced. Therefore I sought for ways to achieve this effect without the need for the participants painting themselves.

Experiments in Photoshop resulted in the idea of printing flowers and leaves separately to be able to experiment with placing extra flowers onto the painting and seeing the effect this has on the look and balance of the painting. Puzzling a flower using the leaves requires close attention to the shape and direction of the petals, as well as close attention to the painting to see where the flower should go.

In Photoshop, petals copied could be 'lost' in the painting if they were placed on the right location. This inspired me to use this in an experimental and explorative game.

Experiment

Three IDE students were asked to take part in this experiment. Participants were asked to create extra flowers onto the painting by putting separate leaves together.

Digital

Digitally, the extra petals and flowers blend in with the painting really well. Participants were asked to create extra flowers using the Photoshop layers with cut-out leaves. Although all participants were familiar with Photoshop, placing and turning the flower leaves was not very intuitive. Because the use was not very intuitive, participants were not as free with the experimentation and were satisfied with the result sooner because of the hassle it would give to change the result.

Physical

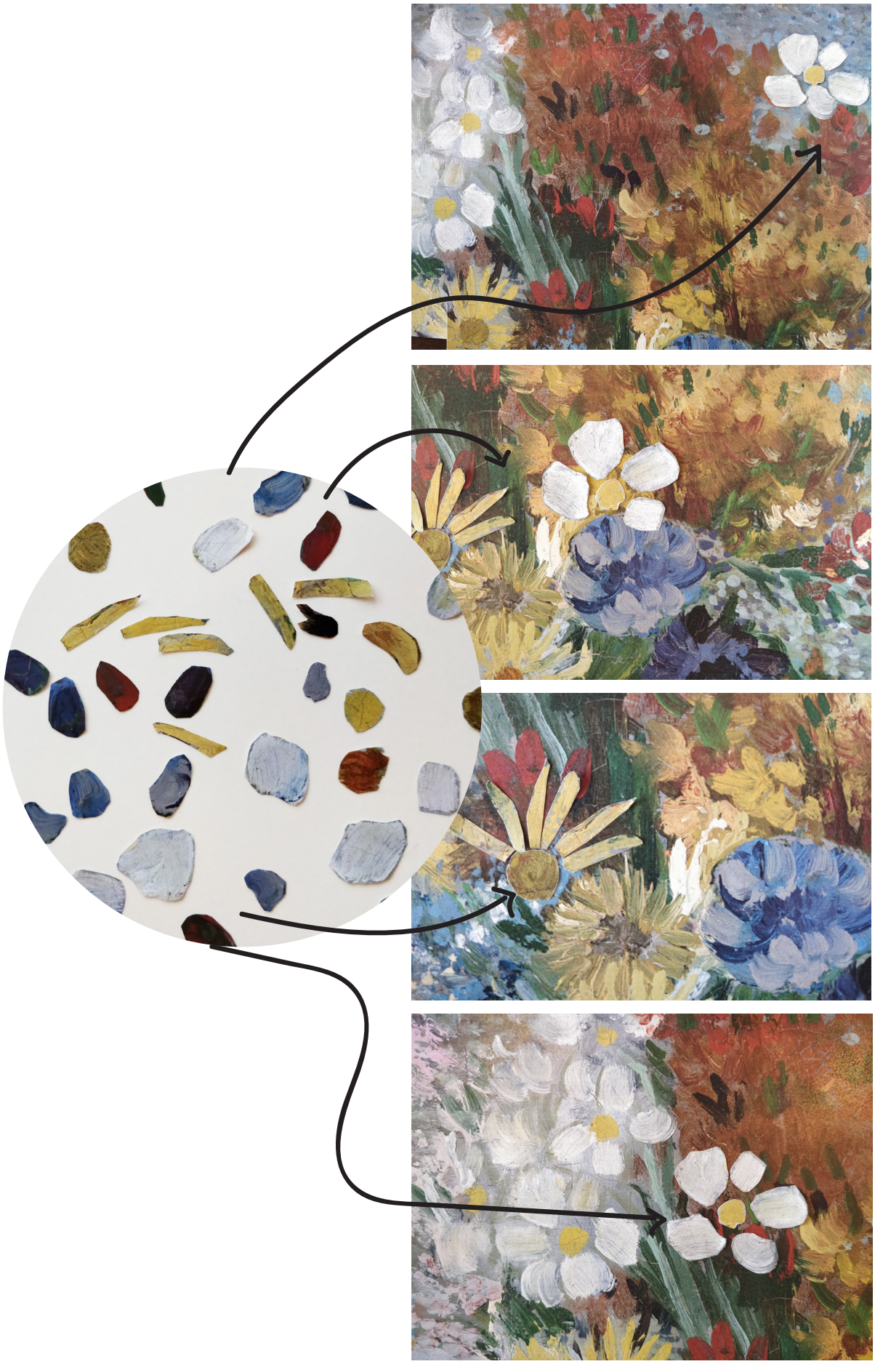
A physical experiment was conducted using paper cut-outs of the flower petals on a printed version of the painting. Participants experimented freely because of the ease of placing the flower petals on the painting and moving them around.

In both experiments, the task stimulated the participants to take a close look at the painting and how the formal elements were used in order to be able to recreate flowers themselves.

Conclusion

Using separately printed flower petals is a good way to let visitors freely experiment with the effect they have on the painting. The formal elements can be brought into practise while at the same time the task stimulates the user to pay close attention to the formal elements of the painting and the design principles used to put them together.

5. IDEATION PHASE



5.2 Concept Development

Turning all findings into a concept

All findings of literature studies, observations and explorations were translated into requirements.

The result of this project should not only facilitate the aesthetic experience, but also make use of the possibilities that using 3D printed fine art reproductions bring while being a good fit to the Science Centre. Requirements are categorized by these three interests and are stated on the right.

Idea's were combined and explored (Figure 51) , finally resulting in one final concept meeting all requirements. In the next chapter, this concept will be discussed and elaborated.

Facilitating the aesthetic experience

The design should:

Focus on the perceptual dimension of art

Create clear goals in exploring the art

Combine a closed goal with an open goal

Focus on formal elements of art

3D fine art reproductions

The design should:

Make use of the possibilities that arise from using 3D fine art reproductions

Science Centre Delft

The design should:

Be based on experiential learning principles

Have a clear visual effect

Create room for a personal approach to the art

Create room for collaboration in the activity

Have a low treshold

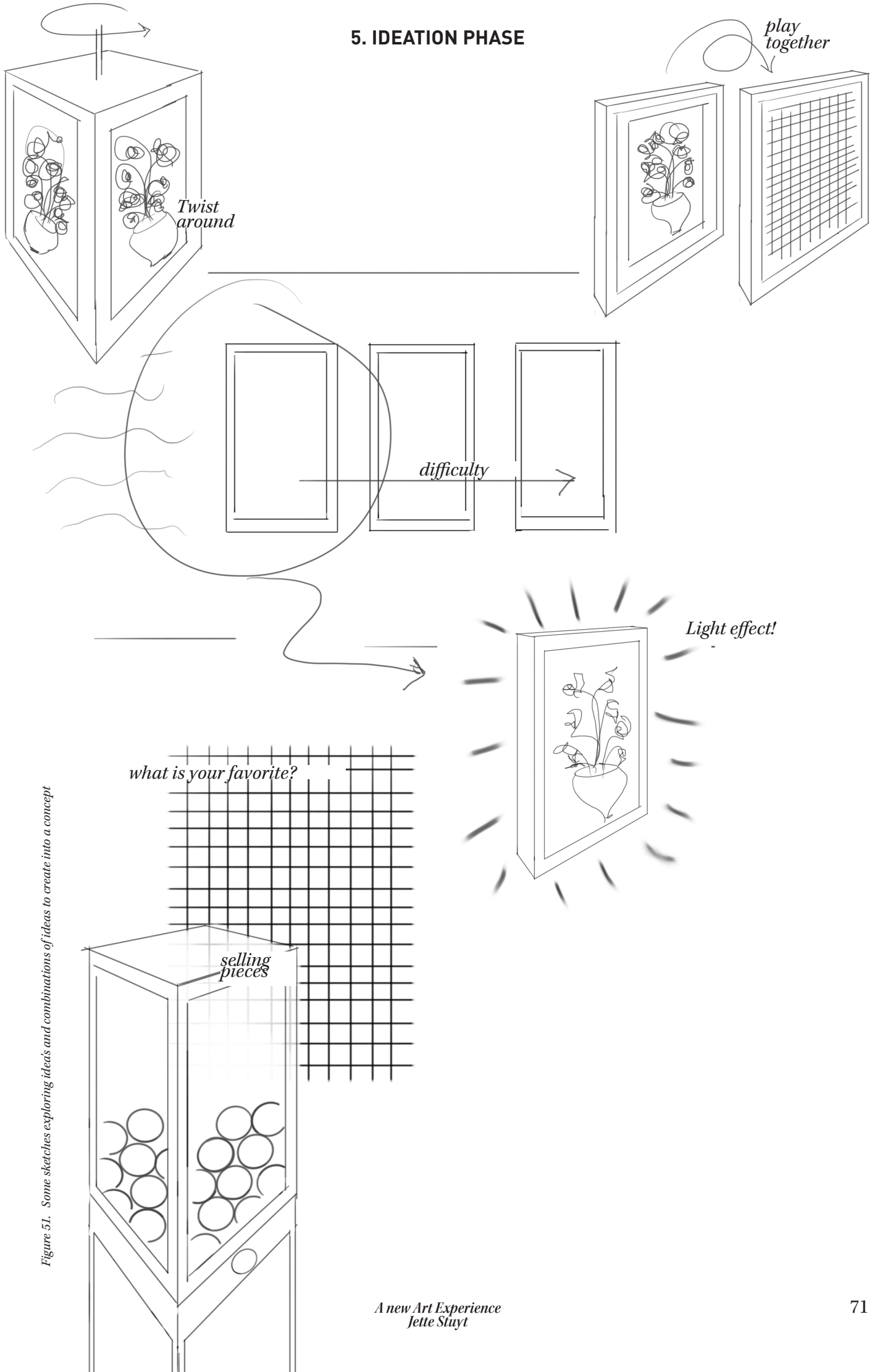


Figure 51. Some sketches exploring ideas and combinations of ideas to create into a concept

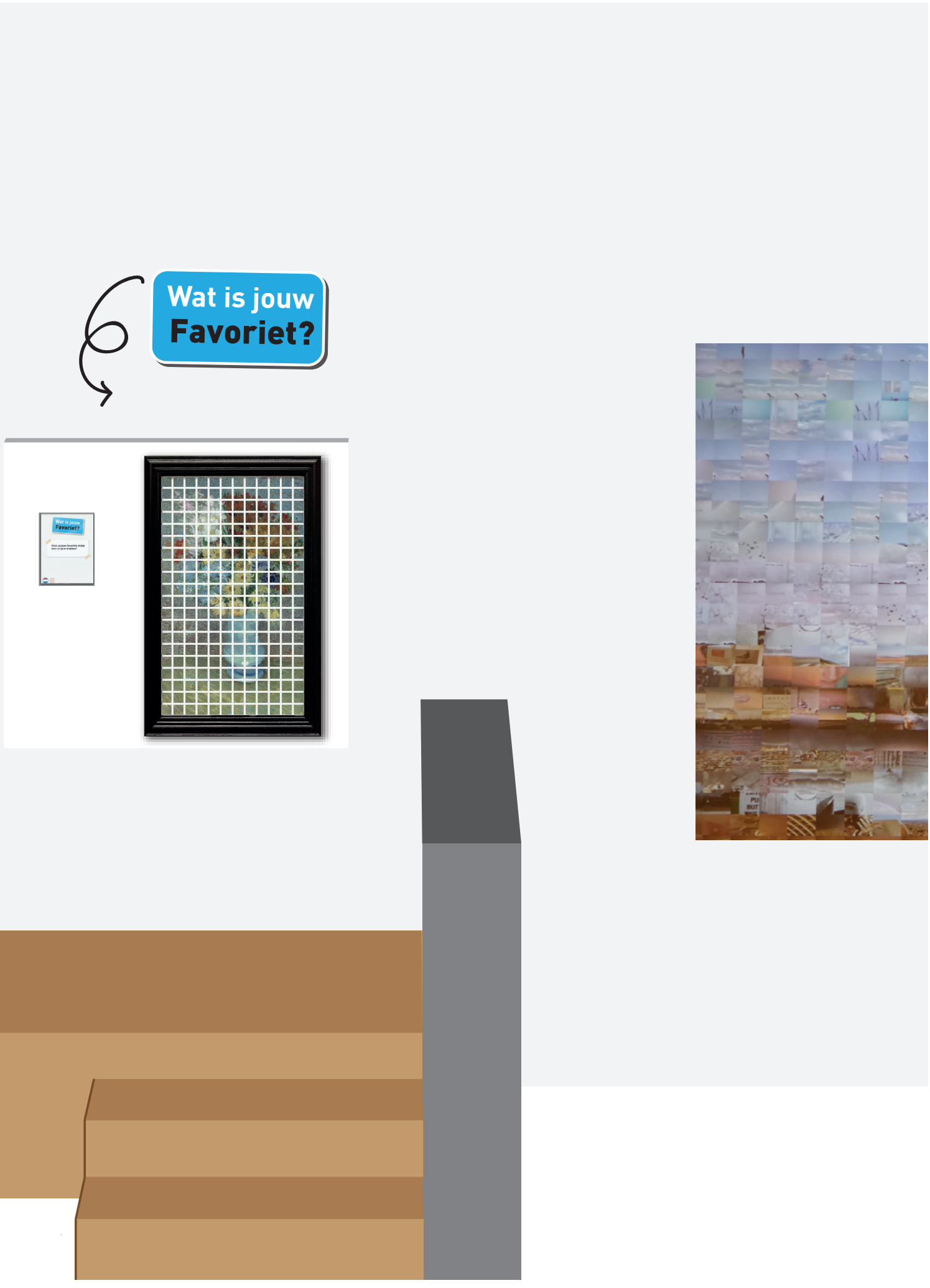
NÉT ECHT

3D geprinte schilderijen:
een Van Gogh die je aan mag raken!

Kun jij Kijken als een PRO ?

Schilder als Van Gogh

6. FINAL CONCEPT


Wat is jouw
Favoriet?

6.1 Concept Design

Turning design idea's into a concept

The final concept is a combination of three elements; each focussing on different parts of the perceptual dimension of the painting.

Concept

The three parts of the exhibition will be exposed next to each other (see Figure 52) to create a clear order. By using three of the same paintings next to each other instead of combining all three activities around one painting, it will be emphasized that these are not regular paintings, but 3D printed paintings. Next to that, more visitors can use the exhibit at the same time

Part 1

The first part focusses on the formal elements of art. It guides the eye to the different building blocks of the artwork, by letting the user search for several carefully chosen pieces within the painting. It's not about seeing one specific detail, it's about noticing differences within the painting. It helps to not only look but to also see; showing that the formal elements are there and how they are used.

Part 2

The second part is combining the formal elements with the design principles. Flowers and petals are printed separately to enable the users to create extra flowers onto the painting. Doing this requires close attention to the build up of the flowers and the painting. The user can experience how their actions influence the composition, balance and other design principles used in the painting.

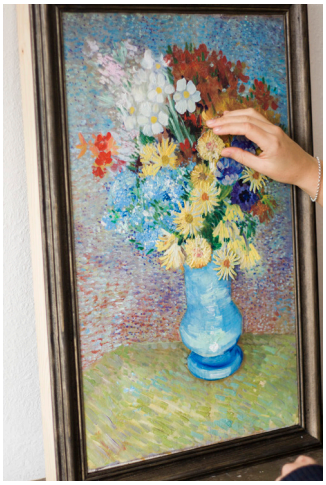
Part 3

The third part of the exhibit has a more personal nature, asking the visitor to choose their favourite piece. The first two parts of the exhibit will have warmed them up to be able to look at the painting from a personal point of view. The question and the painting split into the grid can function as a probe for parents to ask questions about the painting to their children.

The combination of these activities transforms the aesthetic experience into a tangible experience, by providing the user with clear goals and tools to explore the painting. This way, an engaged aesthetic experience can arise that fits well within the Science Centre context.

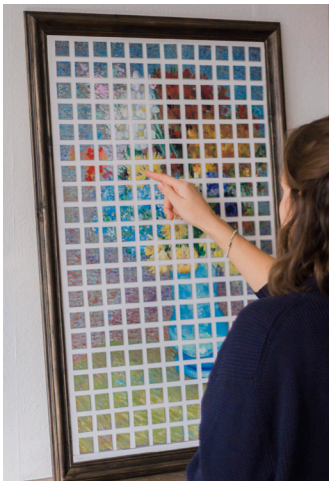
1

The first part of the concept focusses around the formal elements of the painting. Little pieces of the painting are cut out, for the user to find back in the painting. When the piece is hold at the right location, a green ambient light will shine around the painting.



2

The second part of the exhibit brings the formal elements into practise. With the separately printed magnetic flowers and petals, the visitors can create extra flowers onto the painting. This requires close attention to how the formal elements are used.



3

The third part of the exhibit takes the interaction to a personal level, asking the visitor to vote for their favourite piece of the painting. This question functions as a probe to reflect on the painting from a personal point of view.

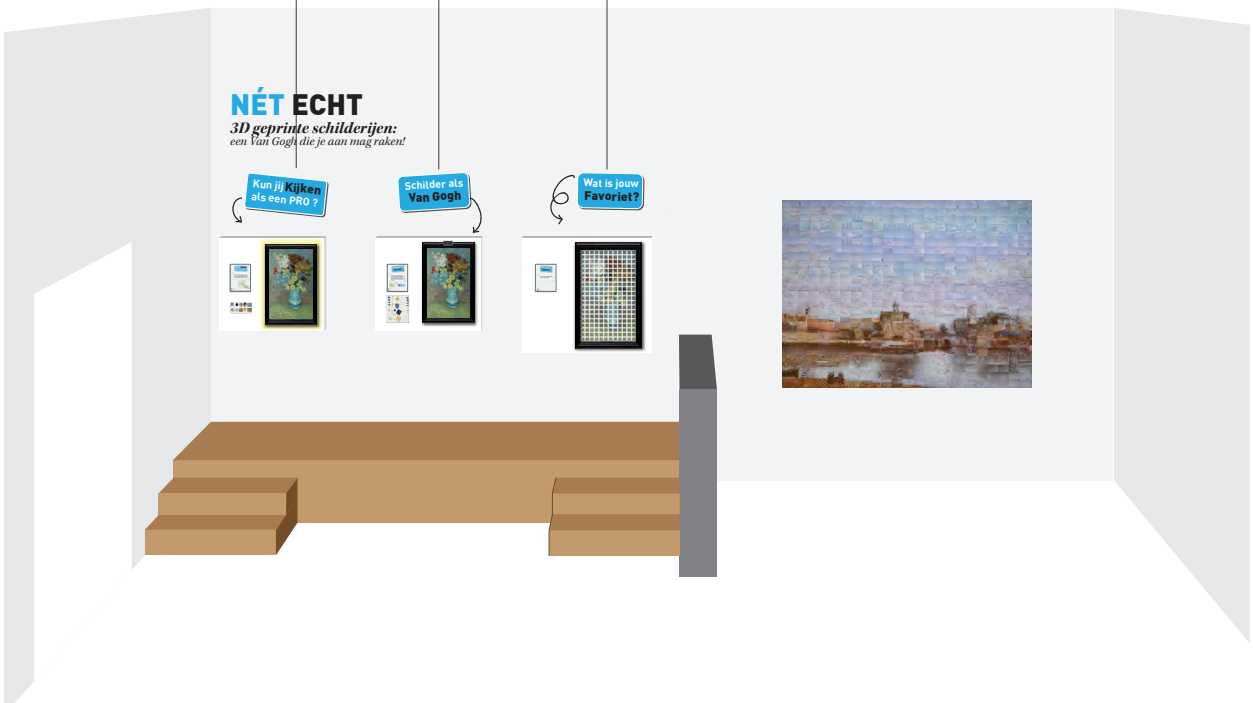


Figure 52. The three parts of the exhibit will be exposed next to eachother

6.1.1 Part 1

The first part of the exhibit is focussing on the formal elements. By the carefully chosen search pieces, the eyes of the visitors are guided to the formal elements of the art (line, shape, colour, texture and space). It's a playful way to get to know the painting, and the building-blocks it is made from. The search pieces are all based on one of the formal elements (examples of search pieces can be found on page 75).

Looking for the pieces in the complete painting requires close attention and analysis of what is seen, and will enable the visitor to focus on the formal elements.

To get a little bit more information about the search piece and the formal element it is aiming for, a small informative text will appear on the display when the user picks up one search piece (Figure 54).

Figure 53. Begin screen

Figure 54. Information about the formal element that the search piece is about.

Technology

NFC technology will activate a green ambient light around the painting when the user holds the search piece at the right location. NFC scanners are mounted in the back of the painting, and NFC tags are placed onto the search pieces. The green lighting functions as a use-cue that the right place is found, and creates a visual effect that can attract other visitors.

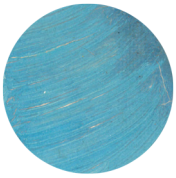
The search pieces will be fixed to the exhibit by a cord that can unroll using a roll-up mechanism. The display can be activated if the roll-up mechanism is activated.


Kun jij Kijken als een PRO ?
A display
Kun jij Kijken als een pro?
Kun jij alle losse stukjes terug vinden in het schilderij? Hou ze er op de juiste plek tegen aan!
Ambilight
Search pieces
The painting

Search Pieces

Line

The flowers are build up from small and quick brush strokes. If you look carefully, you can find the location of this brush stroke.



Shape/Form

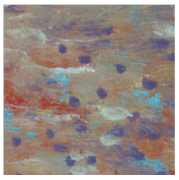
The rounded strokes define the shape of the vase. Do you see to which part of the vase this piece belongs?

Colour

Yellow is yellow, right? There are many kinds of yellow used in the painting. Dark yellow, light yellow, bright yellow.. Do you see where this yellow is used?

Texture

How the paint is put onto the canvas creates texture, and that helps to give shape to the flowers. Do you see where this texture belongs?



Space

By giving the background of the painting different colours, the illusion of space is created. If you look closely, you can find where this piece belongs.

6.1.2 Part 2

In the first part of the exhibit, the visitor got familiar with the painting and the formal elements it is build up from. In the second part of the exhibit, the formal elements will be taken into practise. By the separately printed flowers and petals, the visitors can create extra flowers on the painting. By this experimental activity, the user can experience how their actions influence the design of the painting. By leaving only a few petals out, the illusion of depth is created. By putting more flowers in the painting, the balance and composition is affected.

To create an extra incentive to explore, the user can make a picture of the painting with their additions to send to their mail address (Figure 55 & Figure 57).

Before emailing the picture, a few suggestive questions will be asked to make the visitor reflect on the changes made to the painting (Figure 56).

Technology

The separately printed petals and flowers will stick onto the painting by the little magnets mounted on the back.

A camera will be installed above the painting. Using perspective changing software on the tablet, a straight picture will be produced. This way, the visitor does not have to move out of the way before the picture can be made.

Figure 55. The start screen

Figure 56. Example of A question asked before sending the picture

Figure 57. The user can send a picture of the painting with the additions to their mail address.


Schilder als
Van Gogh
A camera
A display
Schilder als Van Gogh
Maak meer bloemen op het schilderij met de magnetische bloemblaadjes. Kun jij het zo doen dat het net lijkt of ze er al waren?
Maak een foto!
KLAAR?
Puzzle pieces
The painting

6.1.3 Part 3

The third part of the exhibit involves the painting split into a grid. The exhibit invites the visitor to explore the pieces and choose the one piece that is their favourite (Figure 58).
This question functions as a probe to reflect on the painting from a personal point of view.
The visitor is able to press on the piece of choice to vote for this piece. The display will reveal on which place in the top 100 the piece is situated (Figure 59), and enable the user to scroll through the top 100 to see which pieces are popular (Figure 60). This provides food for thought and another reflection, looking at the pieces on the tablet and comparing them to your own findings.

Technology

Each piece of the grid will be mounted to a button, enabling an Arduino in the back to count the button-presses.

When multiple buttons are pressed at the same time, the vote will not be taken into account. The top 100 of puzzle pieces will be displayed on the tablet, enabling the visitor to review what pieces are popular and where their favourite piece is in the top votes.

Figure 58. The user is asked to vote for their favourite piece

Figure 59. When voted, the display tells in which place your piece is ranked

Figure 60. When voted the top 100 is displayed


Wat is jouw Favoriet?
Wat is jouw Favoriet?
Stem op jouw favoriete stukje door er op te drukken!
A display
The painting in a grid

6.1.4 Journey

In Figure 61, a user journey is displayed. In this journey, all elements of the exhibit are displayed in the order of intended use. The icons at the top of each element indicate whether the element should inform the user, requires an action by the user, or should evoke a reflection.

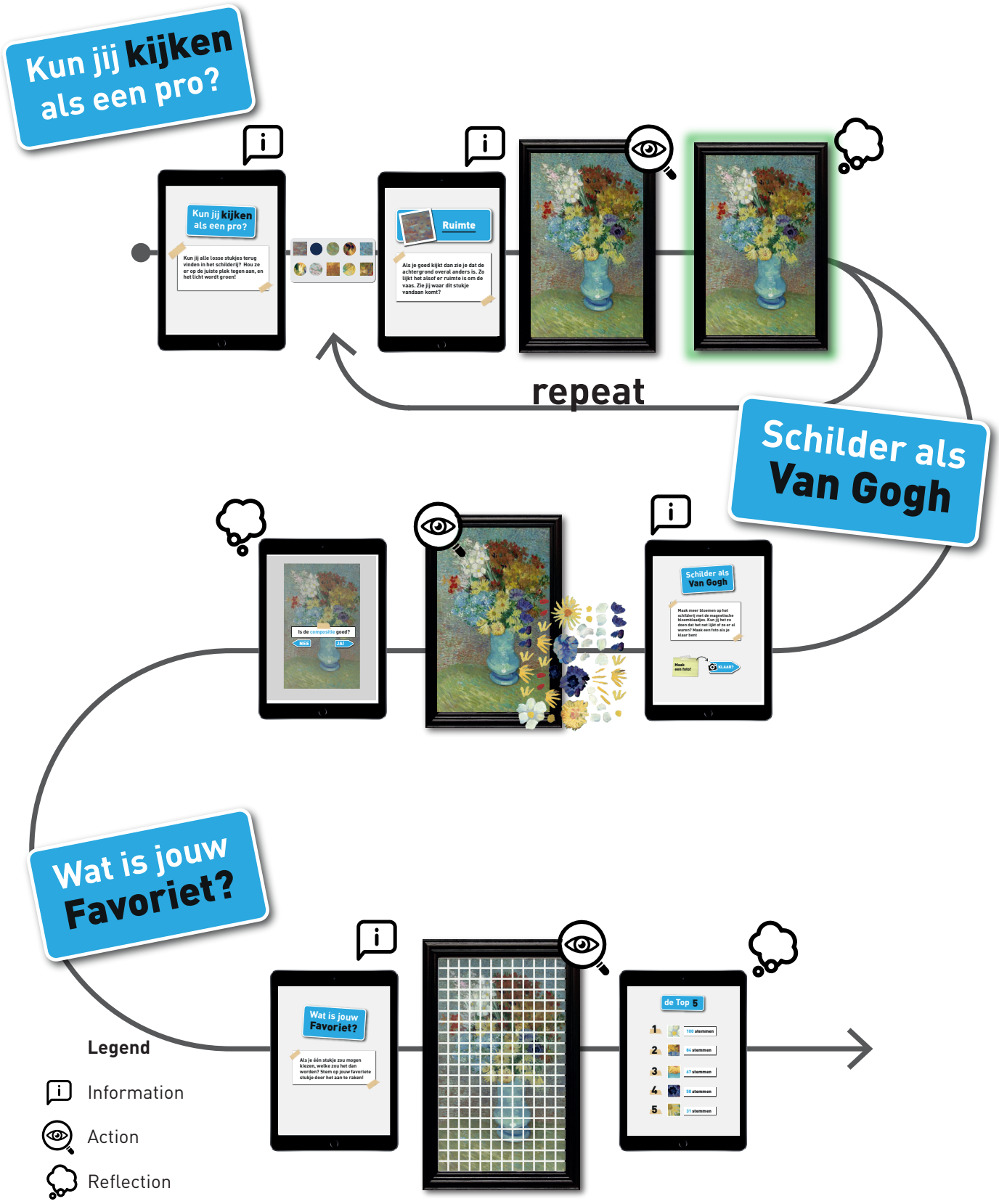


Figure 61. A user journey displaying all elements of the exhibit the user goes through


NÉT ECHT
3D-geprintte schilderijen
Kun jij kijken als een pro?
Schilder a
Van Gog

7. EVALUATION

7.1 User test

Evaluation of the concept in Science Centre Delft

7.1.1 Research questions

The aim of this test was to evaluate the exhibit design both in usability and user experience.

Research questions:

Usability
Where do flaws in usability occur?

User Experience
Does the exhibit result in engaged and explorative interactions with the paintings?
Does the exhibit result in positive emotions regarding the process?

7.1.2 Prototypes

To be able to evaluate the design, realistic prototypes were build.

Part 1 - "Kun jij kijken als een PRO?"
For part 1, a prototype was build using Arduino, NFC readers, NFC tags and a ledstrip (Figure 63). The NFC readers were mounted in the back of the frame, and the NFC tags were mounted on the back of the search pieces. Holding a search piece at the right location results in a confirming green light (the circle in Figure 63).

The informative part of the set-up was prototyped in two ways(Figure 62):

With display: information on the search piece appears on the display when the user chooses one search piece. The activation of the display is managed by the observer, creating a 'wizard of oz' effect.

Without display: the information on the search pieces was printed and displayed next to the search pieces.

Limitations

Because of the high demands the prototype with display makes on the observer, this part of the prototype will be used only for a limited amount of participants to identify usability issues. The rest of the test will be executed with the prototype without display.

Figure 62. The informative panel of part 1 prototyped without display (left) and with display (right).

Part 2 - "Schilder als Van Gogh"

A frame was constructed for the painting. The painting was mounted on a steel plate. On the separately printed flowers and petals, magnets were glued to enable the user to stick the flowers and petals onto the painting in a non permanent way (Figure 64).

A display panel was build using a tablet and a self build tablet holder.
The participants could use all parts of the interface, but at the point where a picture would be made the app would give the message ' Sorry! The camera is out of order. Please make the picture with a phone'.

The complete prototype and information display can be seen in Figure 64.

Limitations

There is no actual camera. Users can get confused because they don't see a camera, and the interface cannot show them a preview of how their picture is going to look.

Part 3 - "Wat is jouw favoriet?"

The painting printed in a grid was put inside a frame. A display panel was build using a tablet and a self build tablet holder. The users could 'vote' for a piece of the painting by touching it. Actuated by the observer, the screen on the tablet would change to 'Thanks for your Vote!' when the participants would touch a piece. After that, the screen would show a (fake) top 5 chosen pieces. The complete prototype can be seen in Figure 65.

Limitations

The interface reaction when the user touches a piece of the painting to vote is actuated by the observer. The interface shows the (fake) top 5 pieces, and thus is not able to mention at which position the pieces that the user voted for stands. Next to that, the user is not able to scroll through the ranking.

Figure 63. Prototype of part 1, with the green light effect in the circle

Figure 64. Prototype of part 2, with extra flowers in the circle

Figure 65. Prototype of part 3

7.1.3 Set-up

The prototype exhibit was set-up in the GameLab in Science Centre Delft (Figure 67), at the location of the Animated Vermeer projection. This is not the location where the exhibit will be located in the end, but was the best possible option for the test because a blank wall was needed.

The observer was looking from a distant location (the red x in Figure 66).

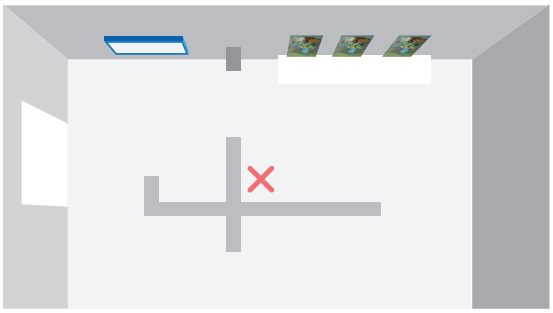


Figure 66. Set-up of the user test

Because there were many people in the Science Centre, observing did not make the visitors uncomfortable.

Because of ethical considerations, no pictures or video's were made of visitors interacting with the exhibit.

7.1.4 Method

Usability

The process of interacting with the exhibit was observed. Up front, a user journey was sketched (see Figure 61 on page 85). Flaws in the interaction with the exhibit were noted and after the research these flaws were indicated in the user journey.

As mentioned earlier, the informative panel of part 1 was prototyped in two ways. For evaluation of the usability aspects of part 1, the realistic prototype with display was used with 6 participants. The rest of the test was conducted with the paper prototype of part 1.

User Experience

To measure the user experience, two observational instruments were used to quantify the interactions observed. For all three parts of the exhibit these two observational instruments were used separately because of their different nature and purpose.

Exploratory Behaviour Scale

The behaviour observed was quantified using the Exploratory Behaviour Scale (EBS). The EBS is an observational instrument developed to measure children's exploratory behaviour in the Science Centre context (van Schijndel, Franse & Raijmakers 2010).

The scale consists of three levels:

Level 1 - Passive contact

"A child walks, stands, sits or leans on something and may hold or transport an object. However, the child does not manipulate the object in an active and attentive manner."

Level 2 - Active manipulation

"A child manipulates an object in an active and attentive manner. This implies that the child pays attention to his or her action(s) and the outcome(s) of the action(s)."

Level 3 - Exploratory behaviour

"A child manipulates an object in an active and attentive manner (as Active manipulation).

In addition, the child applies repetition and variation to his or her actions. “Repetition” implies that the child repeats an action (several times). “Variation” implies that the child performs different actions with one object or performs the same action with different objects. Actions that clearly differ in degree are also considered different actions."

The scale is developed for preschoolers (age between 4 and 6 years). However, as van Schijndel, Franse & Raijmakers (2010) argue, the behaviour described in the scale is the same for older children. Due to further cognitive development, older children will reach level 3 behaviour sooner than pre-schoolers, but the described behaviour is the same. Therefore, the EBS can be used to quantify observations in

this research.

Since the exploratory behaviour levels build up, only the highest observed level was logged.

A participant having level 3 EBS behaviour indicates an explorative, engaged, and conscious interaction with the painting.

prEmo

Next to the EBS, emotions from the prEmo tool were used to indicate emotional responses of the participants during use of the exhibit.

PrEmo is a collection of emotions expressed in clear visual illustrations and animations (including movement and sound), that can be used to let participants self-report their emotions towards products or as a discussion tool in interviews (Desmet, 2018). In this research, the emotions defined in the prEmo tool were used as a way to indicate emotional responses of the participants *observed* during the use of the exhibit. Although this is not a regular use for the emotions defined in the prEmo tool, doing this will help to structure and quantify the observations. Extensive research was done to define the 14 emotions described in PrEmo, as well as the characteristics in body language, facial expressions and vocal expressions that the emotions can be recognized by (Desmet, 2003). Therefore, the emotions described in prEmo form a solid base to structure the emotions observed in this research.

The visuals and animations of prEmo were extensively studied upfront by the observer to be able to indicate the presence of them during the observations.

The emotions observed during the research were scored on the observation sheet that can be seen in Appendix D. If multiple emotions were seen within one part, all were scored. In the notes section, an indication was made of the cause of the emotional response.

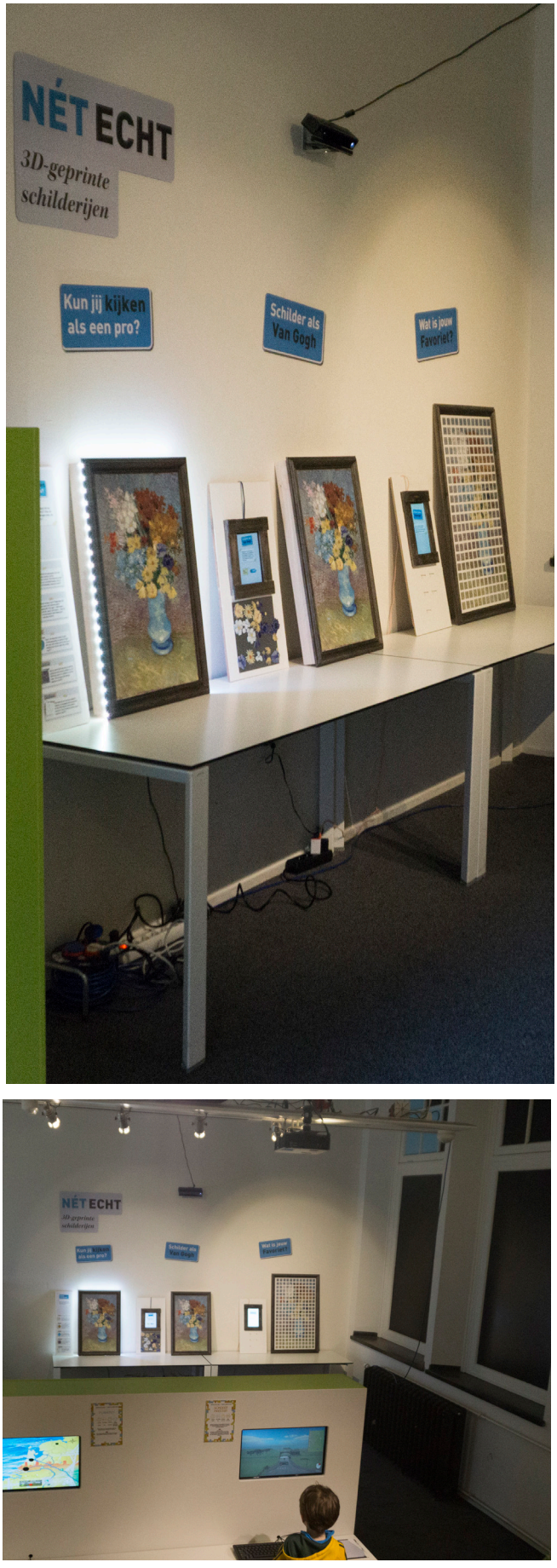


Figure 67. The exhibit prototype set-up in Science Centre Delft

7.2 Results

Results of the evaluation research

From the +- 120 visitors that were at the Science Centre, 38 interacted with the exhibit.

In total, 29 visitors used all three parts of the exhibit. The groups in which the visitors used the exhibit consisted of about the formations displayed in Figure 68.

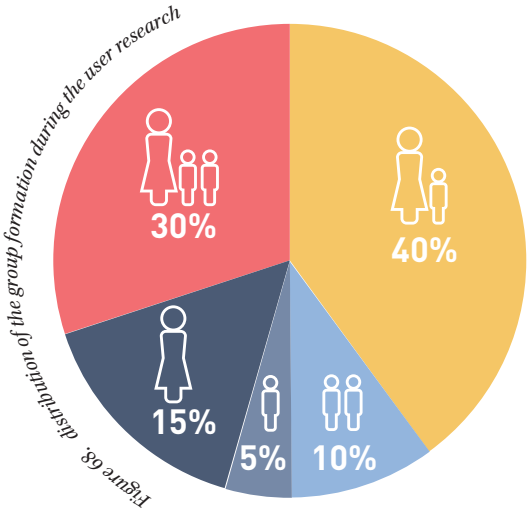


Figure 68. distribution of the group formation during the user research

In case supervisors were not actively participating in the use of the exhibit, or only guiding the child from distance, their activities were not taken into account. In case multiple participants were using the exhibit together actively, actions and responses of both users were counted separately.

General remarks

Surprisingly, all participants started interacting with the exhibit at part 1. The visual layout of the exhibit thus seems to indicate a clear beginning even without the stage.
The nature of the cooperation in the groups that the participants used the exhibit in differed enormously. Some supervisors let their children initiate the interactions whilst only intervening when absolutely necessary, while other parents actively participated in the process. Active participation was typically seen when only one child was part of the group.

The formation of the group in which the visitors were using the exhibit was also of great influence in how many usability errors were observed. Groups including a parent or other elderly supervisor generally were more patient and tended to read the instructions whereas if children were using the exhibit without supervision, they tended to take action before completing the instructions.

7.2.1 Usability

Flaws in usability of the exhibit were indicated in the journey of use displayed on the right.

Part 1

Users of the exhibit tended to read the first on screen instructions, but neglect the second instructions showed (1 in Figure 69) after choosing one of the search pieces. The text about the formal element that the search piece is based on was thus often not read. In these cases, confusion was created by search pieces which did not have visual characteristics that are completely coherent with the painting (2 in Figure 69), like the colour and the texture. Without reading, the participants assumed that the visual characteristics are completely coherent with the visual characteristic of the painting, like the other search pieces.

Because the first part of the exhibit has the same design as the second part of the exhibit, some participants tried to use search pieces of the first part to find them on the painting of part 2 (3 in Figure 69). Although the painting and the frame look the same, the back-end technology is different and will thus not result in a confirming green light when the piece is held at the right place.

Part 2

Out of 38 participants, 4 did not continue with part 2 after part 1 but headed immediately to part 3. This is an interesting observation, that could be due to the fact that the design of part 1 and 2 were too similar and thus did not interest the visitor because they thought to have experienced it already.

Some participants did not read the instructions on part 2 (4 in Figure 69). They continued using part 2 as they had used part 1: they thought they had to find the flowers in the painting and place the magnetic flower on top of the original flower like a search piece. This actions could also be due to the similar designs of part 1 and 2.

A minor problem occurred with 2 participants, who thought they were meant to use all the petals and flowers available (5 in Figure 69)

The questions asked on screen in part 2 (6 in Figure 69) to make the user reflect on their actions were with none of the participants leading to reconsideration of the placement of the flowers and petals. This indicates that the questions do not work to create a moment of reflection. This seemed to be due the fact that the questions are asked when the participant already indicated that he/she was done with placing the flowers, and the participant therefore already decided that the result was good enough. The reflection thus should be more part of the process than questions asked after the process.

Part 3

In the prototype, no haptic or visual feedback was given that the vote was taken into account other than the display changing to 'thank you for your vote'. Some users did not notice the screen of the display changing, and thus were confused and did not know what happened. This made them a bit angry and sometimes made them even check the back-end of the prototype in order to see what should be happening.

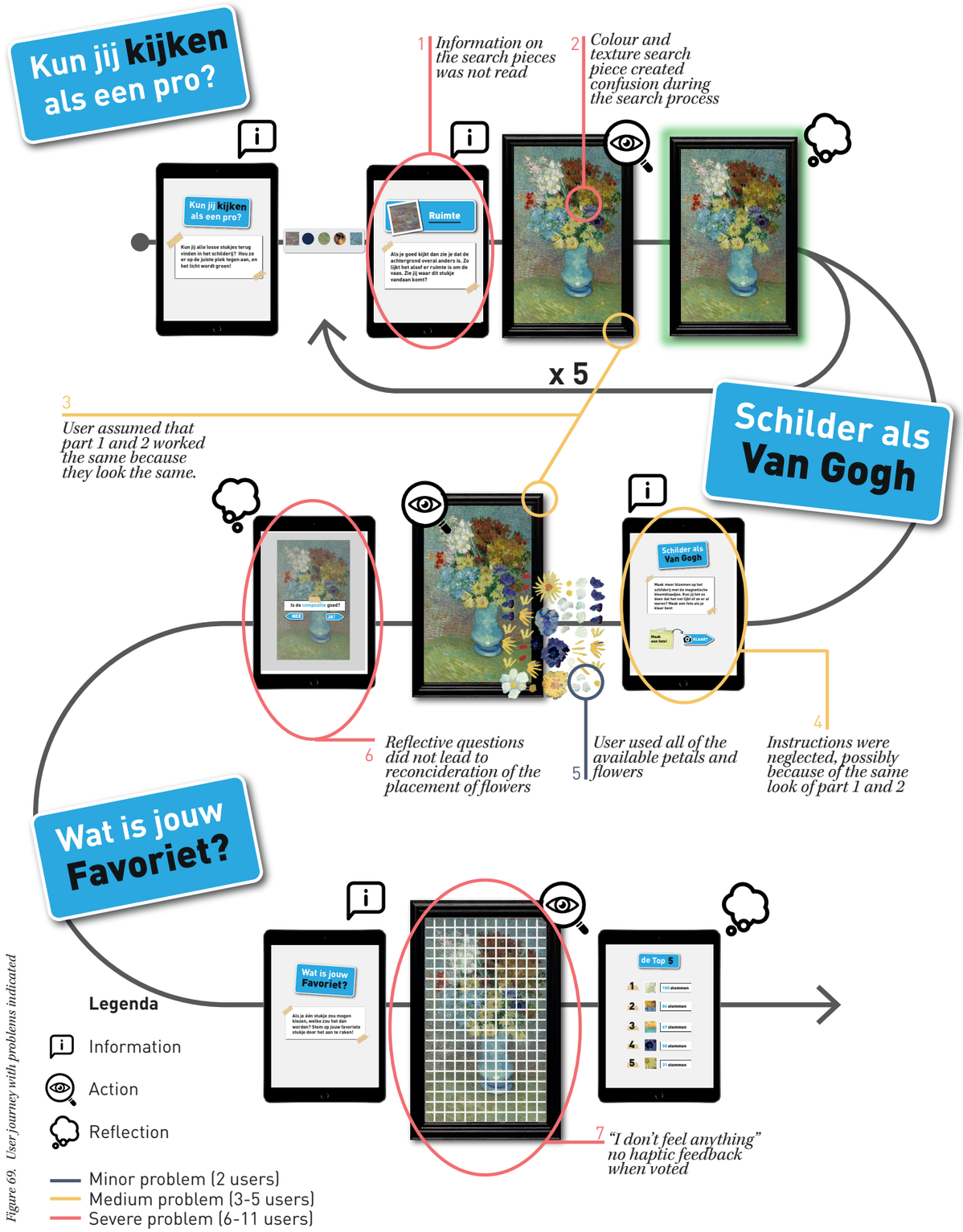


Figure 69. User journey with problems indicated

7.2.2 User Experience

The results from using the Exploratory behaviour scale (EBS) and prEmo as an observational tool are discussed in the coming sections.

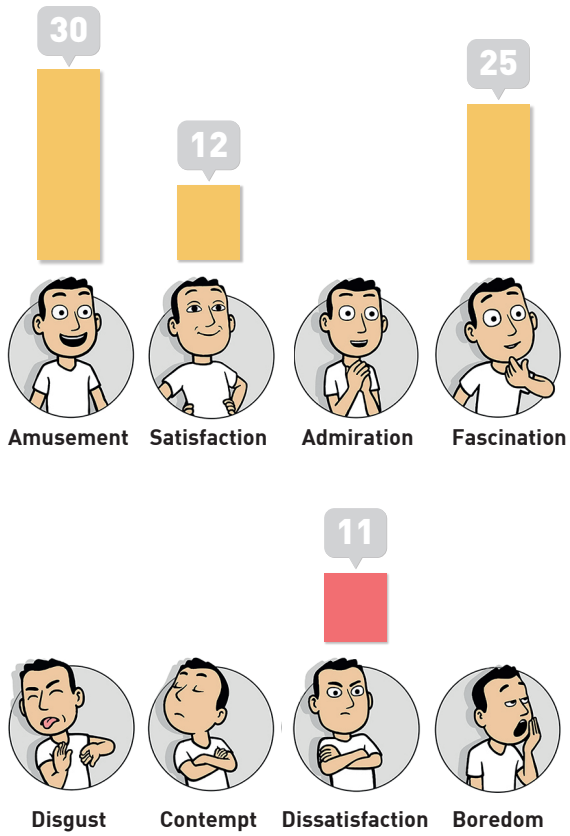


Figure 70. Emotional responses by participants observed during the use of part 1

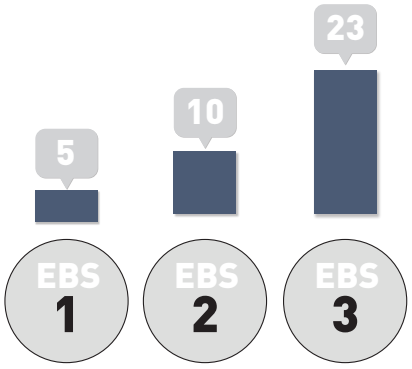


Figure 71. Exploratory behaviour levels of participants observed during the use of part 1

Part 1 - "Kun jij kijken als een PRO?"

In total, 38 participants interacted with part 1.

prEmo

Emotional responses by participants observed during the use of part 1 can be seen in Figure 70. The search process resulted in positive emotional responses. Especially amused (30 out of 38) and fascinated (25 out of 38 times) responses were observed. In many cases, this seemed to be related to paintings being 3D printed, and exploring the surface of the reproduction. The process of exploring the painting and finding where the pieces came from resulted in amused responses amongst many of the participants, especially at the specific moment the right location of a search piece was found. A satisfied reaction was in most cases related to the location of *all five pieces* being found. This seemed to feel like the exercise was 'completed' with good result, and allowed the user to be satisfied. This response was also seen when participants were able to find the right location of a search piece really quickly.

Of all 38 participants, 11 times a negative response was seen, which in all cases was related to not being able to find the location of one of the search pieces. The colour and texture search piece were in most cases subject in this observation.

EBS

Exploratory behaviour levels of participants observed during the use of part 1 can be seen in Figure 71.

23 out of 38 participants could be indicated as EBS level 3, meaning that they actively explored the painting and reconfirmed their findings by double checking the search piece and the painting after the location was found. 10 participants only showed level 2 behaviour, not reconfirming their actions. Typically, their activity was completed when the light turned green. The five participants in EBS level 1 only touched either the painting or one of the search pieces, but did not get involved in the activity of finding the right location.

Part 2 - "Schilder als Van Gogh"

Out of 38 participants, 4 did not continue with part 2 but headed immediately to part 3. This resulted in a total of 34 participants interacting with part 2.

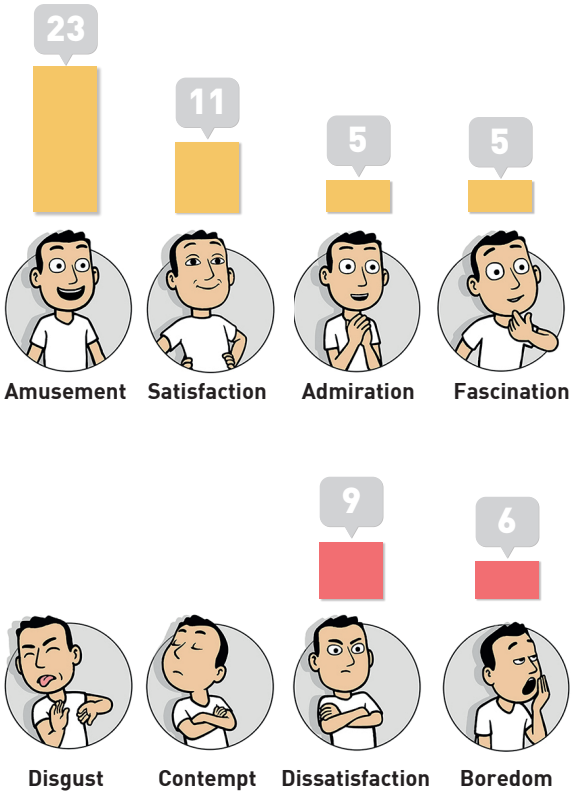


Figure 72. Emotional responses by participants observed during the use of part 2

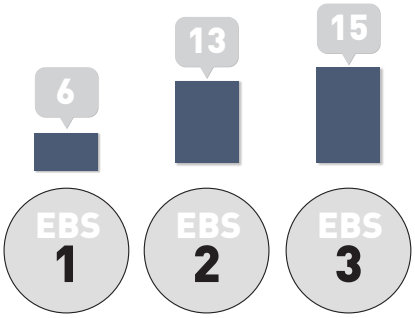


Figure 73. Exploratory behaviour levels of participants observed during the use of part 2

prEmo

Emotional responses by participants observed during the use of part 2 can be seen in Figure 72. The second part of the exhibit resulted in less fascinated responses. This could be due to the fact that they were first introduced to the 3D printed painting and being able to touch it, and thus this first excitement and interest was gone. However, in 23 out of 34 users, amusement in moving and puzzling extra flowers on the painting was observed. Satisfied responses were seen when the users considered the activity finished, and showed the result to their supervisors or peers.

The bored responses where all showing quite quickly in the process, and seemed to occur when the users expected more reaction following their actions.

Dissatisfied responses merely were related to the camera not being functional, which was a disappointment to users actively engaged in the process of creating their picture.

EBS

Out of the 34 participants, 15 showed EBS level 3 behaviour. This means that they placed flowers onto the painting, and actively moved them around to find the right place to their liking. 10 participants only showed level 2 EBS behaviour, meaning that they did place the flowers onto the painting but took little effort to find the optimal position for their liking.

Five participants only passively interacted with the exhibit, and just touched either the painting or the separate flowers but did not attentively explore the possibilities.

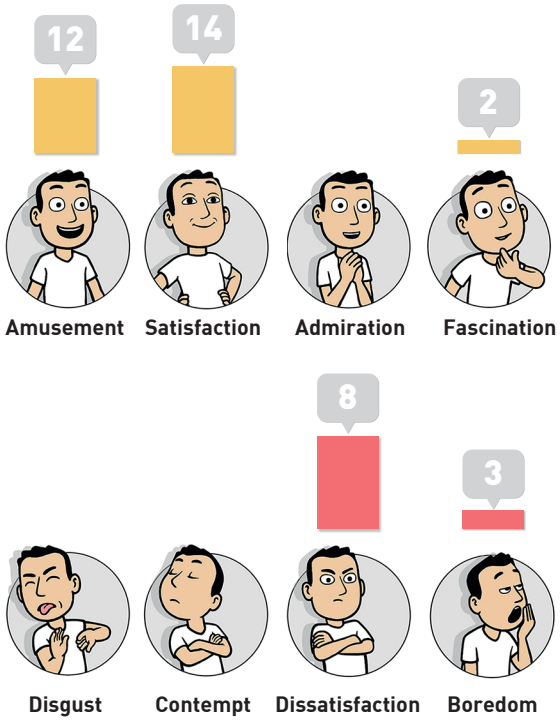


Figure 74. Emotional responses by participants observed during the use of part 3

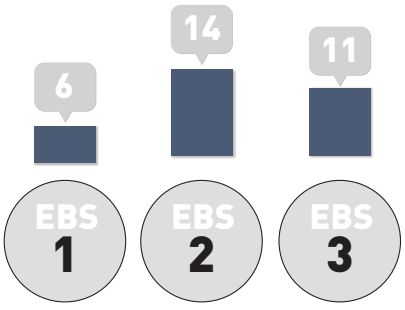


Figure 75. Exploratory behaviour levels of participants observed during the use of part 3

Part 3 - "Wat is jouw favoriet?"

A few participants skipped part 2 of the exhibit but continued to part 3. Six participants stopped interacting with the exhibit after part 2. This resulted in a total of 32 participants interaction with part 3 of the exhibit.

prEmo

Emotional responses by participants observed during the use of part 3 can be seen in Figure 74. Especially amused and satisfied responses were observed when the piece the participant voted for was in the top 5, but also without the top 5 feedback participants were proudly and satisfied communicating their choice to their supervisors or peers.

A limitation of the prototype was that there was no clear haptic or visual feedback that the vote was taken into account. This lack of feedback seemed to prevent the participants voting from having an amused response to the vote, because it may have been an anti-climax.

8 participants got confused because they did not (immediately) see the screen changing into 'thank you for your vote'. Because they also didn't get any haptic feedback, they thus did not know if they had voted. This resulted in dissatisfied responses

EBS

Level 3 EBS behaviour was observed 11 times, when users went back to the painting after seeing the top 5 to reconfirm where the pieces in the top 5 were from. However, most participants were stuck at level 2 EBS behaviour, not reflecting the top 5 result on their opinion.

7.2.3 Conclusion

The following research questions will be answered per part of the exhibit:

Usability

Where do flaws in usability occur?

User Experience

Does the exhibit result in engaged and explorative interactions with the paintings? Does the exhibit result in positive emotions regarding the process?

Part 1 - "Kun jij kijken als een PRO?"

Usability
The research indicated several flaws in the usability of the exhibit that can be improved in a redesign. Attention should be paid to the information on the search pieces which was often not read, and the search pieces that have deviating visual characteristics from the painting.

User Experience
For 23 out of 38 participants, the use of the exhibit resulted in EBS level 3 behaviour, meaning that there was an explorative, engaged and conscious interaction with the painting.

The process of searching for the pieces resulted in a rewarding feeling, showed by the satisfied and amused responses observed. Satisfied responses were reinforced when all five pieces were located. To enable the visitors to find all available search pieces, there should thus not be too many available.

Part 2 - "Schilder als van Gogh"

Usability
Several problems were caused by part 2 having the same visual layout as part 1. To prevent these problems, part 2 should have a clearly different design.

Next to that, the reflective questions should be more integrated in the process of creating the painting instead of being asked only afterwards.

User experience
The result of the research indicates that 15 of the 34 participants showed level 3 EBS behaviour, meaning that the exhibit resulted in an explorative, engaged and conscious interaction with the painting. If the usability issues mentioned above are resolved, it is likely that more users will show EBS 3 behaviour.

Part 3 - "Wat is jouw favoriet?"

Usability
To prevent confusion, a clear haptic or visual feedback should be given to the user when they vote for a piece. This will result in less frustrated responses, and can lead to more amused and satisfied responses regarding the vote.

User Experience
11 out of 32 users showed level 3 EBS behaviour. Because the prototype was a simplified version of the original design, the display was not able to show the users on what place the piece that they voted for was situated. This personalised message can promote an extra reflection, and will promote level 3 EBS behaviour.

Amused and satisfied responses were mostly seen when the participants saw that the piece of the painting they voted for was in the top 5. More positive emotions are likely to be aroused if the process of voting gives clear haptic or visual feedback: something that was lacking in the prototype.

Overall

With the limitations of the prototype in mind, as well as the resolvable usability issues, we can conclude that the exhibit does enable the Science Centre visitor to have an engaged and explorative interaction with the painting. From the positive emotional responses we can conclude that this engaged interactions lead to an enjoyable aesthetic experience.

7.2.4 Discussion

Here, concerns and limitations of the research will be discussed.

Prototypes

Prototype part 1
As mentioned in the set-up, the informative panel of part 1 of the exhibit was prototyped in two ways. To test usability aspects of the design, the realistic prototype was used with 6 participants. For the rest of the test, the paper prototype was used because of the high demands the realistic prototype made on the observer. Because similar patterns in user experience were observed for both prototypes, there was assumed that deviations in user experience caused by using the paper prototype were not substantial and could be neglected.

Limitations of prototypes
Limitations of the prototypes, especially in the prototype of part 2, may have caused negative impact on the rest of the exhibit experience. The last screen in part 2 showed the message ' Sorry, the camera is currently out of use'. This could explain the fact that dissatisfied responses were seen by 9 participants, and may have demotivated the participants from investing attention in part 3.

Limitations in the part 3 prototype caused negative emotional responses, which can assumed to be eliminated in a fully functioning exhibit.

PrEmo

Premo as an observational instrument
The emotions defined in the prEmo tool were used to quantify the emotions seen by the observer. Normally, prEmo is used as a *self-reporting* tool to quantify emotions and feelings without the need for words. Using the tool to quantify emotions *observed* is not validated by research. Although this is not a regular use for the emotions defined in the prEmo tool, doing this will help to structure and quantify the observations. Extensive research was done to define the 14 emotions described in PrEmo, as well as the characteristics in body language, facial expressions and vocal expressions that the emotions can be recognized by (Desmet, 2003). Therefore, the emotions described in prEmo form a solid base to structure the emotions observed in this research.

The benefit of having the prEmo scores from the observation is a more detailed picture of the development in emotions during the use of the exhibit, and being able to indicate the cause of the emotions by observing the participants actions, statements and other expressions

PrEmo for solo participants
Observing the emotional responses of the participants was hard when users were interacting with the exhibit alone. This was due to the fact that solo users were generally less expressive than users in groups. However, this decrease in expressiveness goes for both positive and negative emotions and will thus compensate each-other.

Pre-selection

A rather large part of the exhibit users showed positive emotions . However, only *users* of the exhibit were observed. Visitors of the Science Centre who did not interact with the exhibit were neglected. Hereby, a pre-selection is thus made that filtered out visitors who didn't approach the exhibit in the first place due to lacking interest or other negative feelings.

Because no count was made of the amount of visitors that entered the GameLab, no clear indication can be made of the amount of visitors that saw the exhibit but decided not to interact with it. However, many visitors entering the GameLab were attracted to the games first. In some cases, the children got involved in a game for quite a long time (over 15 minutes) and were stimulated by their parents to leave the GameLab and explore the rest of the museum before having explored all available exhibits in the GameLab.

8. FINAL DESIGN

8.1 Design changes

Changes made following the user research

The user test indicated several usability problems that can be improved by design. Improvements will be discussed per part of the exhibit.

Figure 76. Search pieces displaying only colour or texture should have a clear visual indicator to prevent confusion

8.1.1 Part 1 - "Kun jij kijken als een PRO?"

Search Pieces

Not all participants got to reading the information on the search pieces. This caused problems for search pieces with visual characteristics that are not completely coherent with the painting: the colour and the texture. These search pieces should have a clear indication on the front of the piece (Figure 76) to indicate where the user should look for. This will prevent confusion, and will thus reduce dissatisfied responses. On the textured search piece, the texture should be removed on the place of the overlay print to make the text readable.

Scanners

Using more scanners in the back of the painting will help to create more guidance in the process of searching. An orange light could be activated if the search piece is held in the neighbourhood of the right location (Figure 78). This will give the user more hints whether he/she is looking in the right area, and would motivate to take a extra good look to find the exact location.

This extra guidance will create more reaction of the prototype regarding actions of the user, and will thus result in less frustrated responses when it is hard to find the right location.

Primary scanners located close to each other can share secondary scanners to reduce the amount of scanners necessary.

8.1.2 Part 2 - "Schilder als Van Gogh"

Physical

The physical design of part 2 should look different from the design of part 1 to indicate their different purposes. A change in the physical design is combined with a solution to keep loose pieces, like the magnetic flowers, to a minimum.

Stronger magnet will be used to create more attractive force between the magnet and the painting (Figure 79 on page 104).

Using these magnets will make it easy to move the flowers and petals around on the painting but harder to remove the magnet from the painting. On the sides of the painting, a magnetic 'buffer-zone' (1 in Figure 77) will be created to stall the flowers and petals that are not in use. Flowers thus do not have to be removed from the painting, which also reduces the chances of flowers getting lost.

Figure 77. In the redesign of part 2, a bufferzone is created to stall the magnetic flowers, whilst giving part 2 a distinct look

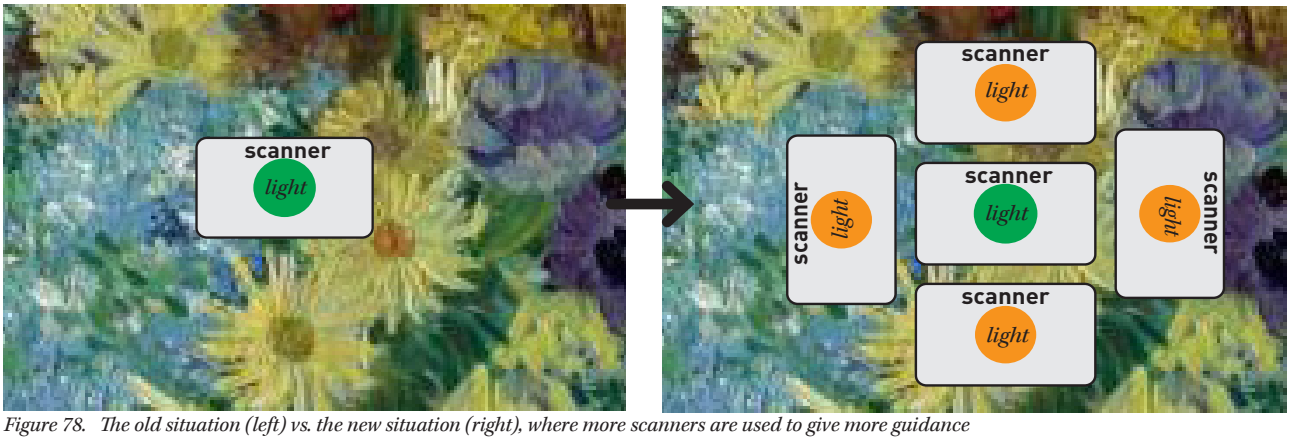


Figure 78. The old situation (left) vs. the new situation (right), where more scanners are used to give more guidance

Digital

The on screen interface was redesigned to create more action/reaction for the users. The button on the home screen will say 'Begin' instead of 'Ready', indicating a clear start of the interaction (1 in Figure 80). On the next screen, a preview of the final picture will be showed, displaying the changes made to the arrangement in real time (2 in Figure 80). In a note, the user is asked to take the composition and balance in mind, and has the opportunity to get more information about these subjects (3 in Figure 80). Hereby, users will get in touch with the terms 'composition' and 'balance' **during** the creation of their painting instead of afterwards.

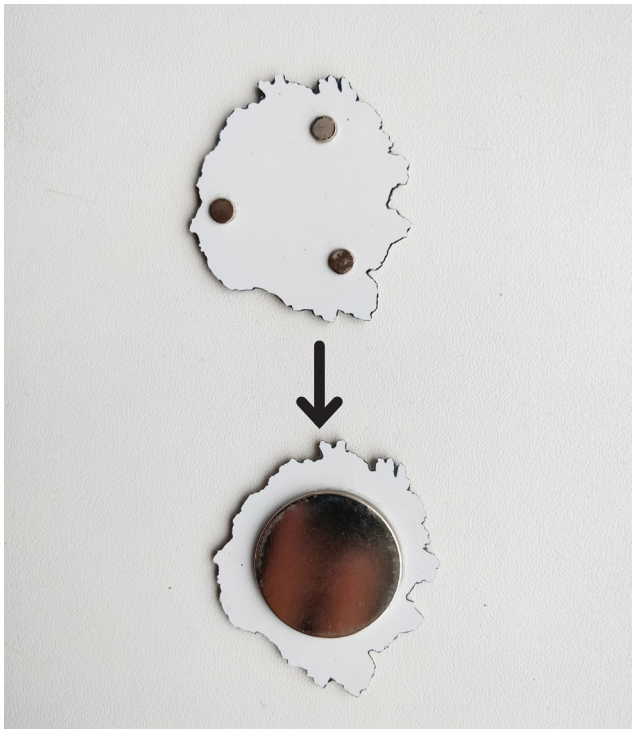


Figure 79. Bigger magnets are used to make it harder to remove the flowers from the painting

Figure 80. Design changes in the interface of part 2

8.1.3 Part 3 - "Wat is jouw favoriet?"

The research indicated that part 3 of the exhibit should contain a clear haptic and visual feedback to indicate that the vote is received well and taken into account.

The haptic feedback is provided by the buttons on which the grid is mounted as described in the concept design. To create more feedback and amusement, a backlight the same as in part 1 can be installed that turns green when the user has voted (Figure 81).

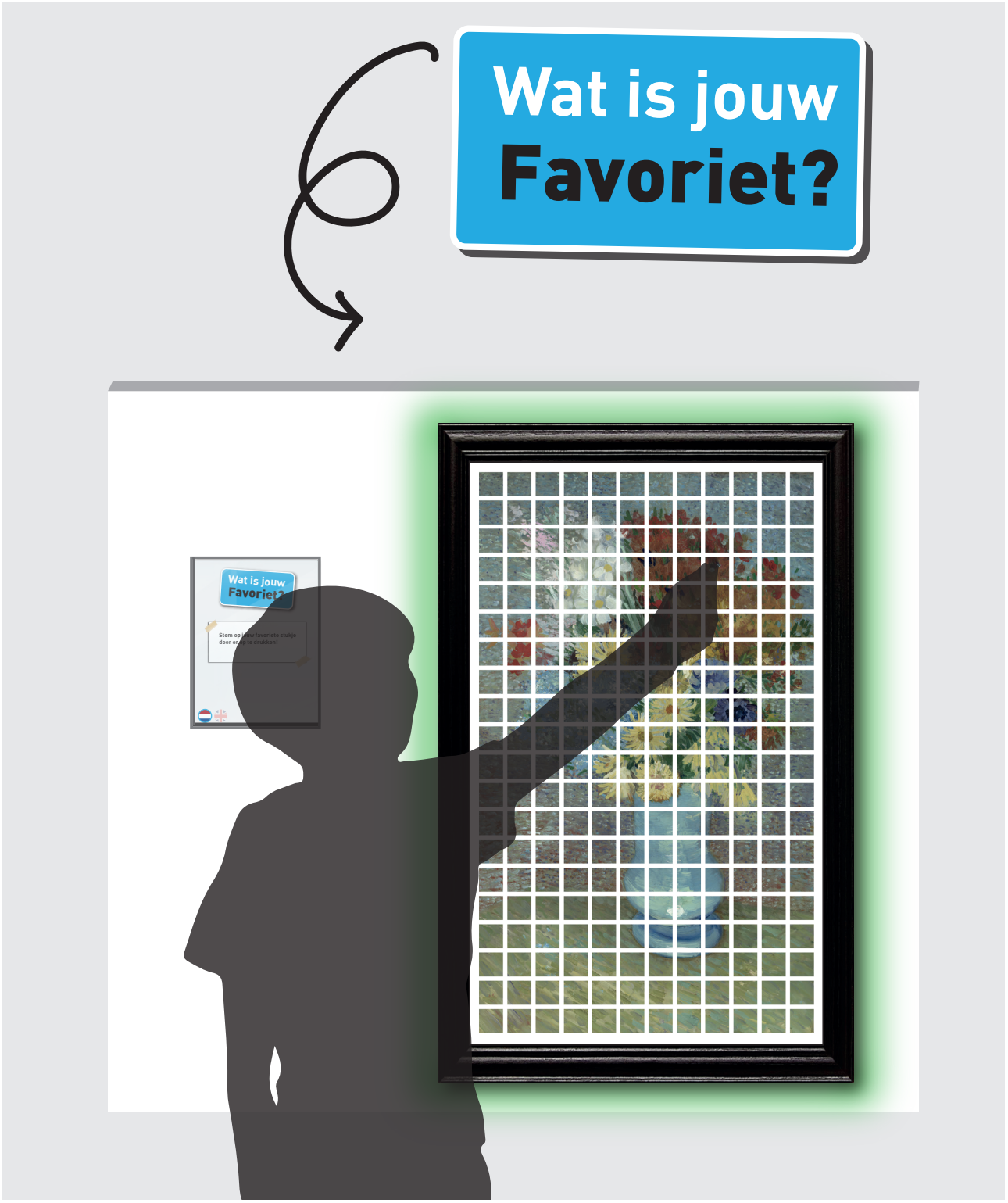


Figure 81. The backlight behind the grid will turn green when the user has voted

8.2 Materialisation

Materialisation of the exhibit design

Stage

Dimensions

The stage can have a height of approximately 30 cm without the need for a fence. With this height, only one step is needed.

The depth of the podium can be 130 cm, enabling the users to pass each other and parents to take a seat at the edge.

Colour

For the look of the podium, inspiration can be found at the other podium already present in the GameLab (Figure 82). This podium has three colours, which also can be used in the new podium. This way, all three parts of the exhibit have a separate floor colour which emphasizes the difference between the three parts (Figure 85).

Figure 82. The podium already present in the GameLab has three colours

Wall panels

For the wall panels that can house the displays and technology back end of the exhibit, inspiration can also be found at the displays already available in the GameLab (Figure 83).

The user research showed that mounting the paintings at a height of around 90 cm from the stage enables the children to take a close look while still being at a suitable height for adults.

Figure 83. The wall panels already present in the GameLab

Colour

The colour of the wall panels should be white in order to be able to see the green lighting.

Lighting

The exhibit should be lid from the ceiling (Figure 84), enabling the users to come close to the painting without blocking the light.

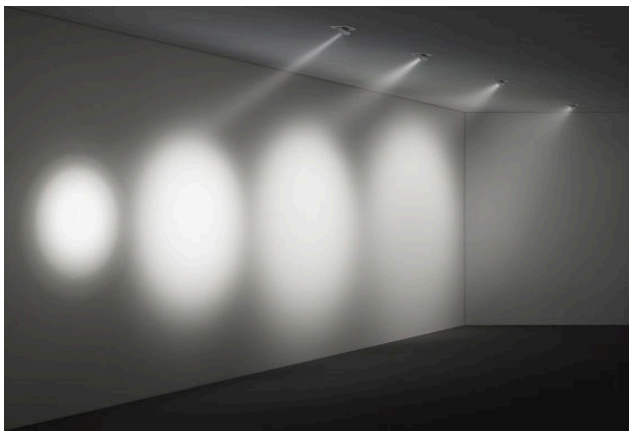


Figure 84. The paintings should be lid from the ceiling

Figure 85. A visualisation of the complete redesign

8.3 Recommendations

Elements that need further considerartions

Recommendations for further development of the exhibit design and implementation will be discussed here. After discussing some recommendations concerning the complete exhibit, some recommendations specific to part 1 and 2 of the exhibit will be discussed.

General

Attracting attention

To attract the attention of the visitors, the back-lights used in the exhibit can create a little light show when there are no visitors interacting with the exhibit. A movement sensor can be used to detect if there are no users on the stage and activate the light-show accordingly.

Titles

During the user research, some insights were gained that can be used to improve the titles used.

1. Although previous research indicated that most of the children do not know yet who van Gogh was, naming Van Gogh in the exhibit title can be of importance in attracting the supervisors. If the supervisors' attention is attracted, this can lead to the supervisor raising enthusiasm for the exhibit and stimulating the child(ren) to interact with the exhibit.

2. The word 3D printed attracted the attention of both children and supervisors, and invites the visitors to closely inspect the paintings.

3. To invite the visitor to engage in a tangible experience with the painting, I would recommend to mention the touching of the painting in the title.

Taking these point in mind, a suitable title would be:

Net Echt!

3D-geprinte schilderijen: een van Gogh die je aan mag raken

(Looks real!, 3D-printed paintings: a Van Gogh you can touch)

Set-up GameLab

I would recommend to divide the GameLab into two separate spaces, as displayed in Figure 86. This way, the three art related exhibits can have their own room, and it will be more clear for the visitors what they can expect.

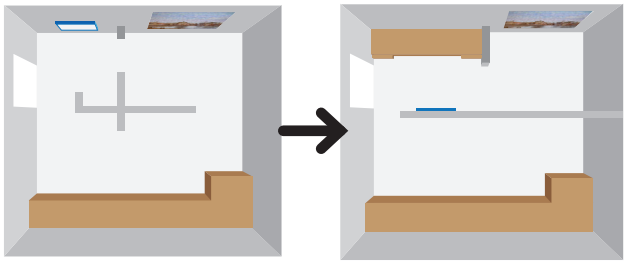


Figure 86. By dividing the GameLab in two spaces, a separate room for art related exhibits is created.

Part 1 - "Kun jij kijken als een pro?"

Information

As mentioned earlier, not all participants got to reading the on screen information about the formal elements that appears after selecting a search piece.

Because the group formation in which the users interact with the exhibit is of great influence on whether there is enough patience to read the provided information, I would recommend not to force the user to have to read the information in order to use the exhibit.

Forcing the user will result in less pleasant experiences for the groups that do not have a supervisor to bring patience; while reading the information it not essential for it to be a useful and pleasant experience.
I would thus recommend to make the reading of information optional, but not essential. This way, the user always has the option to be more informed in a non forced way, but the exhibit still provides the opportunity for an explorative and engaged aesthetic experience for the less patient visitor.

Roll-up mechanism
As described in the concept, the search pieces of part 1 will be fixated to the exhibit using a roll-up mechanism. A small research should be conducted to find out how strong the roll-up mechanism should be. It should be strong enough to roll back up but not too strong that it hinders the users from freely moving the search piece around the painting.

Amount of search pieces
The research indicated that positive emotions were aroused when the participants were able to locate all the search pieces available. For this reason, I would recommend not to use more than 5 search pieces. This already takes a substantial but reasonable amount of time, and thus still enables the participants to find all the pieces. If 5 search pieces are available, there can be one piece for every formal element.

Part 2 - "Schilder als Van Gogh"

Reprint the painting for Part 2
To make sure the magnets have enough power on part 2 of the exhibit, I would recommend to print the painting again on a thinner paper to minimize the distance between the steel plate and the magnets. On this thinner paper, using magnets with a diameter of 3 cm and a thickness of 2 or 3 mm will be strong enough to result in a magnetic power that disables the children from taking the magnets off the painting, whilst they are still able to move the flowers around on the painting.

I would recommend to include the 'buffer-zone' next to the painting in the print-file, so that no height difference between the painting and the buffer-zone will exist and the magnets can easily be slid on and off the painting.

Deterioration
The sliding of the magnets over the painting causes friction, that could cause the painting to wear out over time. Only time can tell how long the painting will stay intact and if using the strong magnets is a durable solution. If this is not the case, the flowers and magnets can be replaced by paper flowers, that can be printed on magnetic paper. This paper can be printed and laser-cut in the Science Centre, which minimises the costs.

Taking and sending the picture
No further research was done to determine in what way the visitor would like to receive the picture made. Sending it through email is a good option, but other social media like Snapchat, Instagram and Facebook could be more appealing for the target group.

9. CONCLUSION & REFLECTION

9.1 Conclusion

Conclusion of the graduation project

This project started off with the following assignment:

Designing an informative and interactive exhibit for Science Centre Delft, using 3D printed replicas of historic paintings. The exhibit should result in a more engaging interaction between the Science Centre visitor (aged 7-12 years) and the paintings, making use of the opportunities that arise from working with the 3D printed replicas.

Through an extensive literature research and doing observations, a framework of the aesthetic experience was made. Hereby, a scientific approach to experiencing art was created. This, in combination with a study about designing for children as visitors, formed the basis for the rest of the project.
The explorative design research that followed, lead to a final concept. A concept that in three parts facilitates the user to focus on the perceptual dimension of the art. By providing visitor with clear goals and tools, the user is encouraged to explore the painting. Finally, a thorough user research proved that using the exhibit resulted in engaged interactions between the Science Centre visitor and the painting.

9.2 Reflection

A reflection on the process

At the start of this project, I was wondering how to approach this complex subject. Art is a sensitive subject, where almost everybody has an opinion on. Experiencing art is different for everybody, so how was I supposed to define where the focus should be in this project? And why should art be experienced in the Science Centre in the first place? Do the visitors even want to experience art in the Science Centre?

Basically, there were two complex problems that had to be tackled in one project: how can the reproductions facilitate the aesthetic experience, and what kind of aesthetic experience makes sense in the Science Centre?

Luckily, I like tackling complex problems and I was intrigued by the subject. Although a few weeks in the analysis phase I started wondering where I got myself into, and how I would ever get out; I always remained trustful that everything would come together at one point. I never expected upfront that there was so much research and literature available about experiencing art. By reading a lot, I gathered insights and stances from different perspectives. By every paper or book that I read, my idea about the aesthetic experience got more and more shape.

The real breakthrough in the analysis phase came when I read the book "Art of Seeing" by Csikzentmihalyi. By simplifying the aesthetic experience (the work of art has certain challenges, the viewer has certain skills), I was able to create a framework where all the other literature I read could fit in. Where I first had a gazillion lose fragments of knowledge; I now had a framework.

That's when the design process could start. Because I had to design a new aesthetic Wexperience, I had no experiences to hold on to in the process. Therefore, the process got an experimental nature. I had a lot of ideas, that I just tried. Decisions were mostly based on my observations and opinion. If I look back at the project, I wish I would have structured the experimental researches I did in the project more in advance. However, in most of the cases I only realized what it meant what I saw later than the observations were done, making it hard to define these structures beforehand.

I'm very happy that I got the opportunity to make realistic prototypes; although there were high costs involved for printing the paintings.

I think this was a necessary research to be done to find out if the explorative research indeed had lead to good results.

In the end my gut feeling was true: it did all come together. I think the final design idea works for all interests: it creates an engaged aesthetic experience, the experience fits well in the Science Centre and it makes good use of the opportunities that arise from using the 3D printed replica's. Off course there are many practical details that still need to find their way, but A new Art Experience was born.

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10.2 Pictures

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