VR for Diversity. The Seven Lives of a Research Project

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Abstract. This paper gives an overview of the research project VR for Diversity that focused on the impact of interaction in VR on the user. For this purpose, a distinction is made between physical interaction, that can be achieved by using controllers, and para-social interaction, that refers to interacting with characters that inhabit the virtual world. In line with the perceived affordance of VR to serve as a perspective shifter, the topic of *diversity* was chosen as the theme for the narratives that were to be created for this the research project. The paper describes a number of different projects that all evolved around this theme and concludes by presenting insights on the impact of interactive VR.

Keywords: Virtual reality · diversity · inclusion · social presence

1 Introduction

Since the re-introduction of virtual reality (VR) in 2014 there has been a consistent exploration into the positive effects of the medium, with many initiatives investigating the ways VR may be used to contribute to a better world, such as *VR for Good* [1] and *VR for Impact* [2]. By 2023, a whole range of VR productions have been presented, that are intended to serve as an invitation to reflect on a particular theme, to contribute to a shift in world view, or simply a change in opinion or better understanding of an issue. This particular use of VR has been defined as 'VR as a perspective shifter' [3]. One of the affordances of the medium that is claimed to contribute to this characteristic is the way that VR allows the user to interact with the content. By interacting with the virtual world and its inhabitants, users are said to experience a heightened sense of engagement that would automatically lead to an increase in knowledge or a change of attitude. However, little theoretical knowledge is available that actually supports this claim. For the research project *VR for Diversity*, that is the topic of this paper, the aim therefore was to study the impact of interaction in VR: what effect does an interactive immersive experience have on the user's factual knowledge of and attitude towards the topic that is presented in the virtual world? For this purpose, a distinction is made between physical interaction, that can be achieved by using controllers, and parasocial interaction, that refers to interacting with characters that inhabit the virtual world.

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In line with the perceived affordance of VR to serve as a perspective shifter, the topic of *diversity* was chosen as the theme for the narratives that were to be created for this the research project. Diversity is a comprehensive and sometimes even ambiguous notion that probably has as many interpretations as there are worldviews. According to the *Oxford English Dictionary*, the term is defined as "the practice or quality of including or involving people from a range of different social and ethnic backgrounds and of different genders, sexual orientations, etc. [4]. Diversity is increasingly stated as an entry condition, for instance in calls for media funding proposals, such as the *Videogames & Immersive Content Development*-call of the Creative Europe program [5]. In calls like that, the concept of diversity may be applied in many different ways: it could refer to diversity within the production team, but also to the topic of the media content itself. As there are probably also many other ways to embed a complex topic such as diversity in media production, the additional intention of the current research project therefore was to investigate what the interpretation of the concept might be, when different teams were invited to create a project that would be titled *VR for Diversity*. As it turned out, this eventually led to several different visualizations of the concept, as demonstrated in a number of separate projects. This paper presents those projects, describing how a research proposal ended up living seven different lives, leading to new insights into the impact of interaction in VR but also into the different ways that the concept of diversity may be embedded in media content.

1.1 Interaction in VR

The literature on the actual impact of interaction in VR is still sparse. In their exploration of the topic Ferguson et al. [6] claim that it may be expected that the attitude of players in a virtual reality serious games would benefit from active interaction, which could lead to better knowledge retention. However, they also point towards the discrepancy that players may recall more factual knowledge when they don't need to interact and therefore be less overwhelmed by the virtual experience. In their experiment, they found that participants in a passive interaction condition had higher percentage of correct answers on the test focusing on factual knowledge. Nevertheless, it was also shown that participants felt more present and showed more cognitive interest in an active interaction condition. The authors point out that this backs up the findings of Flowerday and Schraw [7]. While this study did not focus on VR, its results did also indicate that freedom of choice and interaction led to a negative effect on task performance (learning) but had a positive effect on attitude.

Apart from interacting with the environment, users in VR can also be invited to interact with the characters that they encounter in the virtual environments. One of the first industry accounts exploring the nature of the relation between users of VR technology and virtual characters was published on the blog of the Oculus Story Studio [8]. In his report, Matt Burdette described how the team noticed that in their first prototypes, there seemed to be a distinct lack of connection between users and the characters in the environment, and in turn, the story. Consequently, the team discovered that by having the VR protagonist 'lock eyes' with the user - by looking directly into the camera and seemingly acknowledging their existence – this effect could be partially eliminated. Since then, it has become clear that users in VR may develop dramatically different

connections to the characters and the virtual environment they inhabit than they would with characters in traditional 'flat' media. The term 'social presence', that can simply be described as the "sense of being with another" [9] refers to the ability of a VR system to create the illusion that the user is actually inhabiting the virtual environment with someone else. Several experiments have shown that if the user feels social presence with another in VR, he or she will exhibit behavior similar to a real interaction [10].

2 The Seven Lives

2.1 The First Life: Narrative Novelties

The first life of *VR for Diversity* was a lonely life. The project had started in October 2020 and by that time life on earth had come to a relative standstill, due to the worldwide pandemic lockdown. Research was hard to set up, especially the kind of research that involves placing headsets on heads, making it impossible to keep a safe distance and thus risking contamination. Collaboration was exclusively possible online, from the safety of the researchers' own living rooms. In an effort to work towards a first outcome, an immersive desk research project was set up to examine the different ways that a number of VR experiences that were available in the oculus store use and explore the concept of interaction. For this project, four VR experiences were analyzed and it was concluded that theoretical conventions such as identification, parasocial interaction and 'breaking the fourth wall' may undergo a considerable shift in meaning when used for VR, thus giving way for new investigations into the interpretation of theoretical concepts from communication science and film- and media studies [11].

2.2 The Second Life: Amelia's Dream

VR for Diversity's second life was the main life, as it contained the central project that involved writing a script for VR with an embedded research plan, producing the actual VR experience and then conducting the research [12].

Writing a script for a VR experience comes with a multitude of challenges [13]. In this particular case, an extra challenge was added, namely that the VR experience did not only need to convey a message about gender equality - as was the interpretation of *VR for Diversity* in this project - but also be suitable for an academic experiment that would investigate the impact of physical and parasocial interaction on users. The script was written in close collaboration between the industry partner and the knowledge partners, in many iterations and in a constant exchange of technical, academic and narrative requirements.

The VR Experience

In the VR experience *Amelia's Dream*, the user enters the dream of a young woman. She will tease them a bit and have fun with her visitors, but also shares some of her dreams and concerns, that all relate to issues of gender equality in contemporary society. The first dream that Amelia confides the user in, is her ambition to become an aviator. While trying out an aviator helmet in front of a mirror however, she complains that it doesn't

fit very well. Amelia points out that the helmet has probably been designed according to male standard measurements, as is also often the case with medicine, telephones and even space suits [14]. After this first encounter Amelia is featured flying an airplane, but then decides that she needs to change the world and therefore wants to become a politician. When she is confronted with actual quotes that female politicians receive via social media however, she shies away. Her last dream is to become a dancer. The user is presented with a little musical box that features Amelia as a dancing ballerina when it opens. In the last sequence, Amelia confronts the user one last time and sweetly asks them to support her, as she has decided that she want to do it all: she intends to be fearless and will not let anyone in society stop her from pursuing her dreams.

The Experiment

The VR experience *Amelia's Dream* was meant to study different concepts, related to interactivity in VR, with the positive side-effect of raising awareness about gender inequality and eliciting interest in the topic. In Hartmann et al. [15] the theoretical background of the experiment, the experimental design, moderating factors and all outcomes and discussions are presented in full detail. The current text therefore gives an abbreviated overview of the study, for which two versions of the experience were produced. In version A the user needed to interact with the medium to continue the storyline after an episode ended, requiring them to perform little tasks such as opening the box to see Amelia perform as a miniature ballerina, or start a sequence by pushing a button. In version B, the storyline progressed autonomously, without user interaction. Additionally, some of Amelia's statements were made while she was looking the user in the eyes (i.e. speaking directly into the camera and thus establishing social interaction), while other statements were made while she was looking away, for instance as she was checking her reflection in a mirror.

Sample

The sample consisted of 103 participants (aged 18–60, mean age 26 years; 50 males, 45 females, 6 non-binary/other and 2 preferred not to say) who had been recruited at three universities in The Netherlands. The participants were assigned to either version A or version B of *Amelia's Dream*, after which they were requested to fill out a survey. Participation was on an anonymous, voluntary and non-paid basis, but participants could leave their email address in a separate file to enroll in a lottery[1].

Survey

The survey measured the variables such as transportation, persuasive appeal, interest and social presence, based on standardized scales. Some examples of items included:

Transportation: "I was mentally involved in Amelia's story during the VR experience."

Persuasive appeal: "The VR experience convinced me that gender inequality is a problem."

Interest: "The VR experience made me interested in learning more about gender inequality."

[1] The grand prize in the lottery was the LEGO Amelia Earhart Tribute box.

Additionally, participants' recognition of information was examined by presenting them with 16 sentences, of which 8 were literal transcriptions of sentences said by Amelia during the VR experience, and 8 were faked. For each sentence, participants needed to judge whether it was said by Amelia or not.

Results
Analysis of the survey data showed that the interactive version lead to greater persuasive appeal and stronger interest and insight into the topic. However, recognition of the sentences was better in the non-interactive version, compared to the interactive version. Considering eye gaze, it was found that when Amelia looked the user in the eyes when conveying a message (i.e. when she was speaking directly into the camera), recognition was improved. With some caution, it can thus be concluded that while interaction in VR may heighten the users' interest for a topic, it may also cause them to be less aware of the actual facts that are conveyed within the medium. However, when a protagonist in a VR experience is actively making eye contact with the user while conveying a message, the information is remembered better.

2.3 The Third Life: The LHBTIQ+ Museum in VR

A team of students of the Master Digital Design interpreted the title *VR for Diversity* by building a LHBTIQ+ Museum in virtual reality, thus realizing the third life of the project. Wearing a VR headset, visitors are given a tour through a virtual space with various exhibitions that focus on different elements of queer culture. Upon entering a wall with flags of the different LGBTIQ+ communities is shown, and further on users can view and listen to personal experience stories, that have been shared by members of Pride communities. Another exhibition hall focuses on gay rights worldwide and on the concept of gender by introducing the virtual 'genderbread person' [16]. Furthermore, the museum features an exhibition of work from a Pride Photo Exhibition and a so-called 'Pride Experience Room', where users find themselves in virtual rendering of Canal Pride in Amsterdam, with canal houses, boats and people dancing on the quays.

The LHBTIQ+ Museum in VR was presented at multiple occasions such as museum events and queer festivals but was also accepted as a demo to be presented at the CHI conference in 2022 [17].

2.4 The Fourth Life: *Final Fantasy 7 Remake*

The fourth life of the project was a bit of an exception as it didn't involve VR but focused on diversity in a videogame. A master student from the New Media & Digital Culture program requested to do their internship within the scope of the project and proposed a study into diversity as it is reflected in a particular videogame: *Final Fantasy 7 Remake* [15].

For *Final Fantasy 7 Remake*, producer Square Enix developed a completely new version of the original *Final Fantasy 7* [19] that was launched in 1998 and that is still considered as one of the most famous games of all time, also because of its intricate and compelling narrative [20]. While the remake stays as close to the original as possible, it was clear that in terms of diversity, the narrative needed some careful updating, especially

since some sequences in the original story had since long been the topic of debate because of the potential homophobic message that it conveyed [21, 22]. The internship study focused therefore on a close comparative analysis between the FF7 and FF7 Remake of two scenes, exploring how possibly homophobic content was transformed towards more inclusive narratives. Guided by an enthusiastic review on the Gayming website that states that "what was once an invitation to sneer at the idea of queerness has morphed into a celebration of it" [23], the analysis accurately points out how also classic game content can - and should - be transformed in such a way to meet current standards of inclusion and diversity. But while the reimagining of two of *Final Fantasy 7 Remake*'s classic but conflicting scenes show how, after more than twenty years, Square Enix transformed parts of their heteronormative past into a more considerate and ambiguous experience, both scenes fail to completely avoid heteronormative pitfalls in their narrative structures and gameplay dynamics, thus establishing the ongoing need to study the medium of videogames from a perspective of diversity [24].

2.5 The Fifth Life: Amstelpark VR

The fifth life of *VR for Diversity* blossomed from a collaboration between one of the SME partners and a group of students from the minor program Immersive Environments at the Amsterdam University of Applied Sciences. In this case, the students were challenged to create a VR experience that would benefit the residents of a nursing home, by presenting them with a lively rendition of a place that they were not able to visit anymore, because of physical inabilities. As an additional feature, the students were requested to create an immersive environment for the medium to be shown in, that would enhance the experience of what the users had seen in VR.

The VR experience that was thus created was titled *Amstelpark VR*. It featured a ride on the little train that runs through Amstelpark, a large park in Amsterdam. By placing a 360° camera in the front compartment of the train, the students had captured the experience of being in the park and enjoying its sights and colors. The experience was presented to the residents of the nursing home in a room that was prepared beforehand by decorating it with green leaves and garlands, thus making the transition easier from the real world to the virtual world, and vice versa. To enhance the feeling of the riding train, a gentle breeze was blown through the room with a fan. While there has been no official evaluation test of this projects, the students accounted of the emotional reactions of the residents, and how much the users had enjoyed being able to see and experience the park again.

2.6 The Sixth Life: Decolonialization

A meeting in Lisbon, organized by the Cost Action program INDCOR [25], that had focused on decolonialization inspired the sixth life of the research project. Two teams of students of the Master Digital Design at the Amsterdam University of Applied Sciences were requested to create interactive digital narratives to accompany a set of paintings of the Dutch colony in Brazil in Rijksmuseum in Amsterdam. The dominant narrative that has accompanied those paintings has long been that the Brazil was 'discovered', thereby neglecting the indigenous cultures that already existed there, and ignoring the fact that

the original inhabitants were forced into slavery by the Dutch conquerors. The first group of students created an interactive audio tour called *Hidden History* that enables visitors to listen to stories from Brazilian descendants who tell about the role that the slavery past still plays in their daily lives.

The second student project created a VR experience named *Reframe*, in which the user stands in front of a virtual museum wall with the painting *View of the Island of Itamaracá* (1645) by Frans Post. Subsequently, various images on the canvas can be clicked on, followed by comments from contemporary Dutch, Brazilians and Ghanaians, who each see a different story in these paintings. This way, each viewer is confronted with the perspectives of others and thus with their own prejudices. On the other three virtual walls there are nine fictional paintings generated with the aid of artificial intelligence. While the assignment to the AI image generator had been neutral, in requesting paintings of a Brazilian plantation in 1600, the experiment showed that the image generator then automatically depicts the farm workers in black and places them in a rural landscape, showing how AI is not objective but instead full of prejudices.

2.7 The Seventh Life: Amelia Flies on

The last life of *VR for Diversity* continues to this day, as the main output of the project is still being requested for demos at various events. A recent notable occasion was GirlsDay, a yearly event that involves tech companies and institutions from all over the country opening their doors to girls aged 10 to 15, to elicit their interest in technical education and professions. Girls are invited to participate in all kinds of activities, meet female employees and learn more about working in technology. In April 2023, the VR experience *Amelia's Dream* was the main attraction on GirlsDay at the Amsterdam University of Applied Sciences. Young girls were dancing along with Amelia, commenting on her statements and agreeing loudly and wholeheartedly that girls can be and can do anything they want - thus once again demonstrating the impact on attitudes or even perspectives the medium of VR may convey.

3 Discussion and Conclusions

Conclusions from the *Amelia's Dream* experiment need to be presented with some caution. First of all, the sample was fairly small (103 participants) and the conditions under which the experiments were carried out varied, unfortunately: some participants were watching the VR experience in a busy hallway, while others were in a quieter environment. This of course may have influenced their experience. While none of the outcomes were extremely strong, the most significant effect was the self-reported measure about insight: being able to interact with the environment apparently lead to higher insight in the topic. However, when participants did not need to interact with the environment, they had better recollection of what had been said. This was also the case when the virtual character had looked participants in the eyes when conveying a message. The first outcome is in line with the earlier discussed work of Ferguson et al. [6] and while more research is certainly necessary to further confirm these findings, it may tentatively

be concluded that an interactive VR environment may indeed help to shift a user's perspective on a topic, even by just helping them to better understand an issue. However, when it comes to conveying actual facts that need to be remembered, a non-interactive sequence may be a preferable choice for a VR producer. The second outcome, about the impact of eye-gaze, is a promising first exploration of a field that may prove to become more important in the future with the use of VR pointing towards social experiences. However, also future VR research that focuses on the study of interactive storytelling may benefit from insights like these that connect narrative design to user experiences.

As the description of the different lives of the project has shown, the concept of diversity can be embedded in media in a multitude of ways. Not only can the content of the medium itself focus on diversity, as is the case with *Amelia's Dream* and the LHBTIQ+ museum, but also the intended audience can direct the interpretation of diversity, as the Amstelpark VR experience has shown. In working towards an inclusive and diverse immersive media landscape, and a continuous search for ways that VR may be used to contribute to a better world, it is important to keep sharing insights like these with (future) content developers.

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