

# Observations on Social Good Applications Created by New Developers

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## ABSTRACT

With the advent of easily accessible VR technology, many new VR developers are creating their own experiences. In addition to experiences centered around gaming and entertainment, many of these new VR experiences are meant to improve the social good. However, not much is known about how new VR developers approach creating social good experiences. For example, how do new developers attempt to craft a narrative around their message in VR? To address these types of questions, we reflect on our experiences as facilitators for a VR course centered around social good experiences. The course gave students the opportunity to learn VR development, as well as real-world researchers and entrepreneurs a platform to get their VR ideas developed. We report here on our observations facilitating this group of mostly new VR developers and the trends we observed in the projects developed.

## 1 INTRODUCTION

Thanks to the rise of low-cost headsets and free development environments, developing for virtual reality (VR) has transformed from a task confined to academic settings to one that many people can pursue at their leisure. With VR development so widely available, the variety of content that is being created is potentially vast, but, perhaps surprisingly, in addition to the more expected gaming and entertainment applications, VR is also being used as a medium to impact the world for the better. Individuals and organizations with little to no VR experience but who possess important societal messages are now turning to VR to communicate their ideas.

Given these developers' inexperience in VR development combined with their desire to communicate a specific message, one cannot help but wonder at what these experiences will be like. The social good messages identify the "what," or the content, of their VR experiences, but the "how," or the actual design process used by these new developers, is unknown: How will new VR developers try to leverage a new medium, and how does this differ from how they *should* use it? How successful will the new VR developers be in communicating their social good messages?

In this paper, we explore the "how" for new developers by reflecting upon experiences from a course devoted to VR and its applications for the social good. In the fall of 2017, we facilitated a course open to students of any major who wished to learn VR development to create experiences for the social good. Also integrated into this course was the chance to work with a real-world researcher or entrepreneur who had an idea for a VR experience. Students would work in teams with their researcher or entrepreneur to bring their VR vision to fruition. In introducing VR to the students, researchers, and entrepreneurs, we as the course facilitators had the unique opportunity to examine how new developers try to use VR in their first attempts. We reflect in this paper on what we believe worked well and what might be common issues for new VR developers. In section 2, we briefly describe the course structure and assignments before moving on to discuss the trends that emerged

from the students' projects in section 3. The trends that emerge often reinforce the existing literature on design and user experience but are important to note here as the most frequent trends for new VR developers. In addition to identifying these trends, we also provide relevant design recommendations to improve or mitigate the behavior as necessary.

## 2 THE VIRTUAL REALITY FOR SOCIAL GOOD COURSE

The aims of the Virtual Reality for Social Good course (VR4SG) are two-fold: one, the course gives students the space to learn about VR and its development, and two, the course connects student developers with researchers or entrepreneurs seeking to improve the social good. The course was therefore divided into two main sections: an individual project and a group project with a real-world product owner (PO).

For the first five weeks of the course, the students were given individual projects around a social good topic of their choice so that they may spend time learning or improving their VR development skills. Instruction in VR development was largely self-directed. Students were given a number of tutorials for Unity, the main game engine used in the course. Lectures during this portion of the course were instead spent discussing what types of experiences are best suited to using VR as a medium.

The advocated approach to identifying these types of experiences ties in well with Aylett and Louchart's labeling of VR as a narrative medium [1]; the authors argue that narrative media are identifiable as such given their "particularities that differentiate them from each other." These particularities, in turn, "determine(s) their relative narrative forms, means of communication and displays of content in relation to story." This idea of narrative particularities is clearest when we attempt to adapt a narrative of one medium to a different one. For example, in the *Harry Potter series*, one of the characters, Hermione, magically alters her parents' memories to protect them. The book mentions this fact briefly in dialogue, but the process is visually depicted in the final film by showing Hermione disappear from family photographs. The movie adaptation, a medium for which many scenes of character conversation may become tedious, must visually demonstrate this act to the viewer instead.

Thus, different narrative media are marked by their own particularities, and VR is no different. One of its predominant particularities is the existence of the interactivity in VR [1]. VR is unlike other narrative media in which the user has no control over the experience, and so the stories we tell in VR ought to leverage such user-influence.

Incorporating interactivity was a key design guideline we gave the students for their first assignment. By emphasizing interactivity, we hoped the students would craft experiences that were not better suited to other narrative media. To reiterate this point, we gave as a reference the idea that VR should be considered a "last resort": the stories we chose to tell in VR should be told in VR because they are difficult or impossible to tell otherwise. If a message can be conveyed as well in a film or game as it can be in VR, then VR should not be used.

We also used lecture periods to prepare students to collaborate as a team and with a PO. Because the students would be working with real researchers and entrepreneurs to develop VR experiences, we wished for the students to have a structured approach to collaboration that would enable them to be flexible and incorporate feedback from a variety of relevant stakeholders. So, in addition to discussing what

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experiences are best suited to VR, lecture periods also covered the agile software development process, the scrum framework, and lean principles.

These concepts discussed in class were then applied throughout the course of the second assignment, which was divided into two-week sprints. One member of each student team served as Scrum-Master [2] and coordinated the team's contact with the PO. The PO also reviewed the team's progress each sprint and provided feedback by prioritizing the team's list of tasks, or the product backlog. Students were also asked to conduct frequent scrum stand-ups to review each individual's progress and any hindrances to development.

## 2.1 Projects Developed

A total of 48 individual projects and 11 team projects were developed over the course of the fall 2017 semester at the University of Florida. A wide range of topics were covered in the experiences developed. The most popular topics for the individual assignment included water pollution, recycling, and deforestation. Other experiences addressed accessibility of proper eye-wear for children with impaired sight and virtual construction sites as a means of providing safe yet critical observations for construction management students. The team projects, which were those developed with the guidance of a PO, were also varied and included an airport simulation for those with Autism Spectrum Disorder and a simulation of the journey of a baby sea turtle to the ocean. We note the variety of projects here to highlight the relevance of the observations below to new developers working on different types of experiences. Despite the heterogeneity of topics addressed, the same development patterns occurred for many of these new developers.

## 3 OBSERVATIONS

The majority of students and POs had little to no experience developing a VR application, so the VR4SG course provided a unique opportunity to examine how those unfamiliar with a medium approach using that medium for the first time. As Bailenson notes in *Experience on Demand*, "people using a new medium have a difficult time breaking out of the thinking involved with the previous ones" [3]. From our experience as the course facilitators, we observed the students and POs wrangle with this difficulty, and, in some instances, even labor with the concept of a narrative experience itself. We reflect in this section on some of the most prevalent observations from the course and provide relevant recommendations for each observation. These observations are well-recognized in the literature but are important to review in the context of this course, as we find these to be the most frequent development trends for new VR developers.

### 3.1 An Ambiguous Message

Students were given the choice of what social good initiative they might pursue in the first assignment. Some of them came to this project with ideas in mind, but to help the undecided students identify potential topics, we devised a process by which they might identify a social good message around which a VR experience could be designed. First, we instructed the students to choose a social good issue corresponding to one of the seventeen sustainable development goals developed by the United Nations (UN) [4]. Then, to give a specific narrative for the VR experience, the students were asked to research non-profit organizations with a messages that advocate for the social good issue chosen in the first step. For example, the sixth goal listed by the UN is "Clean Water and Sanitation" [4], so a student might discover that one message the United Nations Educational, Scientific, and Cultural Organization (UNESCO) advocates is the treatment of wastewater for agricultural use [5]. So, by using this process, a student might be inspired to create a VR experience that informs users of the benefits of treated wastewater, instead of an experience that advocates the more general concept of clean water.

Undeniably, clean water is extremely important, but by focusing on specific message related to clean water, the VR experience will hopefully be more impactful and better adapted to the medium.

This process of identifying a social good message worked for many students, but we discovered that despite this process to choose a clear message, some experiences did not demonstrate such a message. No doubt the student had a message in mind, but the experience he or she developed did not communicate it with clarity. One example that stands out is an experience developed by a student in which the user is collecting trash from the ocean. While most potential users would likely agree that trash in the ocean is to be avoided, the takeaway from the virtual trash-collecting could have been any number of ideas: the experience could have instructed the user not to throw trash into the ocean, to produce less trash, or to participate in beach clean-up volunteer work. Any of these messages might have fit the act of picking up virtual trash, but without more context clues, none of them were apparent. This trend denoted little developer attention to experiential fidelity, "or the degree to which the users personal experience matches the intended experience of the VR creator" [6].

#### 3.1.1 Recommendation

To ensure greater experiential fidelity, we recommend recruiting users to test an experience before development has ended and reinforced this guideline by requiring weekly user feedback from the students in the second project. This user feedback, along with regular meetings with the POs, led to much clearer messages from the VR experiences. The users interviewed should be asked to describe what the experience is about, and if the message is clear, their descriptions should match the intended message. Another useful question to ask these users is to have them identify what they would do to continue building on the information they gained from the VR experience. If the users cannot identify such a call-to-action, perhaps the narrative of the experience should be reexamined.

Another suggestion to improve experiential fidelity is to prime the VR user with a back-story or context for the VR experience, much like theme park rides prime riders with content-laden waiting areas that direct the experience they are about to have [7]. The project allowing users to collect trash from the ocean lacked this sort of set-up, thereby rendering the overall message of the experience unclear.

### 3.2 An Over-Reliance on Existing Narrative Techniques

The first project perhaps demonstrated how much literature and film have affected our thoughts on the means through which an idea is communicated, as we saw the influence of both in the students' submissions. Rather than exploiting the visual and aural opportunities with characters and the VE, several students chose to render large blocks of text to convey the messages of their experiences. The interactivity was limited to exploring the VEs to discover the remainder of the text. On the opposite end of the spectrum, other experiences lacked any interactivity at all, save for perhaps the task of clicking a button to move to the next scene; users explored the VEs under the careful direction of the developer and had no capability to change or interact with what they saw around them.

#### 3.2.1 Recommendation

While an interactive experience is likely more resource- or time-intensive to develop than a non-interactive experience, we required interactivity of our students in order to justify the development of a VR experience, as we find that the lack of interactivity in both of these examples suggests that the experiences being created may be better suited to another medium. Thus, we recommend new developers review why a specific story or message needs to be communicated in VR. For example, if a VR experience would only make sense with the addition of large blocks of text, perhaps

the message itself should be delivered via a print medium. The removal of large portions of text from a VR experience should not leave it incoherent. Similarly, for the experiences that lacked any interactivity, one should wonder whether the same story could be told using camera and film, as this would save the time of crafting a VE and would increase the realism of the experience.

To add interactivity back to an experience, we also recommend new VR developers investigate existing interactivity techniques from other VR applications. One type of interactivity that we believe seems particularly suited for social good experiences is the concept of an “accelerated future”: a user can experiment in a VE by completing positive or negative actions, and the experience concludes with the user witnessing the outcomes of their actions, no matter how long those outcomes may take in the real world. An example of this type of accelerated future is used in Fox and Bailenson’s study with a virtual self that lost or gained weight as the user did or did not exercise [8]. This type of interactivity coincides well with a direct mode of learning [9], which we believe works well in VR since VR removes the potential threat of serious hazards.

### 3.3 A Focus on Features Over Message

The introduction of the PO to the students’ development introduced one behavior we found surprising: for some teams, the presence of the PO seemed to shift students into a more technical mindset and away from a focus on the overall narrative. Perhaps this shift was due to the demographics of the course – mostly undergraduate, computer science majors – as this role may have been one the students were more familiar with. As evidenced by the bi-weekly sprint documents, the students began presenting a list of features around whatever message the PO was interested in instead of pitching each week an experience that communicated the PO’s message.

This approach may not seem too flawed at first, as it gives the roles in the development process to those most familiar with them, but the first few sprints for these teams yielded work that was a somewhat incomprehensible, suffering in a similar way to the experiences with ambiguous messages of the first project. For example, a student team was working with one of the course facilitators as a stand-in PO on a project centered around food insecurity. The experience was meant to demonstrate how difficult getting adequate amounts of food can be as an immigrant child who may not have access to federally-funded assistance programs. In the first few weeks of development, the team focused so much on the feature of buying food in a virtual store that the *reason* for buying the food was not apparent when one put on the headset. One could exchange the virtual money for virtual food items, but this action did not communicate a point about food insecurity. Other teams demonstrated this feature-based focus by creating experiences that were a series of scenes in which the user performed a series of tasks, but the reasoning for completing these tasks together were not elaborated.

#### 3.3.1 Recommendation

To steer away from this feature-based mindset, we began asking students to storyboard their VR experiences before completing any further development. Storyboards are, of course, not a new design tool [10], but the task of communicating their importance to students who had had little to no design experience was a difficult conversation. However, we found this process helpful for two main reasons: one, the storyboards reminded students of the overall message they were embedding into their VR experiences, and so yielded more cohesive experiences overall, and two, the storyboard defined the boundaries of the development process. The VR experience was more or less done once everything in the storyboard had been accomplished, thus preventing the “what if” features and ideas that might have weighed down the experience.

Another technique that assisted in honing the students’ development back towards the message was the application of user stories,

an important tool in agile software development meant to shift focus from “...writing about requirements to talking about them” [11]. Students were asked to maintain a virtual development board that tracked each team’s progress on its project, and the majority of the items on the board were required to be in the format of a user story “As a (type of user), I want (some goal) so that (some reason)” [11]. As students became more adept at crafting these user stories, which emphasize a reason for a particular feature as much as the feature itself, we found the students’ progress on their projects grew more focused with fewer suggestions of features that were relevant but unnecessary to the overall message.

### 3.4 A Shift to Perspective-based Experiences

Finally, we noticed one major difference in the projects created by individual students and those helmed by POs: projects devised by the PO almost always had a clear audience in mind from the start of the project. The well-defined nature of the audiences then typically offered a specific perspective the user should take in the VR experience. For example, one experience was meant as advertisement of the use of a mobile phone application that would allow police officers and drivers to communicate with one another safely during a routine traffic stop. The main audience for this application was police officers, as well as the civilians that might be stopped by those police officers. However, in order to pitch this product to police officers, the VR experience was designed from the perspective of a police officer using the application.

#### 3.4.1 Recommendation

We recommend simply that the intended audience be identified before development begins. As with storyboards, audience-focused development is already present in design techniques such as personas [12], but we found that an audience focus offered specific directions for choosing the perspective represented in the virtual experience. As a result, many of the experiences used perspectives very similar or extremely dissimilar to the intended audience. For example, in the traffic stop application, the audience of police officers suggested the use of a police officer’s perspective. On the other hand, the intended audience for the experience that demonstrated the difficulties faced by baby sea turtles traveling to the ocean was individuals who were unfamiliar with the sea turtles’ journey. Therefore, the application was developed from the perspective of a baby sea turtle.

## 4 CONCLUSION

In this paper, we reflected on our experiences facilitating a course focused on VR development around social good messages. We offer four main observations of the projects crafted by new VR developers: the first three – ambiguous messages, over-reliance on existing narrative techniques, a focus on features over messages – represented trends that we believe hindered the VR experience or stalled development. We identify these as the primary hindrances faced by new VR developers working on social good experiences. The final observation regarding the emphasis of perspective-based experiences we believe to be a positive one and recommend continuing its practice for future VR work.

In future iterations of this course, we plan to implement our own recommendations as part of the course structure. We will continue to recommend students demonstrate their project to their peers in order to elicit feedback. We also will continue to provide in-course peer and facilitator feedback that may hopefully assist some students in designing the interactivity of their experiences, and finally, we plan to require all student teams paired with a PO to craft a storyboard and identify an audience at the beginning of their projects to ensure a clear direction and perspective.

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