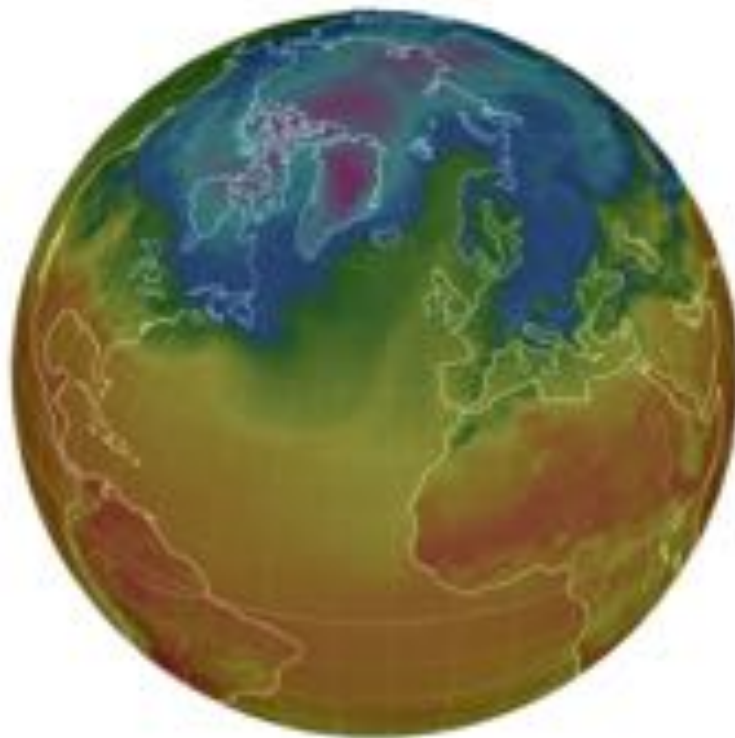


Poor usability prevents enthusiastic grandparents from learning more about the climate

Scary Weathers interactive globe installation –
An evaluation of functionality and ability to communicate
climate journalism to grandparents



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1. Introduction

Climate is a very relevant topic that is constantly getting more coverage in the media. Over the past decades, we have witnessed significant climate change and its consequences. The temperature and sea levels are rising, the ice melts and the occurrence of extreme weather is more frequent than before. It is debated whether climate change is man-made or not, and there is disagreement about how to handle the situation. Nevertheless, it is clear that we are facing a challenge and that society needs information and involvement.

Figures from Kantar's climate barometer for 2019 show that climate change has never received higher attention among the Norwegian population, and that the climate commitment is often greatest among those under 45. The report also shows that those over 60 are as concerned with climate as health (Kantar, 2019). The older population often has a different view on climate as they have lived longer and experienced more change. Many of them also have families in younger generations and thus have reason to be worried about their future. For this reason, in this project, we have chosen to look at how grandparents experience climate journalism. Grandparents spend a lot of time with their grandchildren (Krüger & Myklebost, 2019) and research shows that they play an important role in the development of personality and behavior for their grandchildren (Li, Liu, Gao & He, 2016).

The media plays a key role in the climate debate. Climate journalism helps inform and create awareness, as well as documenting and engaging. There are several studies on how climate research should be disseminated so that it is understandable and engaging, and Corner et al. (2015) illustrates, among other things, seven principles for effective climate communication. In this project we have studied dissemination of climate journalism through the use of an interactive installation at a museum, in light of these principles. Communication of climate journalism on such an installation will differ from dissemination on traditional media, seeing as more visual and interactive elements are often required, thus the installation's functionality becomes a central part of the evaluation. Here we have used Don Norman's (2013) design

principles, which serve as guidelines for a good user experience, to substantiate our evaluation.

This report will be an evaluation of both the installation's functionality and its ability to communicate climate journalism to grandparents. We will also explain the methods that have been used, as well as suggesting design implications based on findings from the analysis.

This evaluation was written as an exam assignment at MIX202 Design for Media Use in the spring of 2020. The course is part of the Bachelor's program Media and Interaction Design at the Department of Information and Media Science at the University of Bergen. The course leader was Professor Lars Nyre. Subject teachers were Professor Andy Opel (Florida State University), senior engineer Zulfikar Fahmy, PhD fellow Fredrik Håland Jensen, PhD fellow Oda Elise Nordberg and master's student Jonathan Lindø Meling. The evaluation is translated into English by Kristin Eidsheim.

1.1 About Scary Weather and The Globe Room

Scary Weather is a newly started media company that deals with dissemination of climate-related content. The company was created in 2018 when Ronald Toppe and Eli Kari Gjengedal decided to take their 20 years of experience and knowledge from TV 2 into the world and into a company of their own. Scary Weather turns facts into stories by producing text, images, video and installations. In addition to providing advice and guidance on communication and practical production, and coaching. The company specializes in climate journalism, and is run by people with long experience and great commitment to climate. Their purpose is to make people care about climate; to create engagement and curiosity (<https://scaryweather.no/>).

One of Scary Weather's customers is the University Museum. As part of the exhibition "Our Dynamic Globe", also known as the "Globe Room", Scary Weather has produced content for three interactive globe installations that tell about the ocean, the weather and the climate on our planet. In addition, they have designed how users interact with the installations (Tops, 2019). The room also contains a giant leather globe located in

the middle of the room, as well as a pair of decorative globes on one wall.



Figure 1: Picture of the Globe room.

We have chosen to focus on one of the interactive global installations - *Changing Climate*. We made this decision in order to be able go more in-depth on the effect of the content, and to research the interactive learning method in relation to usability and climate dissemination. The Globe installation (Figure 2) shows a graphic illustration of the current temperature and wind measurements on a screen, in the form of a globe, hanging on the wall.



Figure 2: Picture of the globe installation.



Figure 3: Picture of the installation control panel.

In front of the screen there is a control panel (Figure 3). Here, the user can navigate the globe using a ball, select language and adjust sound. The control panel also contains information on changing climates, as well as a brief help text explaining how to use the installation.

The purpose is for the user to navigate around the globe and find four points of video content. The videos have a duration of approximately one minute and is about ice melting in Greenland, El Niño, increased temperature and CO 2 emissions.

1.2 Who participated in the survey?

The target group we have chosen are grandparents. Initially, we decided on the age group 50 to 70 years, as we wanted grandparents with young grandchildren and who were not too old to go to a museum with them. Since we had trouble finding informants, we decided to extend the age range from 50 to 80 years. We consider this group interesting, primarily because of their relationship with climate and technology, but also because of the relationship they share with their grandchildren. Grandparents belong to a generation that usually have witnessed major changes in weather and temperature, as well as growing up in a different technological age. For this reason, we consider it interesting to research what they think about the content and whether the installation is user-friendly for an older user group. In addition, we are under the opinion that it is common for grandparents to share cultural experiences, such as visiting museums, with their grandchildren. Thus, it can be exciting to investigate whether the installation can be used as a social point between the relationship between grandparents and grandchildren. Figure 4 shows a graphical representation of the demographics of the grandparents who participated in this project, as well as statistics from the user test.

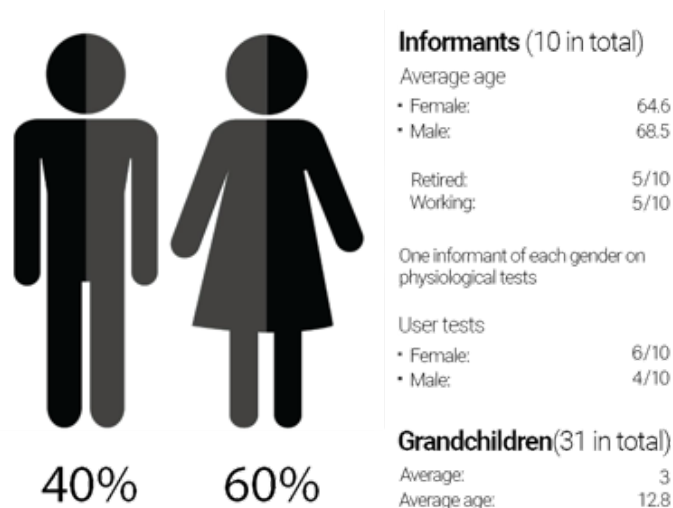


Figure 4: Grandparent demographics and user test statistics.

2. Method

Our studies have had a qualitative approach. Using such an approach, we gain in-depth knowledge of a person's course of events, opinions, judgments, arguments or decisions (Jacobsen, 2005, p. 141). We do this because we do not want an objective measurement that represents an entire community group, but rather an in-depth understanding of the individual's subjective experience.

We have collected data in various ways via semi-structured interview, observation and measurement of physiological data. In this way, we use methodical triangulation, which means that by using different data collection one can get different perspectives and thus a more holistic and correct picture (Østbye, Helland, Knapskog, Larsen & Moe, 2013, p.125). We used a total of ten informants in this project, two of whom have completed a physiological user test and eight of them have conducted user tests with observation. During all user tests, the informants were carefully analyzed and observed, and one disadvantage of this is that the informant's behavior can be affected. This kind of behavior change is called the Hawthorne effect (Halle & Tjora, 2018).

In order to get a better overview and control of the different aspects of the user test, we prepared an interview guide in advance. The interview guide served as a framework for how the test should be conducted. It was also submitted to the Norwegian Center for Research Data, as the project was to process personal data (NSD, 2020). At the end of the semester, all data such as audio and video recordings, notes and interviews will be deleted. We used semi-structured interviews to follow up observations, as well as gain better insight about the informant and their user experience. Semi-structured interviews have a predetermined theme, and also allow for new questions along the way (Østbye et al., 2013, p.105). The interviews gave us a lot of relevant information, but we also found that the informants tended to derail from the topic and talk about completely different things than what we asked.

We first had a warm-up interview where we got to know the informant, then we did the user test on the globe installation. Finally, we had a follow-up interview where we

talked about the experiences around the installation. In this part of the interview we used an interactive element, where the informant was handed out a pile of pictures related to the installation they had just tested, which was to activate the informant with physical stimuli, which could encourage own reflections .



Figure 5: The images used as interactive moments in the interviews.

For the informants who participated in the physiological tests, we used the Empatica E4 stress bracelet and the Tobii Pro Glasses 2 eye tracking glasses. The use of stress bracelets makes it possible to measure the informant's heart rate, skin surface temperature, stress (electrodermal activity) and blood volume pulse, in addition to the bracelet's movements (Empatica, 2020). Using this data, we can interpret how the informant reacted emotionally (Sears & Jacko, 2009, pp. 60-61).

One challenge with physiological measurement is that one has to confirm or disprove data since the measurements only show a reaction, but do not explain what triggers the reaction (Kivikangas et al., 2011). Another significant aspect of eye tracking is that even if the informant looks at an element, it does not necessarily mean that one is processing it (Holmqvist & Andersson, 2017, p. 5). It is therefore necessary to

combine physiological data with the informant's subjective comments through an interview. This combination is called psychophysiology (Lazar, Feng & Hochheiser, 2017, p. 381).



Figure 6: Illustration showing the eye-tracking glasses specifications (Tobii Pro, 2020a).

During one of the physiological tests, we had trouble calibrating the informant's eye-tracking glasses. Most likely, the eyesight of the informant is the reason for this, as it became evident that they depend on reading glasses. For this reason, there are probably deviations in the eye tracking data for the informant, which we have taken into account in the analysis. To ensure quality of collected data, one should recruit informants who do not have narrow eyes or glasses (Holmqvist & Andersson, 2017, p. 7). In future projects we will take this into account when recruiting informants.

In this report, we have selected different guidelines that are emphasized in our analyzes. The first are Don Norman's (2013) design principles for good user experiences, which are based on experience and knowledge of user design. Furthermore, we apply Corner et al (2015) 's principles for visual communication of climate change. These mainly deal with the tools that engage the public in communication about the climate . We have chosen these principles on the basis that we believe they are good guidelines for the project's purpose: *Does the interactive globe installation of Scary Weather provide climate journalism in a way that is engaging and user-friendly for grandparents?*

3. What can be improved?

In this part of the report, we will present our main findings and recommended solutions, in light of the principles for design and effective climate communication, which were mentioned in the method section. We will first address findings regarding user experience and then findings regarding climate communication.

3.1 The navigation globe was difficult to control

Both in the interviews and through observation it emerged that the globe, which is used to navigate, was challenging. For example, an informant replies «that the globe was difficult» as what he remembers best about the installation. When asked what they think of the navigation globe, four of the informants describe the globe as difficult. However, three of these informants point out that it is logical. Despite three other informants claiming that the globe was easy to use, we observed that they did in fact struggle to navigate the globe. The informants used words such as «sensitive», «smooth», «heavy» and «slow» when talking about the navigation globe. Based on observation and what was said in the interview, it may seem that several of the informants only needed some time to familiarize themselves with how the globe works. Still, it seems that the biggest challenge is that it moves in a mirrored direction. The idea is that the ball should have the same behavior as a globe. If the user rolls the ball down, the globe is turned upwards. The fact that the navigation globe is mirrored contradicts Don Norman's design principle of «mapping», which states that our physical actions should be reflected in our design (Norman, 2013, p. 72, p. 113-115).

Recommended solution: We believe it can be beneficial to make the globe more user-friendly. An improvement could be that the on-screen navigation reflects the physical movement of the ball. Several of the informants stated that the movement went against their natural intuition, based on the behavior of, for example, a computer mouse, touchpad, etc. Implementing this change is likely to rely on the established knowledge that users already have, which can be an advantage in designing design solutions. Another suggestion might be to make it clearer that the ball represents a globe, using colors and other tools. In this way, it will often be easier for the user

to understand the behavior of the ball, since they already know how a globe works.

3.2 The video symbols give a poor indication of video content



Figure 7: Image showing how the video symbol appear on the globe screen.

The informants had somewhat mixed opinions about how well the symbols, placed on the globe, indicate video content. Six out of ten informants spent a reasonably short amount of time understanding that they must navigate to the symbols for something to happen. The remaining ones spent significantly longer before either finding out or accidentally playing a video. Figure 8 illustrates how long the informants spent on finding their first video. One of the informants, who had no problem playing videos, says in the interview that he did not understand what the symbols were to represent. At the same time, the informant says that the symbol itself does not matter as it still was visible and stood out on the screen, which was what triggered his curiosity to explore.

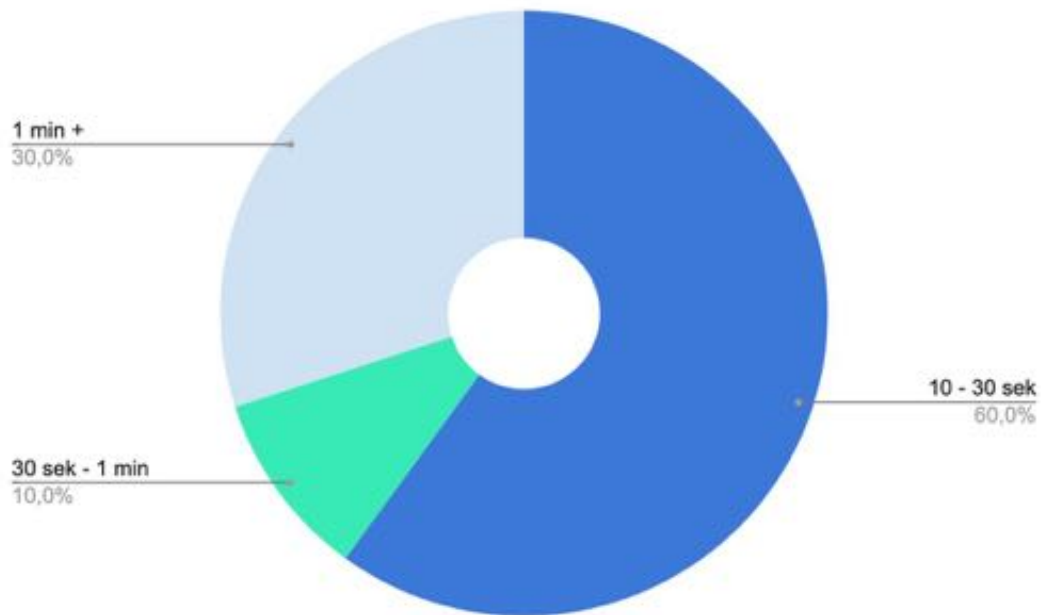


Figure 8: Graph illustrating how long the informants spend on finding their first video.

However, we observed that some informants tried to navigate the cursor to places without a video symbol, hoping that something would happen. It is possible that the reason for this is that the video symbols are not marked well enough, and thus not a clear point of interest for the user. This can cause them to search for information elsewhere. Our physiological measurements also show that one of the informants experienced an increase in heart rate as they did not understand how the symbols and videos are connected (Figure 9). The increase may indicate that the informant was frustrated by not being able to play more videos.

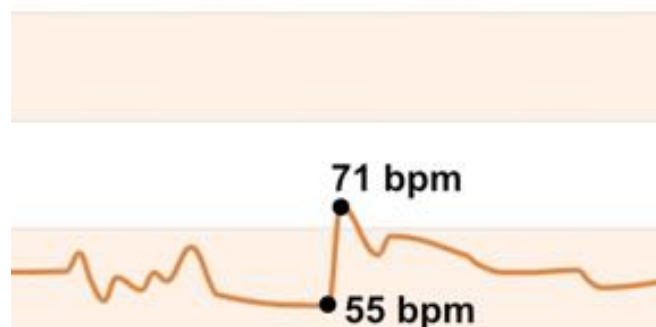


Figure 9: The informant's heartbeat.

Recommended solution: We think it would be appropriate to make the video symbol more visible by increasing its size. By resizing they will become more visible, which is in line with the principle of «discoverability»; all possible actions should be visible to the user so that it is clear what is to be done (Norman, 2013, p. 71). On the one hand, the symbols contrast with the rest of the globe, as they are white and the globe consists of darker colors. On the other hand, the symbols are relatively small and there are only four of them, located in widely different places, which can make them difficult to find. In addition, it will be convenient to replace the globe icon with a play icon as it will be more intuitive to the user because it clearly signals video. According to Don Norman's design principle of «affordance», one must clearly signal available actions to enable actions (Norman, 2013, p. 72). It may be that the most important thing is to make the symbols visible to guide the user to them, but the icon also plays an important role as it conveys what the user can expect.

3.3 Navigation on the globe screen is fumbling

When asked how the informants thought it was to navigate around the globe, four out of ten informants respond «okay». Two of these, on the other hand, are followed by negative remarks. We also observed that several of the informants fumbled some as they explored and navigated on the globe screen. For example, several of the informants enter the same video, which they have already seen, on several occasions, expressing astonishment or annoyance when they realize that they have already seen the video. This can be an indication that it is difficult to keep track of where you are and what you have seen. Four of the informants also expressed a desire to know how many videos are available on the installation.

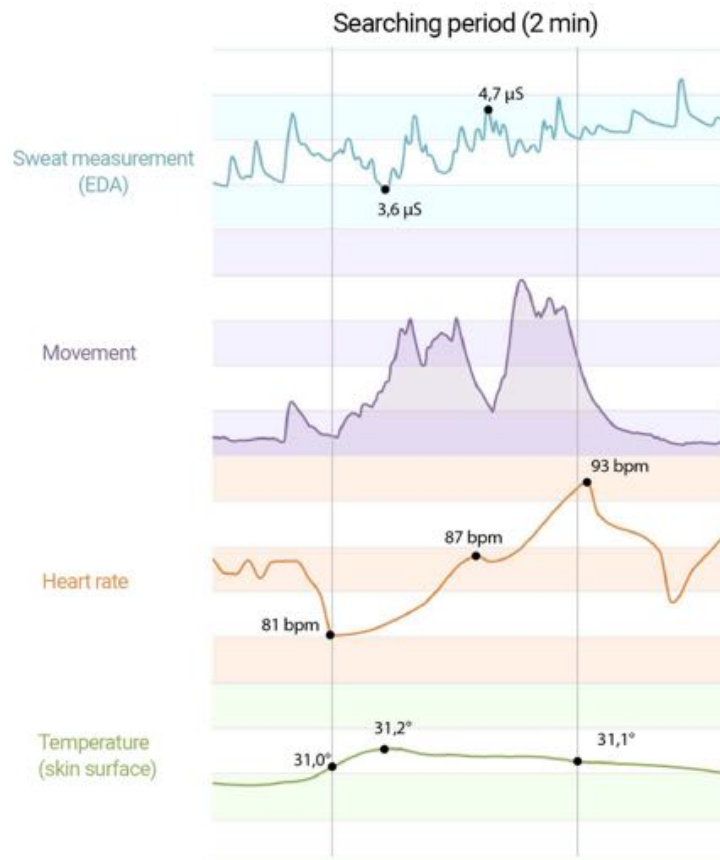


Figure 10: The informant's physiological data for the exploration period.

By looking at physiological data for one of the informants, as they searched for several videos, one can see that the stress measurements have a billowing effect (figure 10). You can also see a slight increase in surface temperature and an increase in heart rate. This may indicate an increased level of stress. In the informants follow-up interview, it was revealed that he felt irritation and uncertainty about whether there was more content or not.

The eye's movements

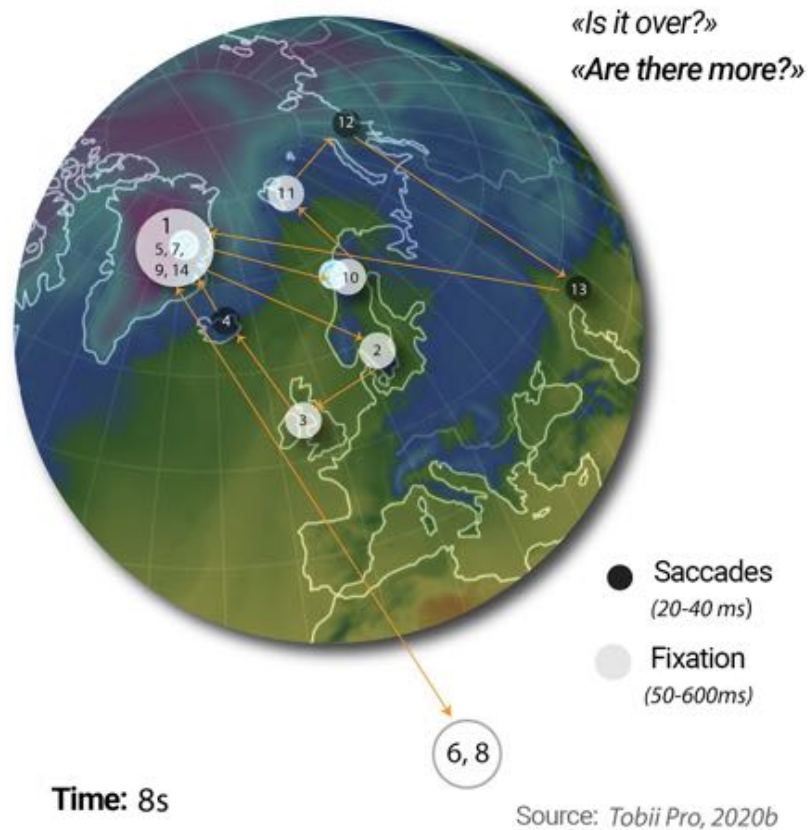


Figure 11: Image that maps the informant's gaze as he searches for content.

By looking at eye tracking data for one of the informants, illustrated in Figure 11, one can see that they alternate between fixating at different points on the globe when searching for content. Fixating means that the eyes focus on a particular area or element rather than the gaze flickering and having frequent movements everywhere (Tobii Pro, 2020b). The eye tracking also shows signs of saccades, that is, shorter glances, which is common when looking for something (Tobii Pro, 2020b). It is clear from the footage that both of our eye tracking informantss eyes are flickering as they navigate around the globe. This may be an indication that they are confused, which underpins the overall assessment that navigation is somewhat challenging.

Recommended solution: We suggest informing the user about how many videos are available on the globe. This can be done in the form of implementing a status

bar at the bottom of the globe screen (Figure 12). The status bar displays an overview of the number of video points that exist, which country the cursor is currently located in and the temperature in said country. In this way, you get continuous feedback on where you are, which can make navigation easier. This would be in line with Don Norman's design principle of "«eedback», which states that one should continuously be informed about the status and outcome of one's actions (Norman, 2013, p. 72). Due to the fact that one is in a museum environment, one may think that the research aspect is a central part of the installation. Therefore, it should be considered whether the status bar affects this. One may also think that placing the status bar on the screen will «destroy» the globe experience. Thus, it may be an option to have the information on the panel instead.

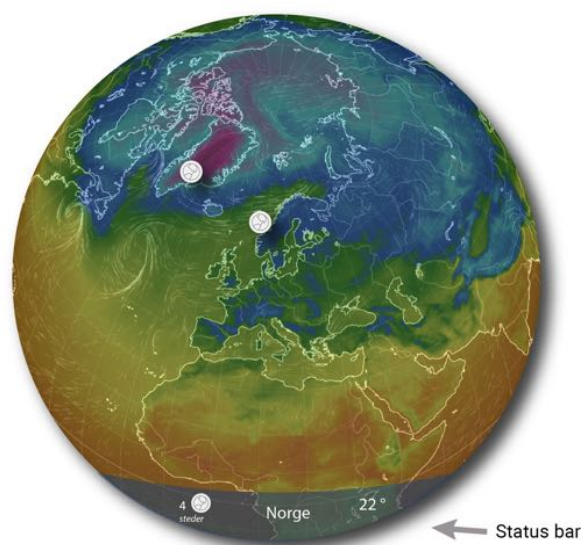


Figure 12: Image showing what a status bar on the globe screen might look like.

3.4 «These are familiar things, it is nothing new»

In the interviews, it became evident that the majority of informants have learned nothing new while using the installation, and that the content confirms the knowledge they already possess. When asked about where they get information about climate, it is answered that it is via media, often in the form of newspaper or news broadcasts on TV. Several of our informants, on the other hand, seem to be positive about getting confirmed knowledge they already have and say that repetitive information can help make the content stick even better.

On the other hand, several of the informants express that they wish there were more content, that the information in the videos is one-sided and that more pros and cons are desirable. For example, one of the informants describes the content as «thin». Although some believe the content is deficient, it may seem that the installation has partly increased the informants' interest in learning about climate. Several of the informants expressed a desire for more videos on the installation, to learn more. Another informant would like to learn more by exploring the rest of the Globe Room.

Recommended solution: We believe it will be useful to tell more climate stories from around the world. Adding content and stories from multiple countries will help to tell something new. It can either be in the form of adding videos or using other media content such as still images or audio, or a combination of these. According to Corner et al (2015) 's seven principles for effective climate dissemination, telling something new is a significant factor in increasing engagement. The more width there is in the content, the more likely it is that the user will learn something new. In addition, it will allow for more exploration, and a variation in the way of communicating can help make it feel new.

3.5 Images that show consequences of climate change are the most influential

An interesting finding, illustrated in Figure 13, is that the topics that are most talked about in the interview after the user test are glaciers, ice melting and sea level rise. The discussion topics can be an indication of what makes the biggest impression on the informants. There is a clear trend among informants that images which show consequences are the most talked about. The topic most often mentioned is iceberg. One of the videos talks about Briksdalsbréen which is constantly shrinking. The reason many people talk about icebergs may be that it shows both a consequence and because several of the informants have a personal relationship with Briksdalsbréen.

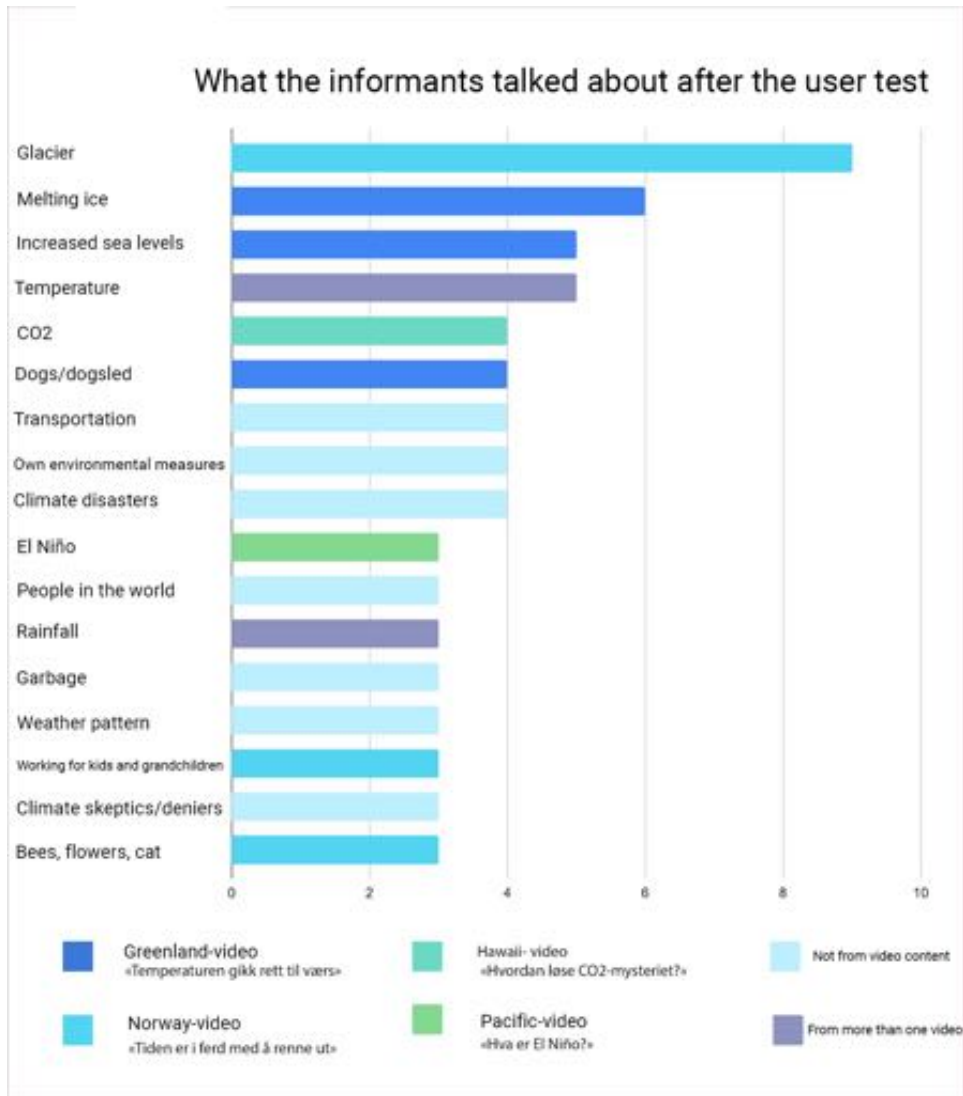


Figure 13: Graph illustrating what the informants talked about after the user test.



Figure 14: Illustration showing the informant's physiological reaction as he talks about the consequences of climate change.

In Figure 14, one can see that one of the informants experienced increasing stress levels when they talked about the consequences of climate change in the interview after the user test. The stress level may indicate that this is a topic that matters to the informant. When we asked about this reaction in retrospect, the informant stated that it was not about of fear, but rather engagement.

Six of the informants posed to see pictures documenting real-life events. For example, one informant stated: «I have heard about it, but seeing it in reality is very scary». In addition, we observed physical reactions such as verbal statements, groans and movements at certain scenes. For example, in the video on Greenland where the hood of the snowmobile starts to melt due to the heat and the dogs are wading in water that should have been ice. This indicates that the pictures which show consequences make an impression on the informants.

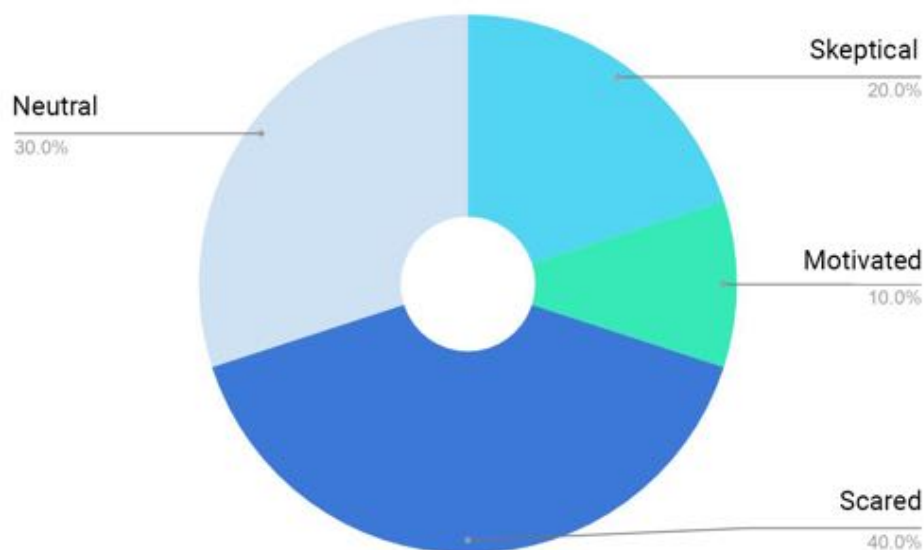


Figure 15: Graph illustrating what impression the informants are left with after using the installation.

Figure 15 shows that the informants are left with different impressions after viewing the content. Nevertheless, the majority express that they are frightened. For example, one informant says, «It just goes to show that everything goes to hell», suggesting that some people respond with irritation.

Several also express concern about the future and a desire to know what measures can be done. This shows that the content is generally perceived as scary and that our informants react differently to it.

Recommended solution: We believe that the content should be more balanced. It should be a combination of images documenting climate consequences and what can be done to reverse the development. One of the principles for effective climate dissemination claims that moments that show the effects of climate change have greater impact (Corner et al., 2015). The principle is that strong impressions can motivate change, but can also be overwhelming. For this reason, we believe it is appropriate to compensate with content that encourages supportive measures. For example, if one takes the cursor over the Netherlands, then a picture of flood destruction is displayed, followed by what work the population is doing to prevent the situation.

3.6 Information communicated via text gets lost



Figure 16: Clips from the eye-tracking recording for informant 1, showing how the informant follows the text with the gaze.

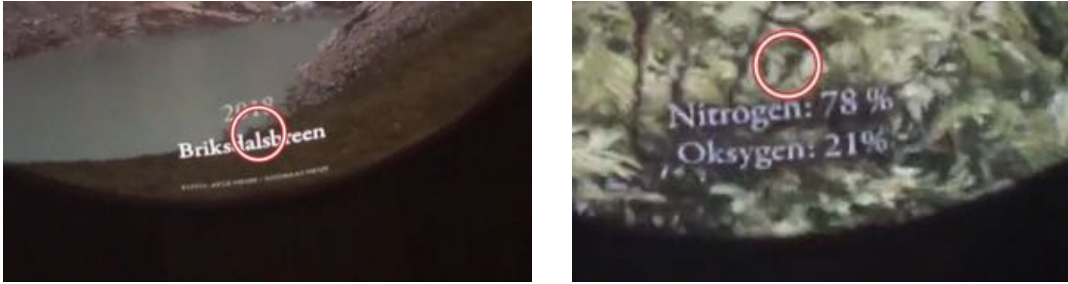


Figure 17: Clips from the eye-tracking footage for informant 2 showing fixation on text.

Findings from the eye-tracking analysis show clear tendencies that both informants read the texts in the videos, both titles and factual text (Figures 16 and 17). However, the interviews show that none of them can remember reading the titles. The informants also never recount any of the factual information, which is conveyed via text, at the bottom of the screen. This is a good example of the fact that even if the informant fixates on the text, it does not mean that the content is perceived or processed.

The interviews also revealed that the informants make use of the video's location when referring to a video, such as «the one in Greenland» and «the Hawaii video». This is despite the fact that all videos have titles that are presented, in the form of text, at the beginning of each video. It may appear that information conveyed in text form is either not perceived at all or lost right after.

The informants generally present little numerical facts from the videos. The only thing mentioned, by two informants, is that the sea level will rise by one meter. This information was presented orally in the video. This may be an indication that the factual texts have not been processed, and thus not fixed in memory. For example, one of the informants says that she cannot recount any numbers, but remembers the rest of the content.

Recommended solution: We believe that as little text as possible should be used to convey essential information. What is communicated via text should be clearer and more readable, either by using better placement or more prominent design. According to Weinschenk (2011, p. 96), people are selective readers, that is, we tend to focus only on what catches most of our attention and filters out everything else.

In order to catch the user's attention, it is therefore essential that the text is conspicuous. For example, using animations or other visual tools. For example, for the video «Time is running out», the title can be presented on a neutral background, with an effect where the title gradually «runs out» such as in an hourglass.

In addition, numerical information, such as that the sea will rise by one meter, should be supplemented with a visual presentation of how sea level rise will look in some places in the world. Seeing the change visually will have a greater impact than just reading or hearing about it, as the impact of climate consequences have greater impact (Corner et al., 2015). A visual representation can also help make the scope more understandable.

3.7 Besteforeldre ønsker å bruke installasjonen sammen med barnebarn

The interviews also revealed the informants' thoughts on how their grandchildren would have understood the installation purely technically, and how they would have incorporated the content. The majority of informants believed grandchildren would have understood more easily how to interact with the installation, than themselves. One of the informants says: «They would have gotten it right away, it is a little more in their fingers». Some of the informants also talk about challenges for their grandchildren. For example, the navigation globe is too heavy for the younger children and the installation appears to be old fashioned, which leads to less interest for the grandchildren. In terms of content, there are shared opinions among the informants. Some express that the content can be daunting and difficult to understand for children. An informant believes that this can be solved by retelling the information to the grandchildren so that they understand it. It is also said that using the installation together can contribute to climate change talks with their grandchildren.

Recommended Solution: We suggest implementing gaming elements on the globe to make learning more fun. In this way, the content becomes less daunting, and it also makes it easier for grandparents and grandchildren to «play» and learn together. The game would have been based on "Meaningful Gamification" which,

according to Nicholson (2015), is a tool for engaging. Instead of a game where the user is rewarded in terms of points, meaningful gamification relies on the user being rewarded in the form of, for example, new knowledge. We imagine one quiz element after the videos, where the user has 30 seconds to answer a question via a touch screen on the panel. The question deals with the content of the video and is provided with three alternative answers, which appear on the touch screen. For example, after the video «How to solve the CO₂ mystery?» the question: In what decade did CO₂ levels start to rise sharply?» is asked. If you answer correctly, a positive «fun fact» is displayed, if you answer incorrectly, the player is sent back to the globe screen. In this way, grandparents and grandchildren can discuss and answer the question together, which can make the impression stronger as one shares the experience.

4. Conclusion

In this report, we looked at whether the project's purpose is being fulfilled: *Does Scary Weathers interactive globe installation provide climate journalism in a way that is engaging and user-friendly for grandparents?*

- The navigation globe was difficult to control. We suggest that the navigation becomes more intuitive and that the ball is better visualized.
- The navigation on the globe screen is fumbling. We suggest making the symbols more visible and the icon more understandable, as well as implementing a status bar that gives the user a better overview.
- The content of the videos does not convey new knowledge. We suggest adding more videos with climate stories from around the world.
- Images that show the consequences of climate change are the most influential. We propose to balance the content by using visual representations of real events, consequences and what can be done to reverse developments.
- Information communicated via text gets lost. We propose to make the texts more eye-catching and to present factual information visually.
- Grandparents want to use the installation with their grandchildren. We suggest a gamified interaction that can create an educational experience together.

We see that the installation is engaging and that the informants are left with a desire to learn more, as well as being very positive about experiencing the Globe Room with their grandchildren. Nevertheless, Scary Weather has a potential for improvement and with further development the installations can disseminate climate journalism which is engaging for both grandparents and grandchildren.

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