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Librarian perspectives on the role of virtual reality in public libraries

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Abstract

This paper explores librarians' perception of virtual reality as well as opportunities and challenges associated with implementing VR in public libraries. We interviewed 36 librarians who developed and offered VR programs as part of the research project, before and after the programming. The findings show how VR may be used in the public library as a learning tool and technology that encourages social interactions. Librarians discuss how the unique qualities of VR such as immersion and interactivity of VR makes it different from other digital media and present a different set of potential challenges when offered in the library. Librarians observed that while VR has a lot of potential as a technology for learning and social engagement, the success also largely depends on the VR content as well as the librarian's strategy for recruitment and promotion. In addition, we found that librarians had different understandings of what constitutes learning as well as how marginalized communities might benefit from this technology. The librarians we interviewed faced many challenges, however, our analysis of their experiences offers insight into designing successful VR programming in public libraries.

KEYWORDS

digital media, informal learning, library programming, social engagement, virtual reality

1 | INTRODUCTION

Public libraries serve as an excellent venue for disseminating new technologies to the general public. As public libraries also serve as a community hub, providing opportunities for the public to use new technologies in these spaces has the potential to reach a wide demographic. In addition to printed materials, more libraries have started offering patrons access to a variety of newer technologies such as 3D printing, E-textile, robotics, to name a few (Fisher et al., 2016; Hoffman, Subramaniam, Kawas, Scaff, & Davis, 2016; Jaeger, Bertot, & Subramaniam, 2013; Lee & Phillips, 2018; Subramaniam, Ahn, Fleischmann, & Druin, 2012). However, when new technology is introduced, it is not always evident how to best implement it. Librarians often find themselves in situations where they are learning about the technologies themselves as they are designing the programming incorporating those technologies. If they are not motivated, not inherently interested, or feel certain limitations as they are learning about the technologies, the service provided to the library will be impacted as well (Koh & Abbas, 2015). In order to successfully adopt and implement different

technologies in library programming, there is a need to first understand the librarian's perspective on integrating such technology.

Virtual Reality (VR) is one of the technologies that is increasingly starting to get adopted in libraries. While the interest in VR is growing, it is still considered an expensive piece of technology which not many people can afford (Dahya et al., 2019). Libraries could potentially be a good venue to introduce VR to the public without the cost from end users, but we currently have limited understanding of how to best offer this technology in libraries. As of now, much research has been done on the possibilities of using VR for both educational and entertainment purposes (Wickens, n.d.; Bates, 1992; Psotka, 1995). In addition, there have been a few studies exploring how VR is used in public places such as in museums (Roussou, 2001; Wojciechowski, Walczak, White, & Cellary, 2004) but few investigate public libraries as the venue for VR programming. We aim to fill this gap by increasing our understanding of the possibilities VR can offer in the public library which serves diverse users and supports goals such as social engagement, equitable access, and informal learning.

We conducted a study with Washington State Libraries to understand the role of VR in public libraries. More specifically, the goal of the project was to better understand the impact of offering VR in public libraries, with a focus on informal learning and community engagement. We conducted a case study of seven library sites using mixed methods to understand the meanings librarians and patrons associated with VR in the context of libraries. During the course of our case study, we conducted an online survey of patrons who participated in the VR program, interviewed stakeholders including both library patrons and librarians, and did several site visits for observations. In this paper, we primarily focus on discussing our findings from the librarian interview data. In these interviews, we gathered information on librarians' perception of the potential uses of VR to understand how librarians envision using this technology and imagine how this technology will develop in the future. We also collected information about their actual experience of offering VR programming in libraries and how that experience impacted their view on VR. By analyzing the collected data, we were able to understand how the different librarians engage with the VR technology and offer suggestions on what kind of preparation and infrastructure are needed to better support librarians when implementing VR in the library. In this paper, we specifically aim to answer the following research questions:

RQ 1. How is VR perceived by librarians as a relevant technology in libraries, especially as a tool for informal learning and social engagement?

RQ 2. Based on librarians' actual experience of offering VR programming, what are the implications for successfully designing and implementing VR programming in public spaces, related to library goals?

2 | RELEVANT WORK

2.1 | Defining of VR and its use

Virtual Reality in this paper is defined as a highly interactive, computer-based, multimedia environment in which the user becomes a participant with the computer (Pantelidis, 1993). Important characteristics of VR are summed up with the 3Is (Burdea & Coiffet, 2003): Immersion, interaction and imagination. *Immersion* can be defined as a physical feeling of being in a virtual space. This is achieved by the sensory interfaces which surround the user. *Interaction* is about the user's ability to alter the environment and to receive feedback based on the interaction. The goal is for the user to have a feeling of presence. *Imagination* is how VR makes it possible for people to perceive non-existent things, creating the illusion of them being real (Sheridan, 2000).

Virtual Reality technologies have first been applied in sectors such as in military, business, and medicine for training purposes. Studies have shown how students can benefit from directly interacting with objects and learning within VR. For instance, medical students were able to study complex anatomical structures within VR. In the study by Jang, Vitale, Jyung, and Black (2017), they showed how the medical students who used VR to directly manipulate a virtual anatomical structure were able to draw the anatomical structure better compared to the group that learned the content through viewing a stereoscopic, 3-D environment without direct interaction. In the case of VR and the military, military personnel exhibiting PTSD (Post Traumatic Stress Disorder) have used different VR content for therapeutic purposes with positive outcomes (Rizzo et al., 2005). In these cases, people have taken advantage of the fact that VR enables users to directly interact with the objects inside the VR space and manipulate them without the risks in reality.

Currently there are multiple VR devices available with varying prices and features (Hellyar, Walsh, & Altman, 2018). There are devices such as Google Cardboard where the user can use their mobile devices in a constructed headset that are comparatively low in price. There are also devices that require to be connected to high-powered computers and are higher in price such as the Oculus Rift and HTCVive (Moorefield-Lang, 2015). The higher-end devices allow the user to more actively interact with the environment due to the hand tracking system (Beattie, Horan, & McKenzie, 2015; Lee, Wang, Tung, Lin, & Valstar, 2015).

2.2 | Current stage of VR research and VR for public places

The current literature on VR is heavily focused on improving the system to enrich the experience with more interactions and immersion (Cummings & Bailenson, 2016; Diemer, Alpers, Peperkorn, Shiban, & Mühlberger, 2015; Riva et al., 2007). Researchers have also investigated how people use VR in multiple situations such as using VR in schools to enhance learning (Brown & Green, 2016), for job training (Smith et al., 2014), and for therapeutic uses (North, North, & Coble, 1998; Slater, Pertaub, & Steed, 1999). However, fewer studies have explored how to use VR in public spaces. Roussou (2002) examined the issues involved in VR for public use and pointed out how the experience in such public spaces was controlled, structured and brief, therefore, questioned the added value of VR in the public domain. However, Roussou (2010) later pointed out how informal educational institutions still showed a tendency to favor various forms of VR to deliver their educational agenda more effectively.

Overall, VR has a relatively short history of being introduced to the general public. Even though commercial VR has been around since the mid 1990's (Engler, 1992), people who had access to the technology were limited. Today, while more people have had some kind of experience in VR and also are more familiar with the concept of VR, it is still considered a cutting-edge technology for the majority of the people and not something many people own themselves. Massis (2015) states that libraries are keenly aware of the importance of introducing all modes of materials to support the work of the student. Librarians are always adopting cutting edge technologies to engage their patrons and use various tools to encourage higher levels of information literacy (Joo, Choi, & Harper, 2019; Pawely, 2003). However, technologies are not neutral but are cultural artifacts (Polgar, 2010). Therefore, librarians need to be strategic in how they offer different technologies to the public.

Prior to our project, Oculus education partnered with the California State Library to offer VR experience in public libraries. The pilot program placed around 100 rifts in 90 libraries to allow even more people to experience VR. The goal of this project for Oculus was the hope that early access of the device would later invite more people in the VR industry (Brant, 2017; Lambert, 2017). Before the partnership with Oculus, John MacLeod started the program Virtual and Augmented Reality in Libraries (VAR) which explored the best devices for VR experience and how such devices can be used effectively in libraries (Brant, 2017; Lambert, 2017). The pilot project with Oculus in California State explored the educational aspect of VR as the main focus of VR has long been on gaming.

The pilot project focused on the implementation of VR programming in libraries and thus, we do not have research data that were systematically collected to show the challenges and factors for successful programming. Our study aims to fill that gap, and furthermore, in our study we not only focus on the educational aspect of VR in libraries but also on community's engagement with the device.

A similar kind of public space where the use of VR has been explored is the museums. Museums are similar to libraries in that they are both public and therefore, serve a diverse group of users. Compared to studies on VR in the library, there have been more studies of VR in the museums (Parry, 2013). In these studies, they discuss the limitations of VR as the technology not designed for novices or special users in mind. Therefore, the studies suggest having clear guidelines of use for VR from seating suggestions to the selection of the application for all different patrons with varying abilities. The difference between museums and libraries, however, is that in many cases museums are able to have a theme that well aligns with the goal of the museum (such as art, science, or nature) or are able to select and use different types of VR applications with pre-set learning goals. In the case of libraries, the criteria for selecting the VR application is often less clear since public libraries typically do not have a particular theme.

2.3 | Library programming using digital media & technology

Regardless of whether or not the library is affluent, it has become common to see more libraries using different types of technologies to build digital inclusive communities (Bertot, Real, & Jaeger, 2016; Ito et al., 2013; Jaeger et al., 2013). Libraries are also considered to be ideal places for connected learning to occur as they provide a space for patrons to learn based on their interest and often gives opportunities for peer support (Hoffman et al., 2016). In the literature, we see more libraries being reconceptualized as a space for learning and for knowledge production through Maker Spaces and tech programming (Koh & Abbas, 2015; Lee & Phillips, 2018; Subramaniam et al., 2012; Yip, Lee, & Lee, 2019). Even though such efforts are being made, Agosto, Magee, Dickard, and Forte (2016) showed that US high school students tended to think of libraries as largely outdated institutions. The study called out the need for libraries to show teens who were highly engaged in technology that libraries and technology were not conflicting concepts.

In a more recent study, Subramaniam, Scaff, Kawas, Hoffman, and Davis (2018) interviewed and had focus

groups of 92 youth-service library staff working in public libraries across the United States. The study reveals the various ways technology is used in youth focused library programming. The different technologies that were mentioned in the interviews ranged from software that allows design and editing, to building kits, and coding with programming resources. The study shared various opportunities and difficulties public youth librarians face in leveraging digital and networked technologies to inclusive learning environments. In our paper, we narrow our focus on the use of VR in particular to better understand the specific implication of using VR in the library rather than all technologies in general.

2.4 | Study design and method

The goal of this research was to understand specifically librarians' perception on VR in Libraries. This study was part of a larger project aiming to understand the impact of offering VR in public libraries by partnering with Washington State public libraries and Oculus. The larger project employed a case study of seven library sites using mixed qualitative methods to understand the meaning librarians and patrons associated with VR in each setting.

We interviewed 23 librarians at the beginning and the end of the project resulting in a total of 36 interviews from participating library sites. There were 13 librarians who participated in both entrance and exit interviews, four librarians who only participated in the entrance interview, and six who only participated in the exit interview. Participants included those who were involved in administering the day-to-day VR programming and a few in administrative roles who were not directly involved in facilitating VR experiences but had some goals or visions of how VR might be used in each library. We chose the participating library to reflect the diversity and variety of libraries in the state of both urban and rural libraries with differing resources. We used the Oculus Rift which provides the user a stronger sense of immersion and more interactivity than simpler devices like Google Cardboard (Powell, Powell, Brown, Cook, & Uddin, 2016). High power computers and the Oculus Rift devices were provided to all the participating libraries during the study.

We used a semi-structured interview protocol (Merriam, 2009) to give flexibility to the participants to reflect on their own experience with VR. In the pre-interview before the librarian ran VR programming in the library, we asked general questions about their role in the library and their goal as a librarian. Next, we asked what knowledge they had on VR and their expectations on how VR could be used in the community they were serving. In the post interview we asked more specific questions on the experience of having VR sessions in the library such as what content they used, and what they considered as successes and challenges in implementing the programs.

All interview data was transcribed and coded collaboratively. We used a qualitative analysis software named Quirkos which provides a visual way to manage and analyze the transcripts. Each author openly coded two librarian interviews and, together, authors generated a codebook through discussions of common themes. All transcripts were then assigned to at least two independent coders. There was a total of six coders for this project. Following a consensus model, the two coders compared their results aiming to reach consensus and in case of disagreement, the third person acted as the tie breaker. The final codebook is presented in Table 1.

We also collected 186 survey responses and 39 interviews from patrons asking about their experience of VR. In this paper, we primarily discuss the main findings from the librarian interviews regarding how they envision the role of VR in public libraries and how to implement successful VR programs. We also conducted site visits from March 2018 through June 2018 to observe patrons using VR and the overall structure of the programs. Field notes were referred to after thematic coding of interview data to identify more descriptive examples of findings derived from interviews.

Each library was responsible for its own programming. Oculus provided a suggested list of educational games as well as some free entertaining applications. The educational games came with no instructions on how the application should be used with the exception of Mission: ISS which had accompanying lesson plans. Below is the list of applications suggested by Oculus for VR programming (Table 2).

The library sites selected for this study reflect the diversity and variety of libraries in the state and include urban sites as well as regional and rural sites.

3 | FINDINGS AND DISCUSSIONS

3.1 | Librarians' prior knowledge and perception of VR

In this section we report on how the librarians perceived VR as a tool for informal learning and social engagement *before* the implementation of the program.

3.1.1 | Informal learning

When librarians were asked about the potential use of VR for informal learning, their answers focused primarily

TABLE 1 Codebook used for data analysis

Learning Experiences	Learning codes will address, reference, project, or allude to any kind of noted success or failure in learning in the use of VR.
Learning Content	Learning content applies to when someone suggests they have actually learned something from the VR experience with a focus on the content of the VR experience.
Learning VR Technology	Learning technology/VR pertains to learning how to use VR, using controllers, and learning about VR technology/
Learning Concerns/ Difficulties	Any concerns about challenges or difficulties related to learning such as assessment, programming, accuracy of the learning content, etc.
Perceptions/Beliefs about VR	**Perceptions and beliefs about what VR can or might do for users in libraries, school, or other public settings.**
What VR Can/Cannot Do	Perceptions and beliefs about VR affordances and uniqueness, perceived problems and concerns, including affordability, needed equipment, and across contexts.
Prior knowledge	What librarians/Users knew about VR before their VR experience in libraries
Perceived Psychological & Physical Effects	Any perceived psychological or emotional effect related to the VR experience, including mental health, empathy, anxiety, disassociation, healing; perceived physical effects like fear of nausea, eye pain, headaches, etc.
Beliefs about User/Audience Qualities	Perceptions about users or audiences who are going to be interested in VR and why
Perceived Social	Perceived advantages/disadvantages about VR in social settings & the possibility of VR as a social tool (e.g., perceptions about room size, thoughts about being watched not based on the experience).
Experience	**Comments about the actual VR experiences**
Emotional Response	Emotional response to the experience, such as fun, excitement.
Physical Reactions	Such as nauseous, dizzy, falling over, knocking into things, etc.
Uniqueness/Affordance of VR	feeling of being transported to a different world, immersion, intangibility of the virtual environment.
Challenges	Comments about the challenges people experienced in their use VR such as time, quality of equipment, etc.
Social	Instances of interactions between the person experiencing the VR and one or more additional persons.
User characteristics	**Comments regarding actual user groups specific to particular gender, race, class, age, or marginalized communities to gamers.**

on the affordance of VR, specifically immersion and interactivity in a virtual space. Many librarians discussed the visual stimulation from the immersive VR experience, often stemming from their own imagination. For instance, L19 stated "instead of learning about the Civil War, they can just be in the middle of the war to see what's going on". Librarians made comments on how such an immersive experience will not only help with "children's imagination" (L1, L9, L23) but also help retain the memory longer (L1, L9). Librarians also discussed the potential of interactivity in VR, especially for learning different skills without worrying about negative consequences; L11 stated "you could interact, maybe try things, all the experiments. You could do chemistry…You could do stuff like that without the danger or the cost of the actual equipment". L13 thought that VR will provide a different way of telling stories and L14 imagined it as a tool for building empathy as people would be able to experience a situation from someone else's perspectives that are otherwise unavailable. In addition, several

librarians talked about their perceived difference of VR from other resources, sharing that some of their library patrons have a difficult time being immersed in books and learning from textual materials, and therefore VR would be a useful resource for them in particular. Overall, there was an expectation that VR would serve as a great supplemental resource to help people be more engaged in their learning experience.

3.1.2 | Social and historical engagements

In the entrance interview, librarians had mixed perceptions of VR as a tool for social engagement. While some librarians were excited that VR could be used as a tool for supporting social engagement such as interacting with people inside VR through conferences and project meetings, some also shared concerns about it further isolating people. For instance, L18 commented on VR that "this can be even more seductive and draw people even

TABLE 2 The list of applications

Name of application	Content
First Contact	Interactive experience with robot to learn VR controls
Dreamdeck	Short series of non-interactive films
Lost	Short animated film encountering a robot in the forest
Google Earth	Explore Earth, tour cities, etc.
Ocean Rift	Explore underwater creatures
Star Chart	Explore the stars and planets in outer space
Mission ISS	Explore a space station
Invasion	Short animated film about aliens coming to Earth
Quill	Illustration tool
Medium	Sculpting tool
Body VR	Virtual tour of the inner body
People's House	Tour The White House with President Obama
Through the ages	Tour Yosemite National Park with President Obama
Cat Flight	BBC documentary/nature documentary

more away from being outdoors in the fresh air or always socializing, that type of thing".

In the entrance interview, we specifically asked the librarians on how VR could impact historically marginalized people in their region. Although how they defined marginalized users was different in each community, librarians talked about the transportational nature of VR experience as something that could be beneficial for them—for instance, in the VR content the users are able to go to virtual spaces or a replica of a real place. The librarians noted that VR gave the opportunity for people to travel to places without any expenses. L14 stated "A lot of people can't fly to Washington D.C. There's no way they could do that and go and visit the White House and learn all of these things, but with VR, they really are having a kind of similar experience... You feel like you're right next to Barack Obama, but you aren't."

The most common way librarians defined historically marginalized people in their community was to refer to people who lacked access to money and technology: "people who have lower income" (L9) and communities that for "financial reasons" (L11) could not afford technology. For these people the librarians felt that VR in the library could positively impact them as the use of technology is free. They also emphasized the importance of exposure and access to such technology (L1, L10, L4) for

such users. Another common way of how they defined historically marginalized people were people from different cultural backgrounds such as immigrants and non-native English speakers. For this group of community many librarians talked about how VR could potentially be used to share the story of their own culture. L22 stated "I think [what] would be interesting is people seeing their own experiences reflected, or even kids whose parents were immigrants". This librarian also added "I think it'd be really cool if there were content that centered their experience instead of seeing themselves as marginalized". L3 had similar hopes about "learning about native culture". L19 also stated "Native Americans weren't treated great ...getting to see living conditions, getting to see artifacts from that [would be valuable]". For the non-native English speakers, librarians imagined how VR could be helpful for them to learn the language as "You get immediate feedback" (L2). There was one librarian (L6) who defined marginalized communities as people who "didn't thrive in school" and for this group of people the librarian stated that experiencing different kinds of jobs skills in a VR setting could be impactful.

3.2 | Lessons learned from VR programming

3.2.1 | Reaching out to potential users

The majority of the librarians were skeptical as to whether the VR programming had any impact on the marginalized people in their communities. While for marginalized communities who were defined as financially disadvantaged were perceived to have benefited from the program [e.g., "we had a number of homeless people come in and use it" (L9)], the impact to people with different cultural backgrounds was more questionable. We do recognize that for some librarians, their goal was not to specifically reach out to the communities who they perceived as historically marginalized, but rather it was targeted to engage "all" people (L7). L14 stated "I don't think we did very much programming here that reached out to other marginalized groups". As a result, these librarians stated how the people who were trying out VR in their libraries were not from any marginalized communities (L5), but rather users were already active in the libraries.

Many librarians also stated how getting participants to sign the waiver form for experiencing VR as a hurdle. For safety issues, children needed a caregiver's permission obtained by having their parents sign a document. The researchers translated all forms into multiple languages - Korean, Spanish, Russian and Somali - to reach

common language groups in the region of the public libraries. However, few waivers in languages other than English were returned to libraries. The cycle of bringing the waiver form to parents, explaining it, getting them to sign it, and getting it back to the librarian was a complicated task for a child.

One librarian who was situated in a community where there were many working-class families such as having more than two jobs reflected how the cycle was 'unjust'. The librarian also described the imbalance in gender distribution of VR users. They reported seeing more male users who were in their 20s and enjoyed playing video games. However, librarians did note that once people tried VR, the majority of them loved the experience regardless of their age and gender. Despite this, they clearly saw that older or female patrons were generally not the first ones to volunteer to participate on their own.

3.2.2 | Space issues: Private vs public places

Several librarians discussed tensions between placing the VR equipment in a private or public space. In case of patrons who desired privacy during their VR experience, they stated they preferred closed-off spaces for VR. A participant quoted "I didn't know who else was watching. So, when they commented on what they were watching, alarm bells went off." However, we also observed that setting up VR in the main space of the library near a general reading area enticed patrons to try VR when they otherwise might not have; seeing other patrons use VR was a good incentive for unlikely patrons to feel comfortable enough to try it out. For instance, in the exit interview, the librarians commented that while they did not think of them as the main target users, a number of elderly patrons used VR, often because they were able to see others participate.

Later, when we interviewed the elderly patron, he stated how he initially believed VR was not for him but ended up enjoying the experience. He shared that the VR setup being in the main space and the opportunity to see what was happening motivated him to try it. Another patron echoed this by stating: "The trouble is in a private room, no one could overhear what's going on. So the beauty of having it where it was, was where everyone can see it going on, is if you had it private then someone like me might not have seen it." Because every library is different regarding the space available, target users, and user characteristics, it is important to understand these elements and select the best setup for each library rather than prescribing one type of setting as a desirable solution. Another idea, if possible, would be to alternate spaces to increase the chance of reaching out to different types of library users.

3.2.3 | Accessibility

Another unique aspect and potential limitation of the current VR technology was that in order to participate, the user had to put the headset on and use the hand controls to navigate in the VR space. This was challenging for patrons who had mobility issues or cognitive disabilities. We did observe a couple distinct instances where the librarian was able to work around the limitations, either by providing closer guidance or taking the controllers themselves and following the verbal instructions of the patron in a wheelchair. In the exit interview, this librarian L13 shared "The thing she said to me right after I took the headset off of her was, "This made me forget for a little while that I'm in this chair", explaining that the VR experience had a positive impact on the user allowing her to forget about her physical barrier in mobility. Despite this positive example, we observed that some of the VR programs used by people with disability did not come with accessibility features. For instance, in one VR experience, the participant in a wheelchair always had a view looking up from a lower position without an option to adjust the height to have a comparable experience as other users who were experiencing it standing up. In addition, while we limited the use of VR for patrons under the age of 13 following guidance from Oculus, there was limited scientific information on the age restriction as to why this limit is imposed.

3.2.4 | Novel technology

As for most of the patrons it was their first time using VR, and librarians stated how the novelty of VR led to strong interest (L12, L8). L8 stated how this resulted in people "peer coaching" each other. For instance, the librarian shared how a child would try VR and tell their friends whether or not they should "give it a try" and then guiding them in their VR experience. The librarian stated how this "brought out good social aspects". However, the librarian stated when the novelty effect wore off, the interest faded in some users.

During our library site visits, we also witnessed how people participating in the VR program generated conversations among the librarian, the people trying the VR experience, and also the spectators, including people who might not otherwise talk to each other. People responded and reacted to what was happening in VR as shown on the outward facing display screen and people interacted

with and around the person in VR. For instance, in field notes, one researcher writes:

> User 3 goes into *Ocean Rift* and User 1 is giving instructions (User 1 is also a teen volunteer). User 3 is swimming...She keeps moving around and gets away from the sharks and switches scenes... User 3 says "Yeah, but what else is here?" and keeps exploring. "Anywhere but those sharks" and User 1 helps navigate the options, and everyone around tries to help her decide where to go. Others are still sitting or standing around watching.

Here, even though there is only one child in the VR headset, spectators with and without VR experience are actively engaged with helping the user. This is a good example illustrating how VR can be used in the library as a social tool even though the VR application was designed for a single person experience. In addition, librarians also noted in the exit interview that the experience of VR sparked unlikely conversations between the older patrons and younger patrons after they have both experienced VR.

3.2.5 | Limited VR content

Many librarians expressed how the content available in the VR did not meet their expectations and were interested in having tools to create their own experience in VR. L23 stated "but the more I learn about it, even though we have the hardware, the software capability is not there yet", noting the specific limitations of the VR experiences that are currently available for learning. L22 stated "I'm really interested in game design and involving people of different ages in content creation".

The applications people were using such as visiting the White House, going under water, and going into space did provide memorable and enjoyable experiences to them but most patrons did not talk about learning new information from those experiences. This also had to do with the limited time people were allowed to be inside of VR. A few patrons also pointed out that some of these "educational" VR experiences simply provided them text to read within the VR experience, thus simply replicating an educational model that is familiar to us, rather than a meaningful integration of the educational content that requires and makes the best use of immersive interactions.

The majority of librarians discussed patrons learning about the VR technology itself more so than learning

from the experience within VR. For instance, several talked about library patrons learning how to use the controller to interact within the VR environment. L18 stated "actually physically using the hand controllers and interacting with the visual fields using the headset and... That was a learning outcome". L13 acknowledged "I haven't really approached it with learning objectives that I wanted to teach. I think, for the most part, my main goal was to get a few people familiar with the technology". Likewise, for many patrons, the experience was about getting exposed to the new technology, rather than reaching the point of learning different job-related skills, empathy, or a particular subject in VR. Some librarians also regarded patrons experiencing VR itself as a valuable learning experience.

3.3 | Implications for librarians

3.3.1 | Targeted outreach

Interviews with librarians revealed the importance of how the librarian identifies 'marginalized communities' in one's community in determining the overall success of the program. For instance, if we identified 'marginalized communities' as financially disadvantaged people, some librarians may state that the programming was very successful indicating the fact that patrons who would otherwise have difficulties accessing the technology due to financial reasons had a chance to try out VR. However, a librarian who has a different definition of a marginalized community based on race and ethnicity may view that marginalized people are being excluded and would aim for a wider outreach. Therefore, it is important to remember that our understanding and perception of marginalized communities do impact how we evaluate the success of the program and come up with strategies for targeted outreach.

3.3.2 | Alternative options

One of the current limitations of VR is that it does not take into consideration participants with impairments very well. In addition, there are restrictions regarding the use by young children under certain age. This means that VR programming will inherently exclude certain people for engagement. This also shows how technology is not neutral as discussed in prior work (Polgar, 2010). Therefore, it is important to think about how to connect the VR program with existing services and resources in the library to make the program more meaningful to a larger audience. This also impacts how the library may reach

out to underrepresented populations - instead of simply promoting the use of VR as a new technology, trying to connect it with another program which they value, such as a STEM or art/design program, and promoting it may have better success. For instance, we observed a highly successful session in one of the library sites where they had offered music-related VR experience in conjunction with wrap-around programming using a music creation software. Youth patrons took turns and enjoyed the VR experience while their friends were sitting on the table using the software to make music. The patron in the VR experience would engage in conversations with their friends, as they compared and commented on individual's performances. Librarians need to make judgement as to how to best set up the VR in each unique library's context to maximize the user engagement.

3.3.3 | Content creation

Current VR content has limitations on supporting learning or engaging due to the limitation of available content within VR. One way to potentially address this issue is to design VR programming which incorporates more creative experience for the users. Currently, some urban libraries have started to involve historically marginalized people in their communities in developing content relevant to their communities. For example, Seattle Public Library has created their own content in VR that was relevant to their communities such as 'the Evolution of the Duwamish River in VR' that introduced the history of the Duwamish River and the community surrounding it and 'The experience of the Great Seattle Fire in VR' with student interns from underrepresented populations. While not all libraries yet have the infrastructure to involve users to build their own content in VR, we do believe that tools that allow content creation within VR such as art tools still give opportunities to patrons to feel more empowered in how they experience VR rather than simply consuming the existing experiences that are made for them.

4 | CONCLUSION AND FUTURE WORK

In this study, we found that as the space and the people being served in the library drastically differ by location, the opportunities patrons can have in the libraries very much differ as well. Each of the librarians involved in this study were dealing with different situations as to the number of patrons, the space they had, and the additional resources provided from their own library and community. The work aimed to contribute a general understanding of the librarians' experience of having VR in a public library setting. From these findings we learned that often whether VR programming is successful or not is not simply about the technology itself but how each librarian made a careful and intentional decision on different ways of creating social and educational experiences. In addition, we learned that the perception and expectation librarians had on VR prior to implementing the programming did not match the currently available content within VR. We do not know in the long run how the different patrons being served in the library would engage with VR and how librarians' use of VR will change as they reflect on previous experience. It will be important to continue to accumulate these kinds of insights and establish guidelines that can be turned into a useful resource for sound development and evaluation for VR and other interactive technologies that will undoubtedly continue to emerge in the future.

In our future work, we plan to explore how to offer more VR content creation opportunities for users in public libraries ranging from simply having them use various art programs to actually code the VR content in game engines like Unity. We believe that libraries can play an important role in promoting diversity in creative workforce who get to design these experiences. This will not only help reflect various perspectives in the experiences themselves, but also help the technology thrive as more people will be able to participate in generating interesting content.

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