



# NEVADA XR LIBRARIES REPORT — 2018-2019



# Phase I

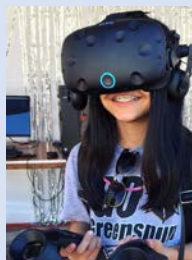
Nevada State Library's Emerging Technology Early Adopter Program

A Nevada XR Libraries Report



## Key conclusions

- AR/VR programs provide measurable benefits to youth and adult learners on outcomes directly related to classroom instruction.
- AR/VR programs can demonstrably improve student engagement.
- Program quality and intentionality influence outcomes.
- Regular access to AR/VR resources measurably benefit persistence in problem solving.



## Feel the Learn

### Library leveraged XR programs

The State Library is facilitating the development of 21<sup>st</sup> century skills for all Nevadans by encouraging the adoption of extended reality (XR) in an anytime/anywhere learning space like the local library. By empowering teachers to integrate this technology into their classroom, we are ensuring that Nevada's students have equal access to the technology necessary to keep pace in the current and future knowledge economy. Extended reality offers students the opportunity to see themselves in a future STEM career, which is impactful for all Nevadans, especially those too often underserved.

Thanks to the 2017 Nevada Legislature-approved Senate Bill 549, a small portion from these state funds became seed money for a pilot program aimed at placing educational extended reality technology in libraries. Further leveraging SB 549, the Nevada State Library assembled a group of partners—such as Califa, XR Libraries and Lifeliqe—to assist in the implementation of Nevada XR Libraries. With help from these and local libraries, we were able to launch Nevada's first extended reality library program.

In fact, it is due to the commitment of our partners that this initiative is succeeding beyond our most optimistic hopes. What follows in these pages are noteworthy stories and outcomes from Nevada XR Libraries' first year.

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Carson City librarian Maria Klesta explains XR to a patron.

## Executive summary

In a 10-month long pilot, Nevada librarians from 15 libraries and one planetarium assisted more than **1,600 patrons** in experiencing XR. Public response to this emerging technology was extremely positive, with over **90% of patrons reporting that they had learned** something from their experience, felt confident about what they have learned, and are likely to attend similar library programs!

In an education-focused use of the technology, librarians partnered with local teachers to integrate XR into their curriculum. The 13 participating libraries brought access to educational XR experiences to 309 students. Overwhelmingly, students reported positive results, from increased **engagement (86%)** to more subject **curiosity (80%)**, to **improved understanding (83%)** as a result of using XR. The students also strongly felt that virtual reality has the potential to help them **prepare for a future job (83%)** and wanted to see **more VR in their library (93%)**.

Teachers reported that their students loved experiencing VR and were genuinely excited about learning in that format. One student summarized it: *"When teachers explain [concepts like cells] I don't really know what [they're] saying. But since I've been in a cell now, I can explain it."* It is fair to say that this immersive approach to education has endless potential for Nevadans and the Nevada State Library is proud to share our results from this initiative.

## Introduction



Education around the world continues to rapidly shift to include emerging technologies, and libraries continue to adapt to offer access to their patrons. An emerging technology can be defined as a radically novel and relatively fast-growing technology, which is full of potential and capable of changing the status quo. The Nevada State Library is committed to ensuring Nevadans have equal access to emerging technologies, providing resources and training to encourage libraries to adopt them, and empowering library staff and library patrons to use the technology to meet their needs and expand their horizons. A 'ladder of learning' from 'pre-K to gray' blends formal and informal learning through schools, universities, media, museums, libraries, companies, churches, youth groups, parks and more.<sup>1</sup>

One such emerging technology is extended reality (XR), which is an umbrella term used to describe the real and virtual combined environments created with technology. Extended reality includes augmented reality (AR), mixed reality (MR), and virtual reality (VR). Although the most visible use of extended reality is in video games, XR is also a very powerful learning tool. Due to the immersive nature of the technology, studies have shown that students are able to recall memories faster when they learn in VR, and users are far more likely to be deeply engaged with the topic they are studying. Extended reality creates engagement and enthusiasm for learning in students and embeds

social and emotional learning in their curriculum<sup>2</sup>.

By encouraging the adoption of extended reality in an anytime/anywhere learning place like the local library, the State Library is helping facilitate the development of 21<sup>st</sup> century skills for all Nevadans. By empowering teachers to integrate this technology into their classroom we are ensuring that Nevada's students have access to technology necessary to keep pace with the knowledge economy. Extended reality offers students the opportunity to truly see themselves in a future STEM career, which can be impactful for all Nevadans, especially those too often underserved.

Thanks to the Nevada Legislature's vision during the 2017 legislative session, a small portion from Senate Bill 549 became seed funding for a pilot program for embedding educational extended reality technology in libraries. Leveraging the funding from 2017, the Nevada State Library assembled a group of partners for its pilot, including Califa, a nonprofit library membership consortium representing 230 libraries in California, subject matter experts from XR Libraries and Lifeliqe. Lifeliqe is a VR/AR publisher with the world's largest collection of educational 3D STEM content.

"It's very exciting to see how Nevada's libraries, at the local and state levels, and in universities, are partnering with schools and industry to invent the future of the state," said Dr. Milton Chen, senior fellow and executive director emeritus at The George Lucas Educational Foundation (GLEF) "The world of work is changing rapidly, and these partnerships offer the best chance for Nevada's youth and adults for success and for communities to thrive."

<sup>1</sup> Chen, M. (2010). *Education nation: Six leaning edges of innovation in our schools*. Hoboken, NJ: John Wiley & Sons, Inc.

<sup>2</sup> Laseinde, O.T. & Adejuyigbe, S.B. & Mpofu, Khumbulani & Campbell, H.M. (2015). *Educating tomorrow's engineers: Reinforcing engineering concepts through Virtual Reality (VR) teaching aid*. 1485-1489. 10.1109/IEEM.2015.7385894.

## Timeline

A Knowledge Summit was convened in April 2018 at the Brewery Arts Center in Carson City. The aim was to bring six local and state leaders together to discuss educational and workforce issues in Nevada. It was facilitated by Dr. Milton Chen and formed the basis of the NV XR Libraries pilot. See Fig. 1 for more on Dr. Chen's ideas.

In July 2018, 16 libraries submitted applications to participate in the Nevada XR Libraries pilot program. After the first group of 11 libraries was selected, an all-day in-person training was held at the Nevada State Library in August 2018, which offered hands-on opportunities to learn how to introduce patrons to virtual reality and guide them into the experiences. Virtual reality experts from the University of Nevada Reno, Lifeliqe, and XR Libraries were on hand to offer their expertise.

After the in-person training in August, libraries received XR equipment and began to host public programs. Each library was encouraged to find what worked for their patrons and to share with the group successful programs that could be reproduced. Many libraries utilized drop-in programming to introduce patrons to the new technology. Since interest in Nevada XR Libraries was so strong, a second group up of five libraries was added to the pilot program in January 2019 (this included the Nevada State Library itself). They began hosting public programs in the spring of 2019.

Beginning in February 2019, libraries begin partnering with local schools or other formal learning groups to bring educational XR content to students. This part of the Nevada XR Libraries program, *Libraries=Education*, is modeled after Valerie Gross' 21<sup>st</sup> century vision for libraries<sup>3</sup>. Nearly all the 16 pilots participated in the *Libraries=Education* project. The Nevada State Library encouraged libraries to use educational virtual reality content, for example the Lifeliqe VR Museum from our partner Lifeliqe, for their projects and to tie the virtual reality content to an existing lesson. Research has shown that XR can be a vital tool in assisting students achieve favorable outcomes in science-based programs.<sup>4</sup>

August 1, 2018 to June 15, 2019



**Knowledge Summit:** Images from Dr. Chen's Carson City visit. L, SCLL Member, Karsten Heise and Deputy State Librarian Tammy Westergard during Dr. Chens panel discussion; next, Dr. Chen during a special event with the Dept. of Administration staff; XR Libraries Director John MacLeod demoing XR for a curious mind!

FIGURE 1

# Education Nation: Six Leading Edges of Innovation in our Schools

## Thinking

- The thinking edge includes new roles for school leaders, teachers and students and the 21<sup>st</sup> century job description signals the end of the solo practitioner and the rise of the team collaborator.

## Curriculum & Assessment

- The curriculum edge includes social / emotional learning, globalizing the curriculum, bilingual education for all and real work to prepare for with linked learning.

## Technology

- One to one technology, online learning, intelligent text and assistive technology are the intelligent assistants of the 21<sup>st</sup> century and create student engagement, and enthusiasm.

## Time/Place

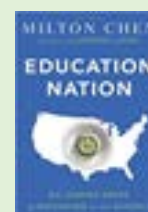
- Anytime anywhere learning is the hallmark of the library and it facilitates place-based learning. Library learning places helps forge strong in the schools and this community, which helps to improve quality of life and economic vitality.

## Co-teaching

- The library links home, school many learning places with librarians as expert co-educators.

## Youth

- Today's youth are digital natives.



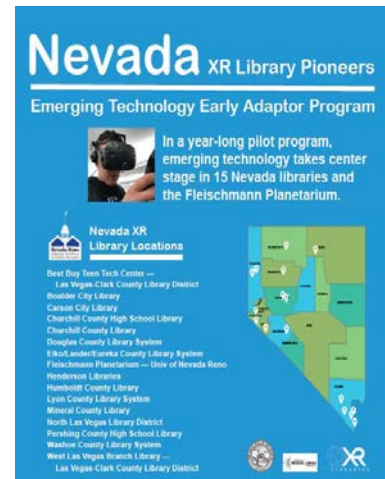
<sup>3</sup> Gross, V. (2019). [https://valeriegross.com/Home\\_Page.html](https://valeriegross.com/Home_Page.html) [webpage]

<sup>4</sup> Lamb, C., Antomenko, P., Etopio, E., & Seccia, A. (2018). Comparison of virtual reality and hands on activities in science education via functional near infrared spectroscopy. *Computers & Education*, 124, 14-26. <https://doi.org/10.1016/j.compedu.2018.05.014>

## Overview of participating libraries

Sixteen libraries and one planetarium participated in the first year of the Nevada XR Libraries program, including two school districts and one special library.

- Boulder City Library
- Carson City Library
- Churchill County Library
- Churchill County School District
- Douglas County Public Library
- Elko-Lander-Eureka County Library System
- Fleischmann Planetarium (UNR)
- Henderson Library System
- Humboldt County Library
- Las Vegas Clark County Library, Teen Tech Center
- Las Vegas Clark County Library, West Las Vegas Library
- Lyon County Library
- Mineral County Library
- Nevada State Library, Archives & Public Records
- North Las Vegas Library
- Pershing County School District
- Washoe County Library



The Nevada XR Libraries poster

In total, these participating libraries assisted over 1,600 patrons into XR during the first year. Over half (56%) of those patrons came to the library specifically to use the virtual reality equipment. In a general survey, these patrons reported that because of the virtual reality program they learned something (95%), felt confident about using what they learned in VR (92%), feel likely to apply what they learned (85%), and are more likely to attend a similar library program (96%) or to use other library services or resources (91%).

In the next section, we go into detail on how some libraries brought virtual reality experiences to their patrons.

## In practice

### MINERAL COUNTY LIBRARY

Mineral County Library in Hawthorne was a part of the first cohort of pilot libraries and began hosting XR events in August 2018. Very early on, the library created the XR Club, a group of young enthusiasts who gathered weekly to talk about and experience XR in the library. The XR Club is headed by library staff member Kathy and her husband, and they have helped the group explore virtual replicas of Chernobyl and Mt. Everest and guided the group through the massive social VR platform Altspace. The adult leaders of the group make sure the social experiences are fun but controlled and safe.

At the end of the first year of the Nevada XR Libraries program, XR Club members are still active and engaged with the technology.

During the first year of the program, Mineral County Libraries guided 114 patrons into virtual reality. From the survey data, the majority of VR participants at Mineral County learned something (89%), felt confident about using what they learned in VR (89%), feel likely to apply what they've learned (94%) and are more likely to attend a similar library program (100%) or to use other library services or resources (87%).

Mineral County Library also participated in the Libraries=Education part of the XR Libraries program. See the Libraries=Education section of this report for more details.



Members of the Mineral County Library's XR Club pictured in August 2018

## WEST LAS VEGAS LIBRARY

The West Las Vegas Library, part of the second cohort of pilot libraries, began hosting drop-in XR events with library patrons in March 2019. Youth Services Department head, Marco Veyna-Reyes, began offering the drop-in opportunities during other teen library events, encouraging users to try out VR for 15 minutes at a time. Soon, Marco trained three Youth Services staff members to assist with the drop-in programs. In May, the library shifted XR programming to Tuesdays to help coordinate with other STEAM related programming in the Youth Services Department. Teens at the West Las Vegas Library now have near-daily access to education STEAM learning opportunities.

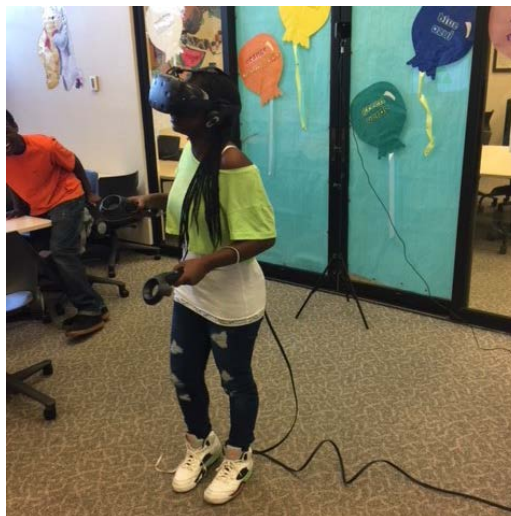
Month (2019)	# of programs	# of participants
March	4	20
April	4	11
May	4	21
<b>Total:</b>	12	52

Marco's drop-in XR programs have been a big success at the West Las Vegas Library. Each event drew interest and helped to spread the word among the community. Tom Sommer, branch manager, has taken the opportunity to encourage staff to embrace the new technology as well. Discussion with teachers about a collaboration in the fall are positive, and teachers are excited about students making real world connections by using the XR equipment.

During the first year of the program, West Las Vegas guided 52 patrons into virtual reality. From the survey data, the majority of XR participants at West Las Vegas Library learned something (87%), felt confident about using what they learned in XR (90%), and are more likely to attend a similar library program (85%) or to use other library services or resources (74%).

Moving forward, West Las Vegas is working with the vendor SWITCH to transform a large meeting room in the

library into a “Robot Lab” which will include technology like a 3D printer, drones, and robots. The current XR equipment will be a part of this new emerging technology space. Additionally, in the fall of 2019 the library will be partnering with the Rainbow Dream Academy (K-8) to bring students to the library to try XR. This outreach arm of the XR project at the West Las Vegas Library is also reaching out to Democracy Prep Academy (K-12) to collaborate with science teachers.



Teens at the West Las Vegas Library engaging with Virtual Reality

## HUMBOLDT COUNTY LIBRARY

Through library assistant Kyle Ebert, the Humboldt County Library began hosting drop-in XR programming opportunities in August 2018. During the first year of the program, the library guided 61 patrons into XR . From the survey data, the majority of XR participants at Humboldt County Library learned something (95%), felt confident about using what they learned in XR (95%), and are more likely to attend a similar library program (93%) or to use other library services or resources (85%).

Humboldt County Library also partnered with a local school, Lowry High School, to integrate educational XR content into existing lesson plans. For more information on this collaboration, see the Libraries=Education section of this.

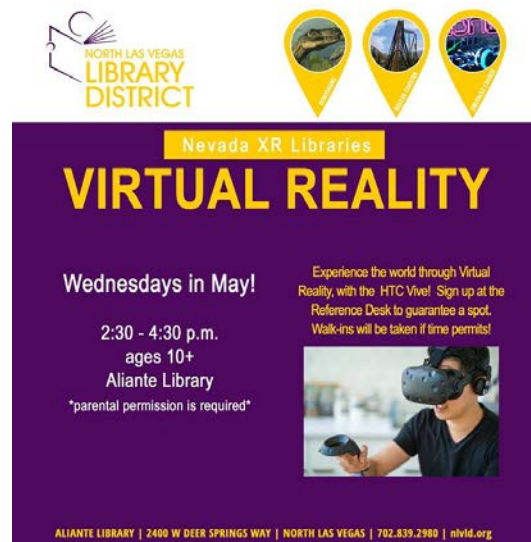
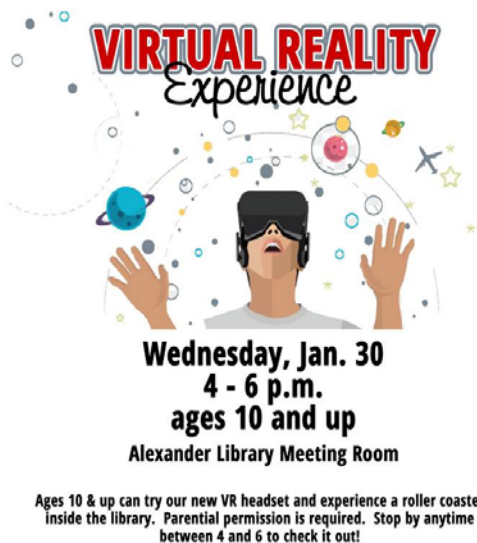


Teens at the Humboldt County Library engaging with Virtual Reality.



## NORTH LAS VEGAS LIBRARY

Part of the second cohort of libraries, the North Las Vegas Library began hosting drop-in XR programming opportunities in the spring of 2019. During the first year of the program, the library assisted 167 patrons into XR. From the survey data, the majority of XR participants at North Las Vegas Library learned something (95%), felt confident about using what they learned in XR (95%), and are more likely to attend a similar library program (96%) or to use other library services or resources (92%). Librarian Shelly Alexander led the virtual reality initiative at the North Las Vegas Library.



Advertisements for virtual reality events at North Las Vegas' Alexander and Aliante Libraries.

North Las Vegas Library also partnered with a local school, Cram Elementary, to bring educational XR experiences to students. For more on that collaboration, see the Libraries=Education section of this report.

## DOUGLAS COUNTY PUBLIC LIBRARY

The Douglas County Public Library began hosting XR events in the fall of 2018. Recurring teen XR programs and adult virtual vacation programs began in September, continuing until June of 2019. Larry Wilson, department IT coordinator, is the virtual reality lead at the Douglas County Public Library. Over the first year of the program, the library assisted 95 patrons into XR. From the survey data, the majority of XR participants at the Douglas County Library learned something (98%), felt confident about using what they learned in XR (83%), and are more likely to attend a similar library program (100%) or to use other library services or resources (99%).



An advertisement for a virtual vacation program at the Douglas County Public Library.

The Douglas County Public Library also made a connection with the nearby China Springs Youth Camp, a court-ordered residential rehabilitation facility for young people convicted of juvenile offences. The camp houses young people aged 12-18, male and female, and seeks to help the youths develop skills, gain knowledge and experience, and become productive members of their families and communities. Youths from the China Springs Youth Camp came to the Douglas County Public Library to experience virtual reality in May 2019. This collaboration was made possible by children's librarian Kira Frederick, Larry Wilson, and Wendy Garrison, director of juvenile camp services for the Youth Camp.

Looking forward, Douglas County Public Library hopes to continue to build on their relationship with the China Springs Youth Camp. Additionally, they are transitioning into a summer teen XR program and plan on continuing the successful adult virtual vacation program as well!

## CHURCHILL COUNTY PUBLIC LIBRARY

The Churchill County Public Library, with the assistance and expertise of librarian Joe Salsman, began hosting drop in XR events in August of 2018. Since August, the library has been hosting three programs a week. The XR programs have attracted a large group of new library users – middle school boys especially. The library has reported a sharp increase in engagement from middle school patrons, who not only use library resources but are also building relationships with library staff and expressing curiosity about the logistics about the library itself. One young patron is even contributing to the XR program at the library by seeking out new software to test and evaluate. Over the first year of the program, the library assisted 315 patrons into XR.

The Churchill County Public Library also partnered with an art teacher at a local high school, Churchill County High School, to bring educational XR content to students. While the program did not prove to be as successful as anticipated, the Churchill County Public Library has had much success with open-ended, exploratory XR experiences for patrons. Moving forward, the library plans to focus on exploratory and curiosity-led programs to engage its most enthusiastic patrons.



Librarian Joe Salsman supervising young patrons in virtual reality.

## NEVADA STATE LIBRARY, ARCHIVES & PUBLIC RECORDS

In addition to serving as the facilitator of the Nevada XR Libraries program, the Nevada State Library is also a participating library in this XR initiative. Library consultant Annie Gaines began facilitating walk-in patron sessions in February 2019, assisting at least 22 patrons into virtual reality the first year of the program. Annie would often try out and review virtual reality experiences to recommend to participating libraries and cataloging and government publications librarian Kelly Robertson verified XR content in the Lifeliqe VR Museum in order to create detailed cataloging records of the educational content.

Thanks to Kelly's expertise and dedication to cataloging virtual reality content, the State Library co-led with Califa (a non-profit library consortium in California) an XR cataloging Hackathon, where participants collectively attempted to catalog as many XR records in one day as possible. Held on June 13 with two in-person locations (the Nevada State Library in Carson City and the XR Marin Classroom at South Novato Library in Novato, California) and the opportunity to participate remotely, the Hackathon created 395 new catalog records and made history as the first XR cataloging Hackathon!



Left: Hackathon participants in Novato, California. Middle: Hackathon participants at the Nevada State Library, including cataloging librarian Kelly Robertson (standing) Right: Nevada Deputy State Librarian, Tammy Westergard

One walk-in XR patron at the Nevada State Library, Preston Simpson, utilized the technology to visualize healthy lungs. A cancer patient receiving treatment in Reno, Simpson regularly practices visualization meditation techniques and was intrigued at the prospect of using highly accurate 3D models of the human body to visualize healthy organs in XR. Annie and deputy state librarian Tammy Westergard were on hand to guide Simpson into the Lifeliqe VR Museum, where he spent time browsing the models and visualizing a healthy body.



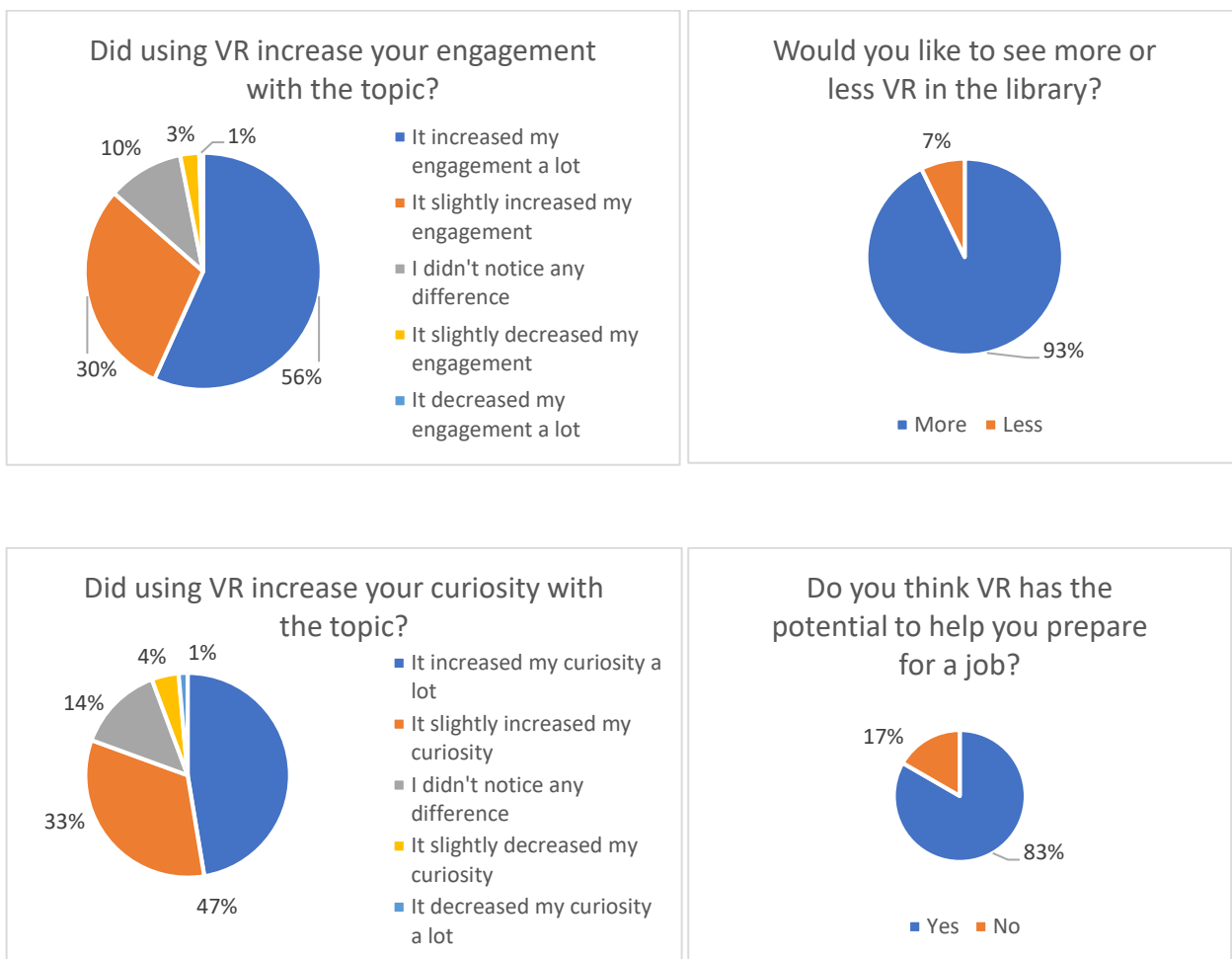
Preston Simpson inside the Lifeliqe VR Museum at the Nevada State Library

In the future, the State Library hopes to expand the availability of its XR equipment to other departments and divisions in the state government.

# Overview of *Libraries = Education* Pilots

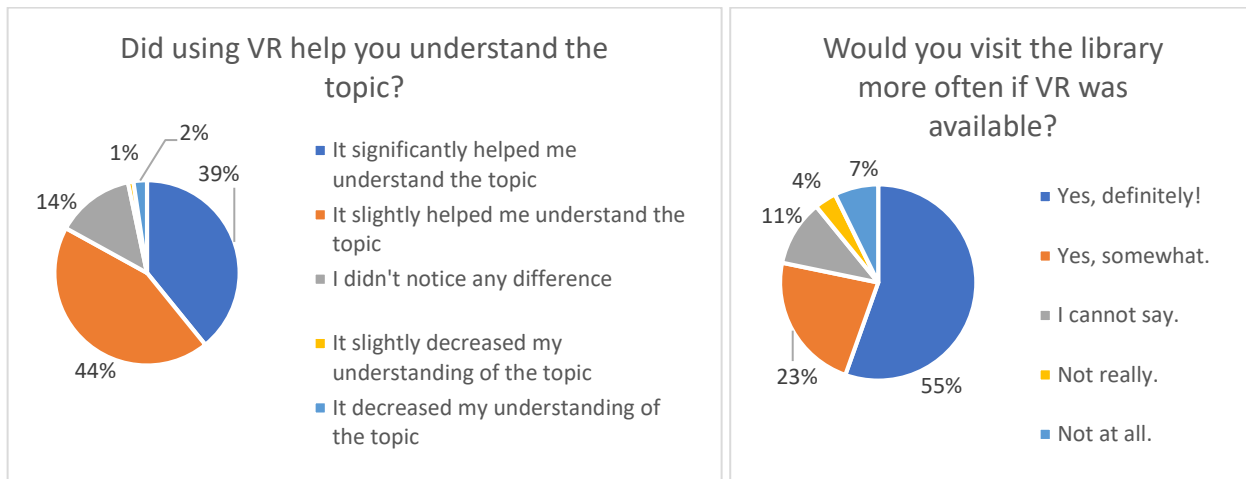
Thirteen libraries completed the *Libraries=Education* portion of the Nevada XR Libraries program, with largely positive outcomes. Research has shown that XR-based experiences can improve learning outcome gains.<sup>5</sup>

The *Libraries=Education* projects and their results are listed below. Overall, at least 309 students participated in the educational XR project. A clear majority of participants found that using virtual reality increased their engagement with the topic (86%), increased their curiosity with the topic (80%), and helped them to better understand the topic (83%). Participants also strongly felt that virtual reality has the potential to help them prepare for a job (83%), wanted to see more XR in the library (93%), and would visit the library more often if XR was available (78%).



<sup>5</sup> Merchant, Z., Goetz, E., Cifuentes, L., Keeney-Kennicutt, W., Davis, T. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education*, 70, 29-40. <https://doi.org/10.1016/j.compedu.2013.07.033>

## Libraries = Education Pilot overview continued



In the next section, we go into detail on how libraries collaborated with schools or other learning groups to bring educational XR content to students.

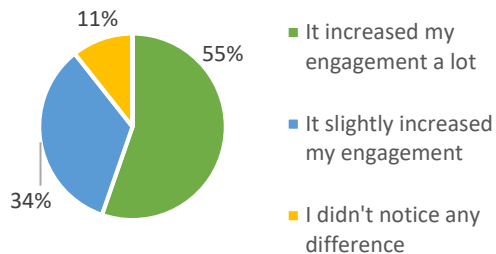
# Libraries=Education Libraries

## NORTH LAS VEGAS LIBRARY

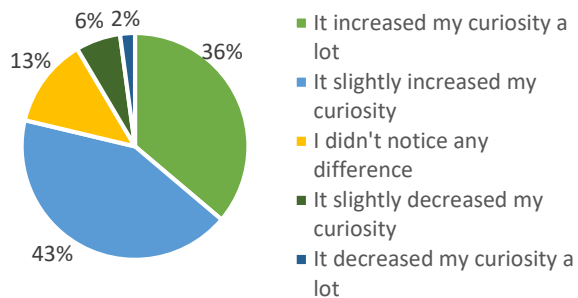
Library type <b>Public Library</b>		Location <b>North Las Vegas, Nevada</b>		# of participants <b>47</b>	
Project <b>Measuring student curiosity using Lifeliqe VR Museum's cell modules</b>		Age range <b>6<sup>th</sup> grade</b>		# of surveys completed <b>47</b>	
% experienced increased engagement	% experienced increased curiosity	% experienced increased understanding	% think VR could help in job preparation	% would like more VR in the library	% would visit library more if VR available
89	79	96	81	96	96

Librarian Shelly Alexander of the Aliante Branch of the North Las Vegas Library partnered with Brian and Teri Cram Middle School teacher Derek Leino, who teaches 6<sup>th</sup> grade science and used his class' time with XR to study cells using the Lifeliqe VR Museum's cell modules. XR learning sessions with the students were held at the public library over a four-week period, where students accessed modules on plant cells, white blood cells, and the bloodstream. Based on the feedback provided in the survey, students found the XR experience engaging and educational. 47 students participated in this collaboration, n=47.

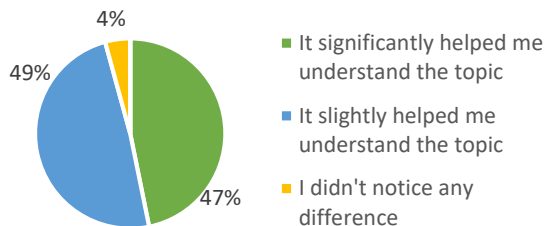
Did using XR increase or decrease your engagement with this topic?



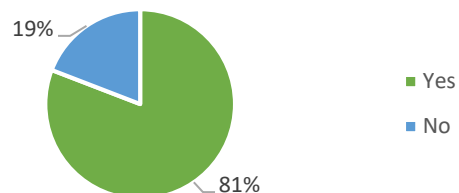
Did using XR increase or decrease your curiosity with this topic?

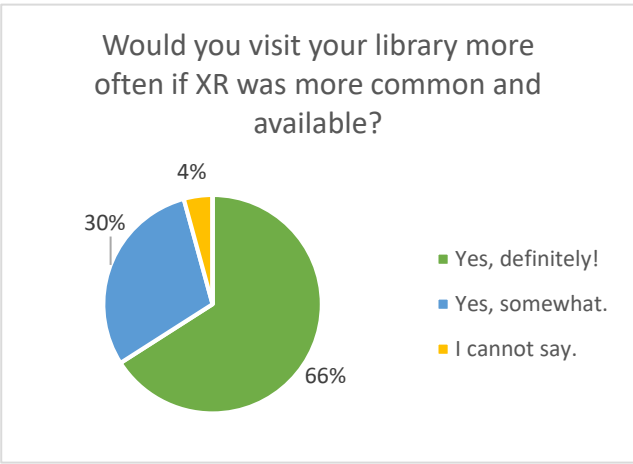
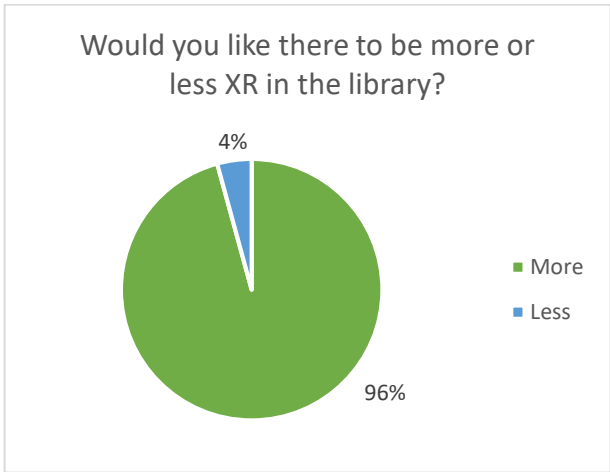


Did using XR increase or decrease your understanding of this topic?



Do you think XR will help you prepare for a future job?





Mr. Leino reported that the students loved their experiences in XR and were genuinely excited about learning in that format. Mr. Leino intends to continue to work with the library to bring educational XR content to his students in the coming school year.

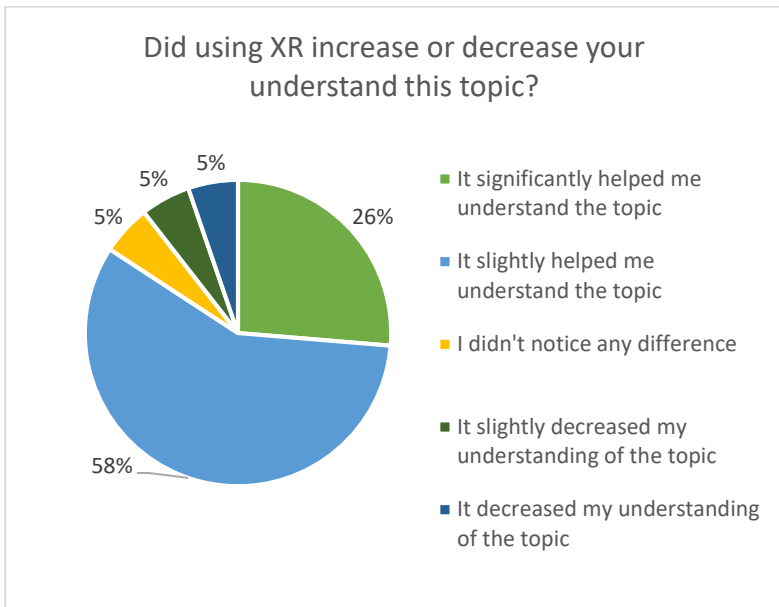
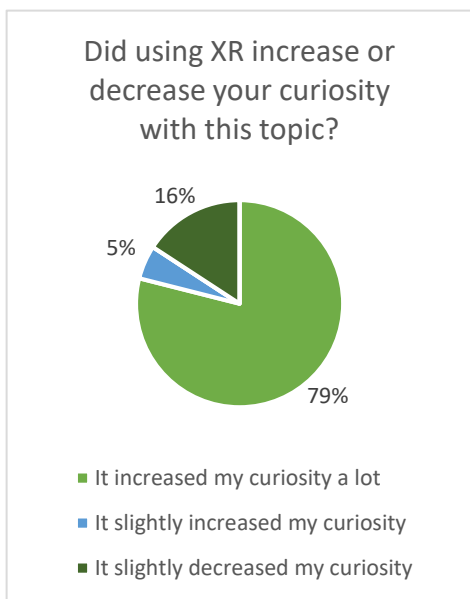
Some selected quotes from participants:

- “When teachers explain [concepts like cells] I don't really know what [they're] saying. But since I've been in a cell now, I can explain it.”
- “It was cool because you could see all of the cells in the human body and you could touch them and grab them.”
- “It's really difficult reading something from [your] book but when you see it clearly it gives you a new thought.”
- “I found the viruses the most engaging because I got to experience them as if they are hitting my face. I learned a lot from this to see what is going on and how the viruses would attack.”
- “It would help [with a future job] because it would teach us how to do stuff when we are older like draw blood and surgery.”

**MINERAL COUNTY LIBRARY**

Library type		Location		# of participants	
Public Library		Hawthorne, Nevada		27	
Project		Age range		# of surveys completed	
The Universe Beyond		10-14		19	
% experienced increased engagement	% experienced increased curiosity	% experienced increased understanding	% think VR could help in job preparation	% would like more VR in the library	% would visit library more if VR available
-	84	84	-	-	-

Due to difficulties partnering with local schools, Library Director Courtney Oberhansli and Assistant Director Kathy Kachelries decided to bring the educational content in the Libraries=Education program to their XR Club. Over a six week period, XR Club members attended weekly events to introduce them to different XR experiences related to space and the solar system. Based on the feedback provided in the survey, participants found the XR experiences exciting and were eager for more. Around 10 library patrons participated in these educational events, some attending all six. There were 19 completed surveys, n=19.



The librarian facilitators found that the students' curiosity about a topic in XR depended on how free they were to explore within the virtual world. Club members responded positively to the educational content, and with that librarians found that the young patrons' interest accelerated in pursuing personal educational experiences in more subjects. Looking forward, the Mineral County Library would like more job/career training in XR, including those that could grant a certification upon completion.

Some selected quotes from participants:

- "In school they tell you what to do and how to do it. With VR you can explore everything you need and more."
- "With a library you have what? Books! When you read books, you gain the knowledge of that book. But with VR you have a virtual image and I feel that an image speaks louder than words."

**LOWRY HIGH SCHOOL / HUMBOLDT COUNTY LIBRARY**

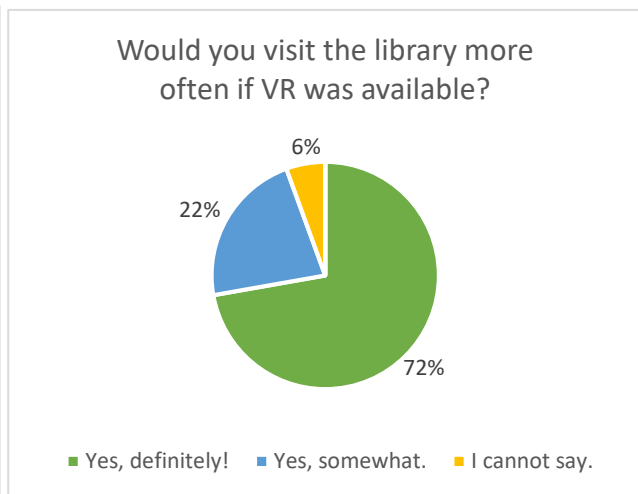
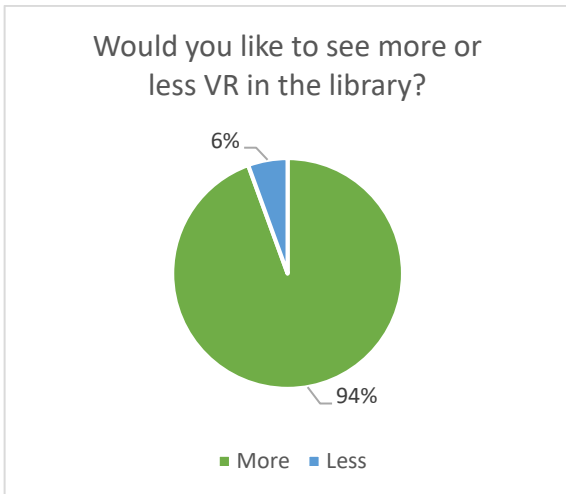
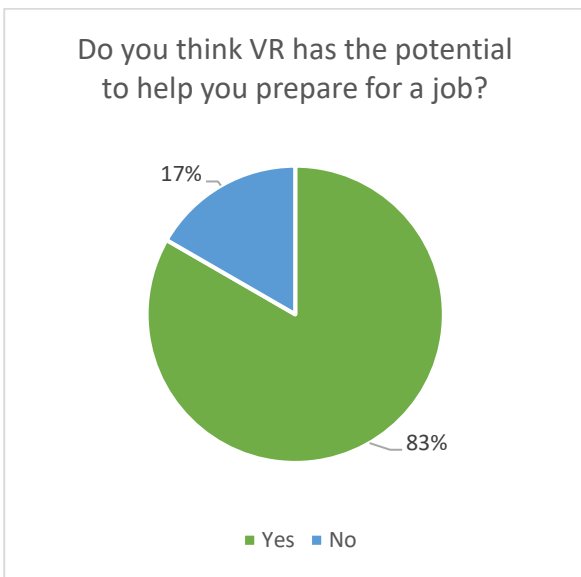
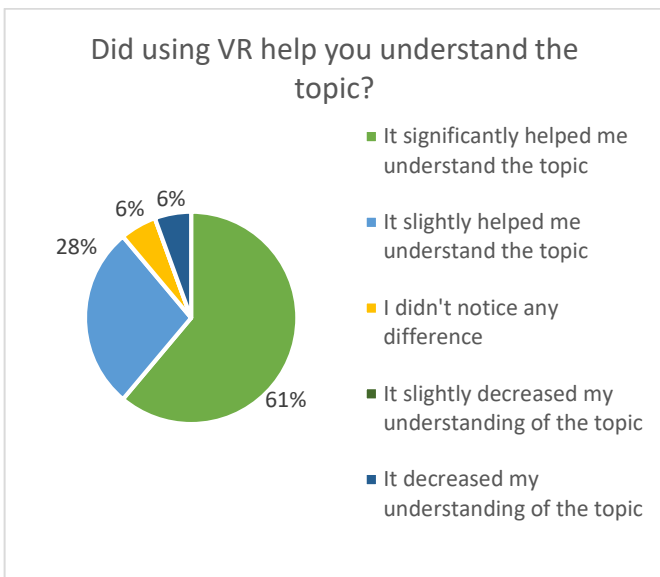
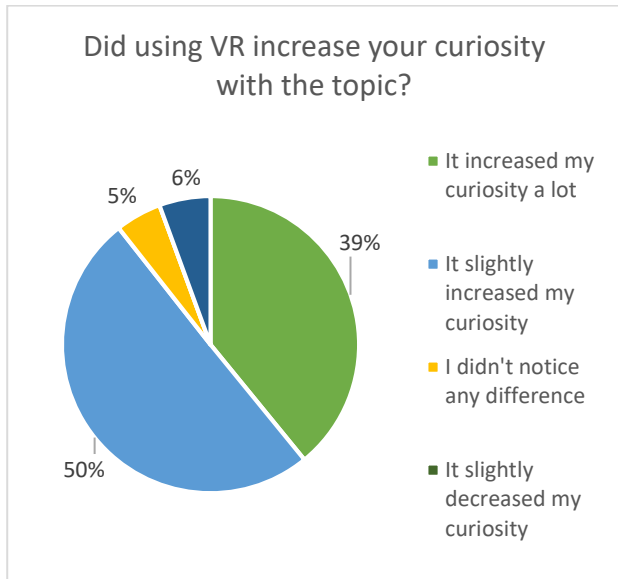
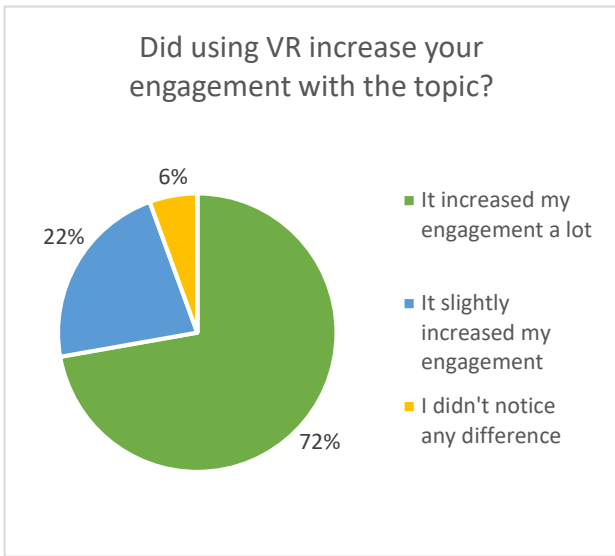
Library type		Location		# of participants	
School Library		Winnemucca, Nevada		19	
Project		Age range		# of surveys completed	
Virtual Reality DNA Pilot Project		High school		18	
% experienced increased engagement	% experienced increased curiosity	% experienced increased understanding	% think VR could help in job preparation	% would like more VR in the library	% would visit library more if VR available
94	89	89	83	94	94

A collaboration between the Humboldt County Library and Lowry High School brought educational XR content to High School students in Winnemucca, Nevada. The school librarian, Pamela Bidart, worked with science teacher Michelle Pasquale to find which educational content would work best with her DNA lesson plan. Library assistant Kyle Ebert from the Humboldt County Library provided the technology to the school.

Mrs. Pasquale's goals for this collaboration were to increase student motivation and interest as well as to enhance student learning and understanding. Before sending her students to experience virtual reality, Mrs. Pasquale taught her students the basics of DNA and showed a 10-minute video before administering a pre-test to each student. After the student experienced DNA, chromosomes, mitosis and meiosis in XR, they returned to class and took a post-test. Between the pre- and post-tests



and the survey results from these students, there was a significant increase in understanding, engagement, and curiosity in the topic.



From Mrs. Pasquale: “Not only was the program a success for the increased interest and motivation, but the experience led to greater understanding and comprehension of what was taught in the classroom.” Despite a few issues with the technology, all involved believe this strategic partnership to be a complete success. From the student surveys and reflections of Mrs. Pasquale and Mrs. Bidart, it is clear that the students are more engaged, motivated to learn, and their learning experience in virtual reality left them wanting more. The school library and public library intend to continue their partnership into the next school year.

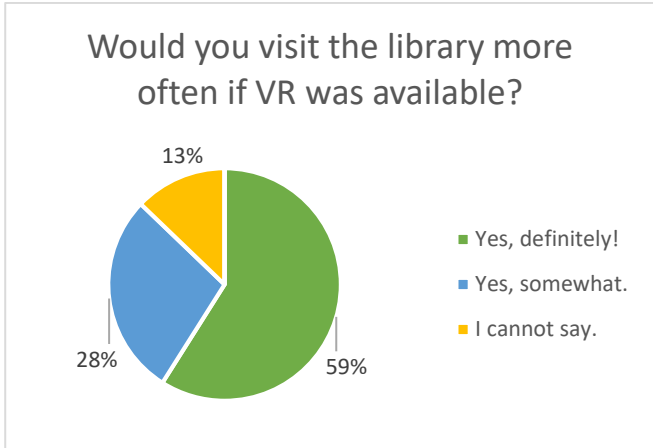
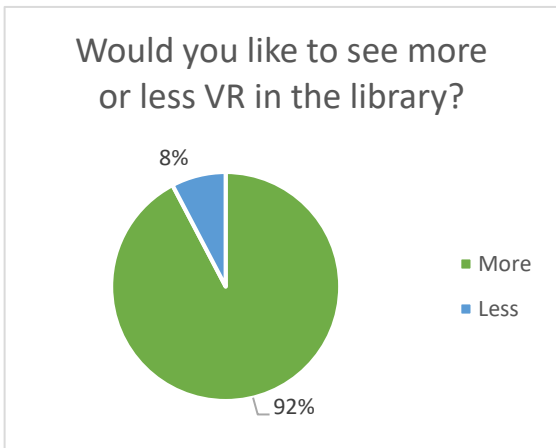
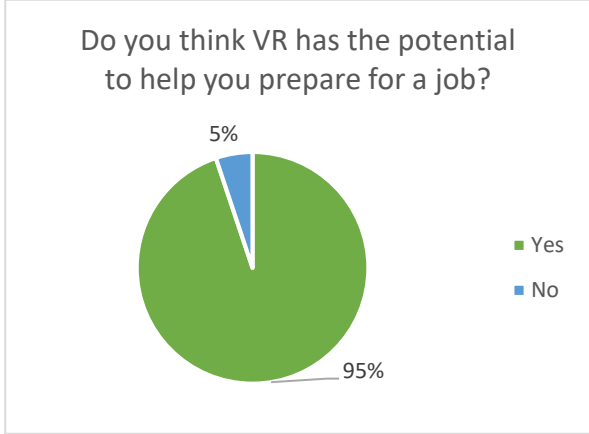
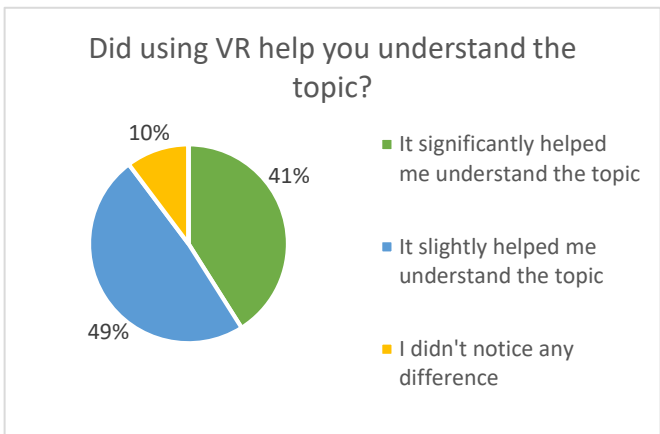
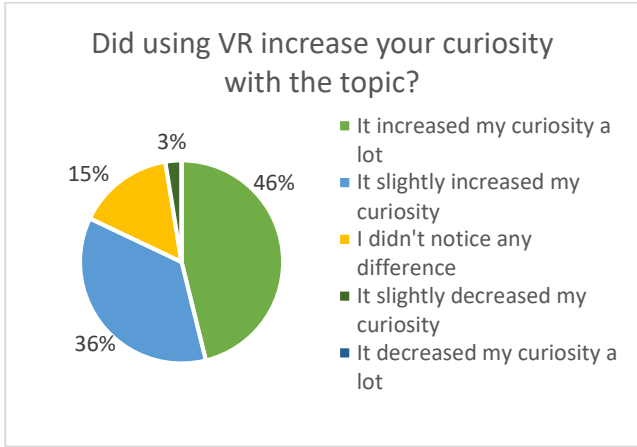
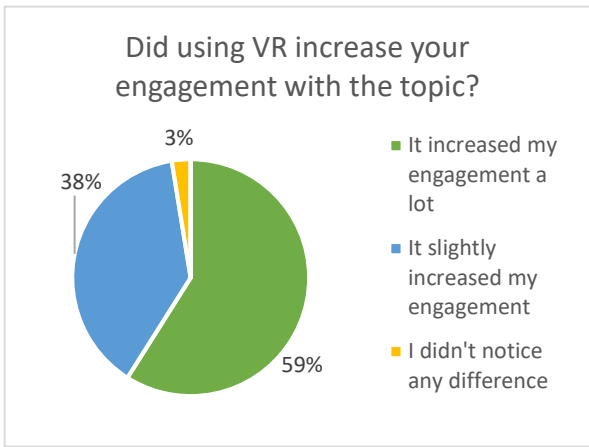
Some selected quotes from participants:

- “In class it was hard to understand how the processes work & what was contained in the division or process. By using this technology I could see what was going on in the process & how it works right in front of me.”
- “It’s cool because it’s more like hands-on learning.”
- “I think that it increased my engagement because it made the visuals from the textbook come to life.”
- “I am a very visual learner so I feel that this experience helped me out a lot by showing me everything in detail.”
- “If the library had this I would come here every day.”
- “My usual visit to [the] library is very quiet and not very interactive. But with this it was very interactive and I learned a lot.”

## CHURCHILL COUNTY HIGH SCHOOL

Library type		Location		# of participants	
School Library		Fallon, Nevada		40	
Project		Age range		# of surveys completed	
Virtual Anatomy – Studying the Skeleton		High school		39	
% experienced increased engagement	% experienced increased curiosity	% experienced increased understanding	% think VR could help in job preparation	% would like more VR in the library	% would visit library more if VR available
97	82	90	95	92	87

School librarian Holly McPherson collaborated with health teacher Elaine Adams to bring three-dimensional learning to her health class. During a lesson plan on the skeleton, Mrs. Adams brought her students to the school library to study in immersive XR. Using Lifeliqe and Anatomy XR programs, the students manipulated a skeleton and tried to name each bone as they removed it from the virtual skeleton. Based on teacher reflection and the student surveys, after experiencing and manipulating the XR skeleton the students were more engaged in the topic and wanted to learn more about the individual parts of bones and how they fit together. Mrs. Adams felt that her students found the activity so engaging because it was “hands-on.”

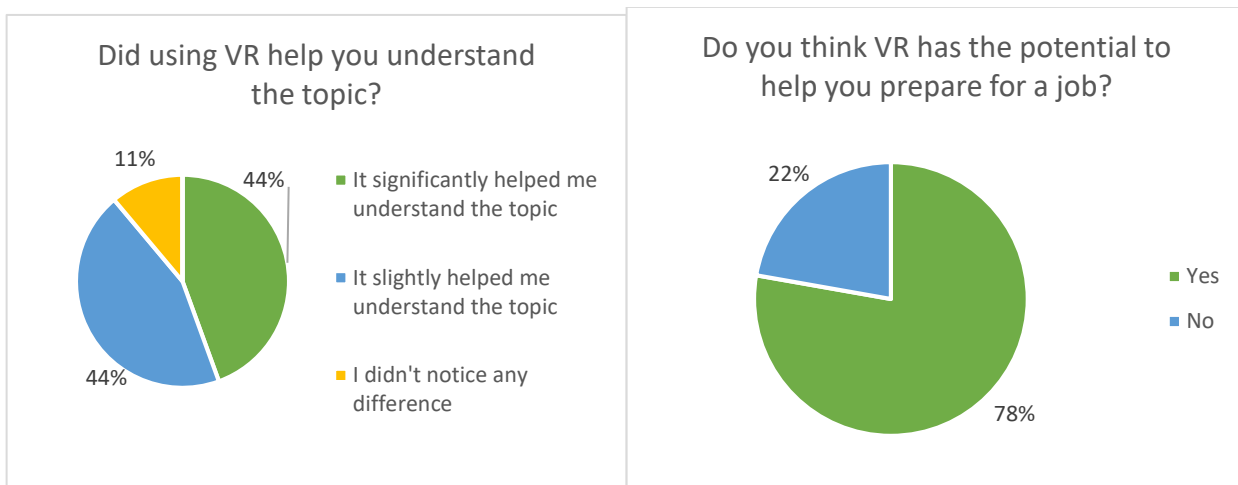
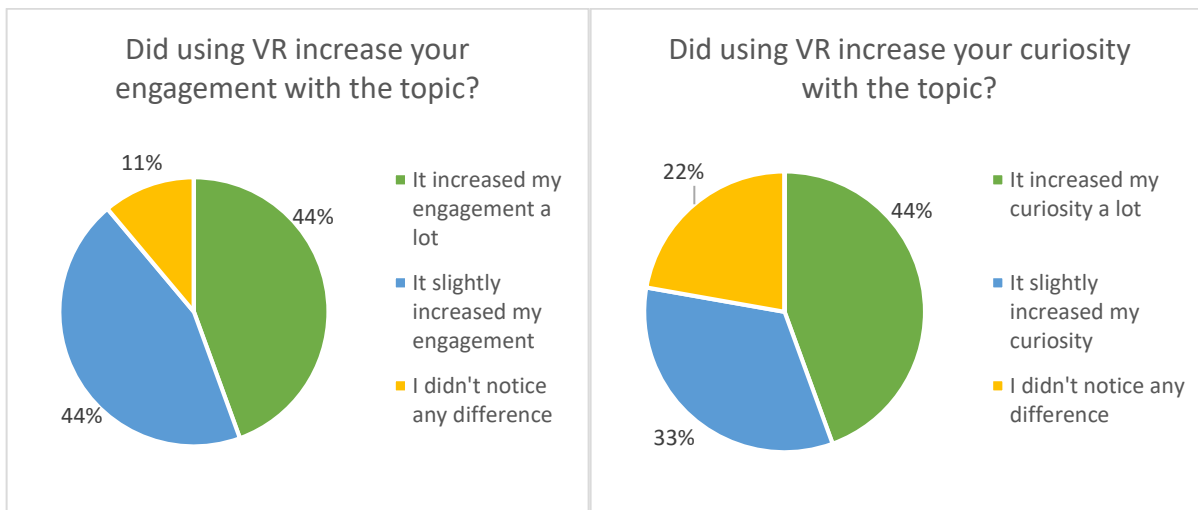


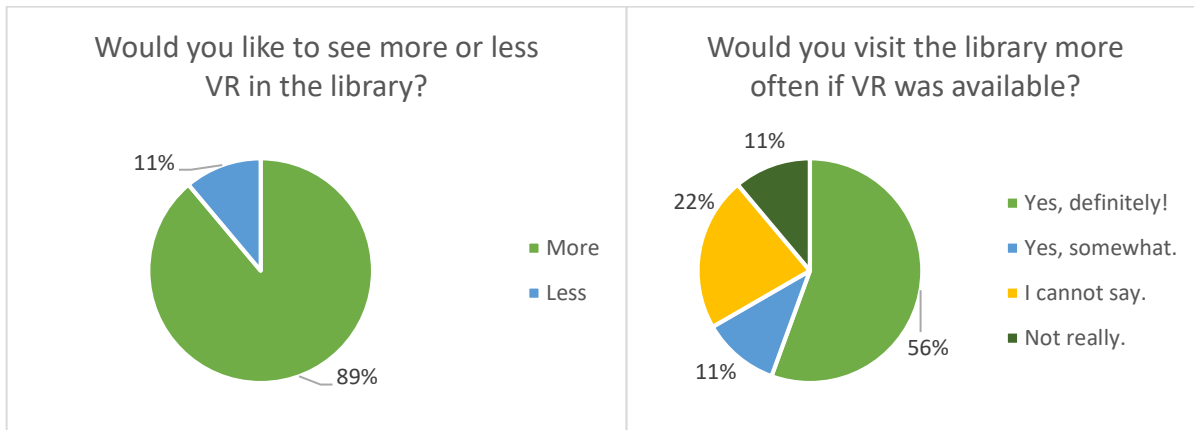
Some selected quotes from participants:

- "The virtual reality made it way more enjoyable to go to the library."
- "This helped me to understand my topic better than just reading a book because I was able to see each individual bone in its rightful place."
- "[VR] was hands on and more engaging. It was like there was a real skeleton there."

Library type School Library		Location Fallon, Nevada		# of participants 9	
Project Special Education – Writing About VR Experiences		Age range High school		# of surveys completed 9	
% experienced increased engagement	% experienced increased curiosity	% experienced increased understanding	% think VR could help in job preparation	% would like more VR in the library	% would visit library more if VR available
88	77	88	78	89	67

In addition to Mrs. Adams' health class, school librarian Holly also collaborated with special education teacher James Christensen to introduce his students to XR environments. After experiencing educational models of animals and sea life and riding a virtual roller coaster, students were asked to write about their experiences using descriptive language. Holly noted that XR has the potential to help special education students in particular, as it can help increase communication skills. In the future, Holly would like to see XR applications that show employee/customer relations, build job skills, or help to prepare the user for an interview.





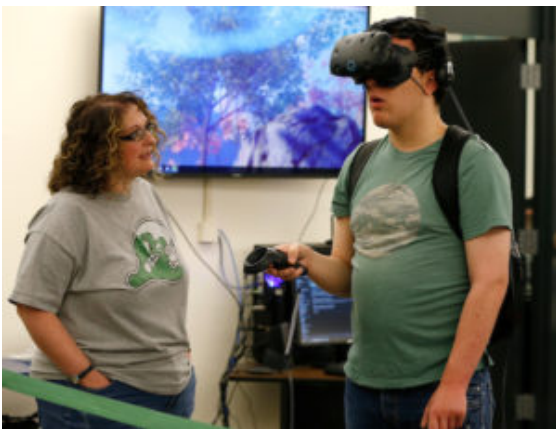
Some selected quotes from participants:

- "I felt like I was really moving with the roller coaster even though I was sitting."
- "Learning through [VR] is better."

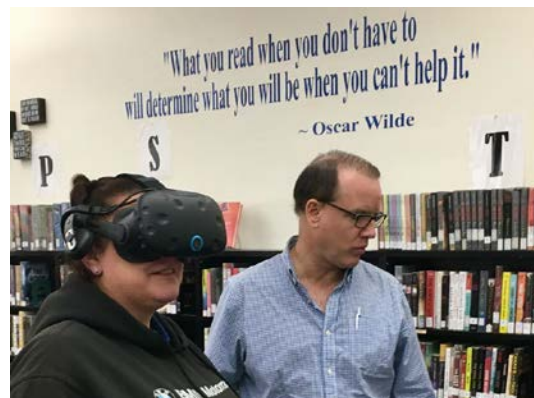
## LOGAN'S STORY

For one student at Churchill County High School, virtual reality has made an enormous real-world difference. Logan, an 18-year old student with autism, has been working with his speech pathologist, Justin Worthy, to use immersive XR programs to improve communication, articulation, and reading skills. When Justin first introduced XR to Logan he noticed a difference right away. "When he's in the program, you get an instant response," Worthy said. "It was amazing to me to see the difference." When immersed in XR, it is much easier for Logan to answer questions successfully and speak in full sentences, and he is very curious about the world around him.

The improvement doesn't stop when the headset comes off. Logan continues to show increased articulation in the real world, which helps at his part-time jobs after school. At home, Logan's parents see improvement in his communication and are thrilled to see him so engaged with a subject. The value of XR for students with special needs was an unforeseen benefit of the Nevada XR Libraries project, and we are looking forward to continuing this work with other students who may benefit.



Logan with librarian Holly McPherson  
 librarian Holly McPherson  
 (image courtesy of The Fallon Post)

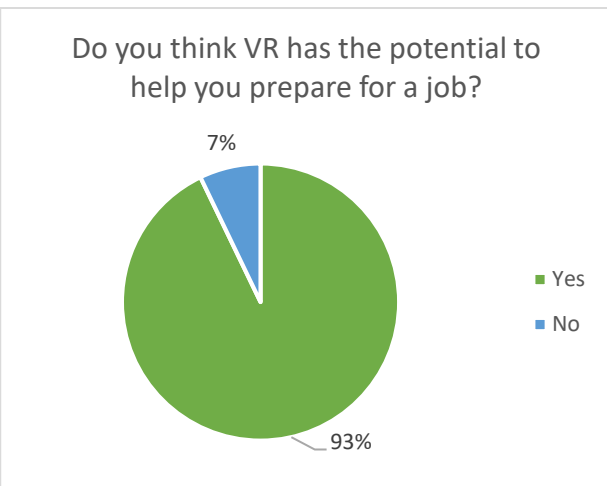
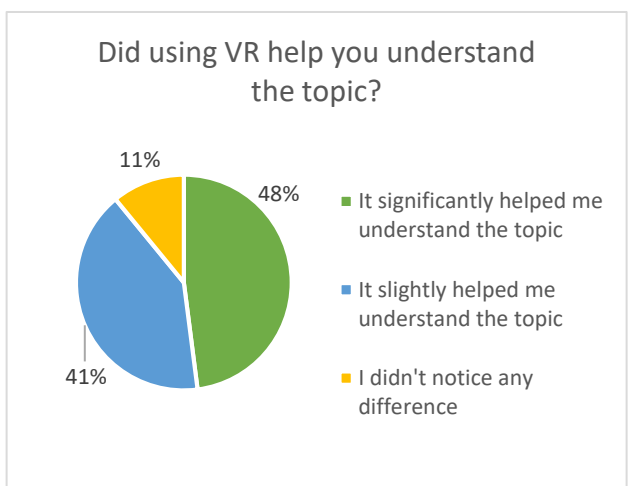
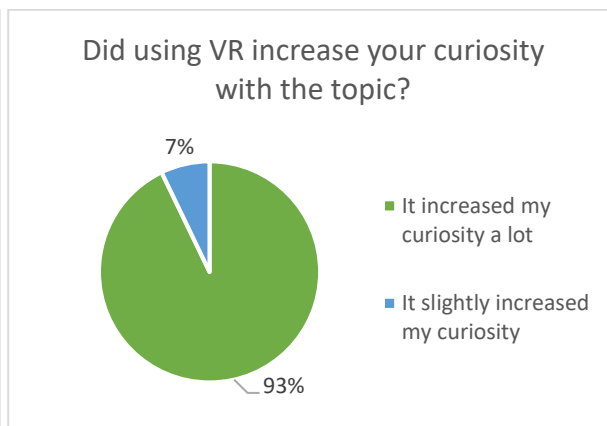
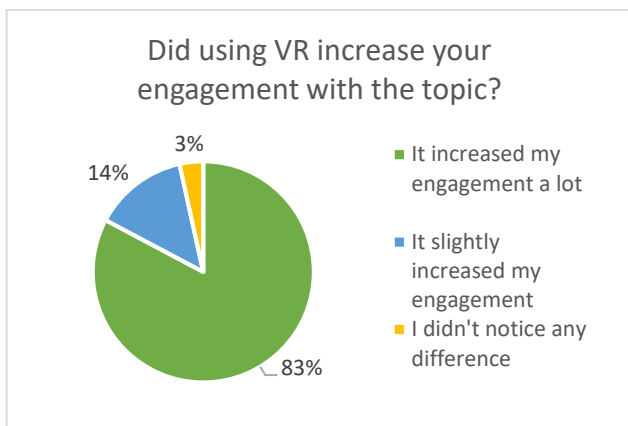


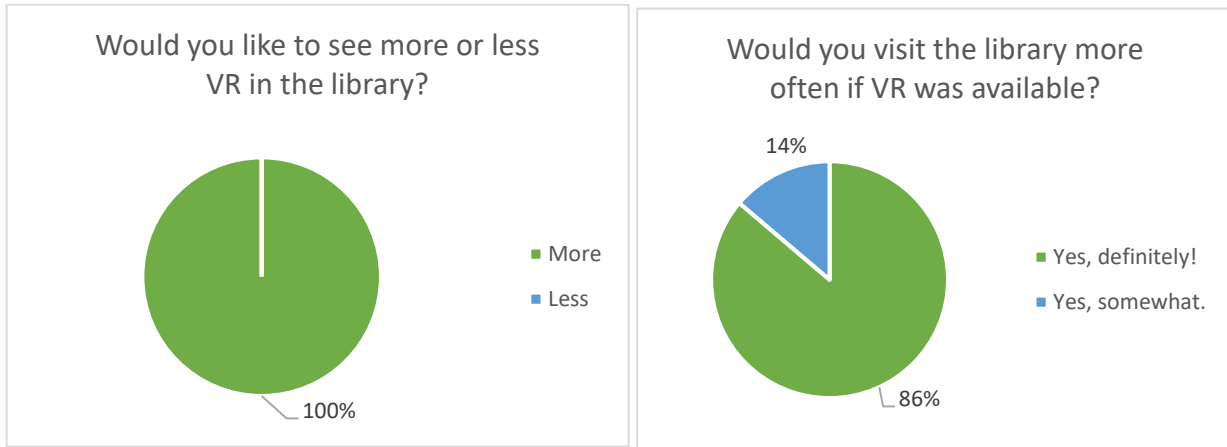
Mark Andersen, from Lifeliqe with Logan's family.

## PERSHING COUNTY HIGH SCHOOL

Library type School Library		Location Lovelock, Nevada		# of participants 30	
Project General exploratory VR sessions		Age range Middle and high school		# of surveys completed 29	
% experienced increased engagement	% experienced increased curiosity	% experienced increased understanding	% think VR could help in job preparation	% would like more VR in the library	% would visit library more if VR available
97	100	89	93	100	100

School librarian Shelly Nee facilitated exploratory sessions in XR for middle and high school students at the Pershing County High School library. Due to an abundance of projects Shelly was unable to partner with a teacher to integrate educational XR into a lesson plan. However, the free-form nature of the exploratory XR sessions may have led these students to become even more engaged and curious than their counterparts. See their results below.





Some selected quotes from participants:

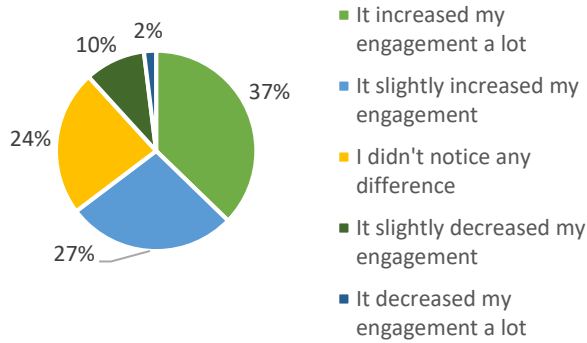
- “It was mind-blowing.”
- “I want to be a mechanic, you could use the VR to show how to replace parts on the vehicle.”
- “[VR] put me inside of learning.”

### CARSON CITY HIGH SCHOOL/CARSON CITY LIBRARY

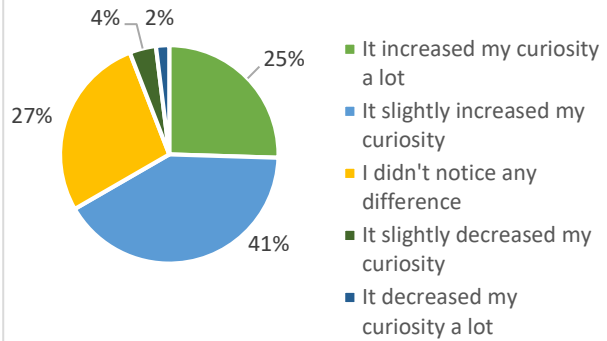
Library type		Location		# of participants	
School Library		Carson City, Nevada		51	
Project		Age range		# of surveys completed	
Plant Biology study sessions		High school		51	
% experienced increased engagement	% experienced increased curiosity	% experienced increased understanding	% think VR could help in job preparation	% would like more VR in the library	% would visit library more if VR available
64	66	64	73	86	40

In the fall of 2018, science teacher Julie Koop and school librarian Ananda Campbell brought students to the library to experience XR as a study aid for a plant biology lesson plan. This collaboration was facilitated by Ermal Reinhart from the Carson City Library. From the student surveys and instructor feedback it seems as though there was slightly less of an increase engagement, curiosity or understanding in this group of students compared to students in other *Libraries=Education* projects. Perhaps this reduction in engagement was due to a shorter time period to experience XR (one student noted they were only able to be in VR for 2 minutes) or to using the VR as a study tool rather than as an integrated part of the lesson plan. Teacher feedback also noted how difficult it was to organize a class around utilizing one XR setup with a class of 30.

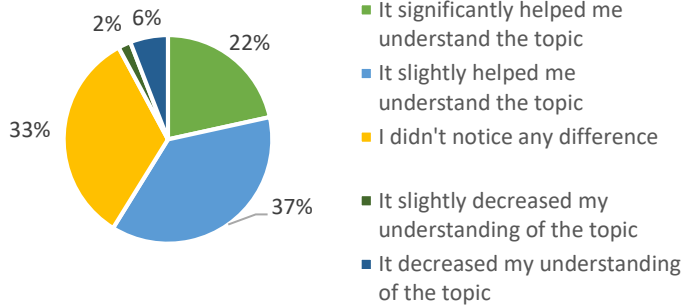
Did using VR increase your engagement with the topic?



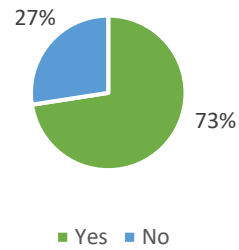
Did using VR increase your curiosity with the topic?



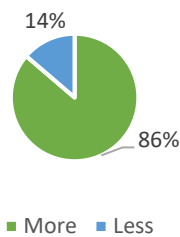
Did using VR help you understand the topic?



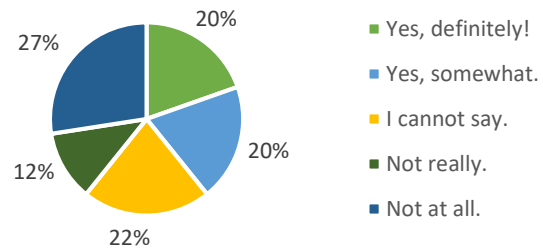
Do you think VR has the potential to help you prepare for a job?



Would you like to see more or less VR in the library?



Would you visit the library more often if VR was available?



Some selected quotes from participants:

- “[VR] can help because you can simulate the possibility of having that job and you can learn more about that field through some pre-experience.”
- “I would describe [VR] as more fun [than] an actual library and more educational.”
- “I was right there with the organelle I was studying.”



## NEVADA STATE LIBRARY, ARCHIVES & PUBLIC RECORDS

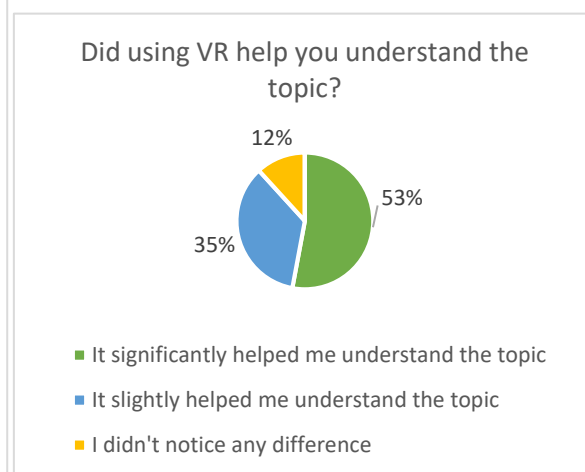
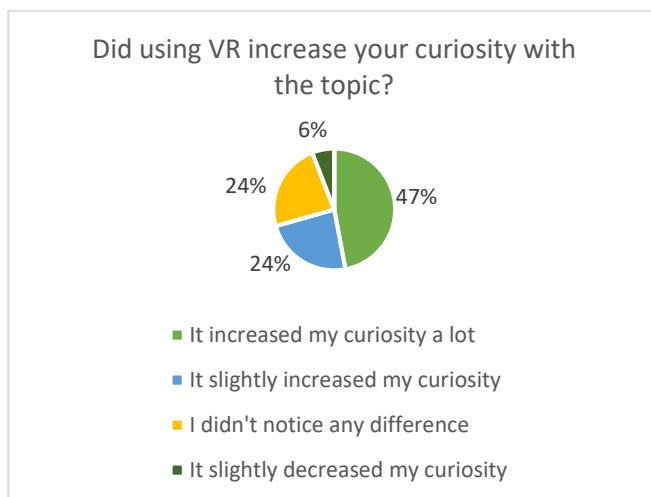
Library type		Location		# of participants	
Speical Library		Carson City, Nevada		19	
Project		Age range		# of surveys completed	
Talking Books Sensivity Training		Adult/Senior		17	
% experienced increased engagement	% experienced increased curiosity	% experienced increased understanding	% think VR could help in job preparation	% would like more VR in the library	% would visit library more if VR available
100	71	88	79	73	-

In a collaboration between Nevada Talking Books Services and Library Planning & Development departments, the Nevada State Library utilized an educational XR experience as a tool for sensitivity training for both Talking Books staff and volunteers. Nevada Talking Books Services (NTBS) is a part of the Library of Congress' National Library Service for the Blind and Physically Handicapped (NLS) network of libraries providing services to blind, visually impaired, or physically handicapped individuals.

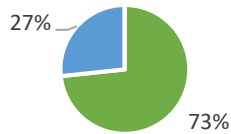
For this sensitivity training, library consultant Annie Gaines first introduced an XR experience called 'Notes on Blindness' to six Talking Books staff at the invitation of Talking Books librarian Hope Williams. Williams was interested in offering the training to meet standard guidelines of the National Library Service for the Blind and Physically Handicapped, which requires network libraries to offer sensitivity training. After feedback and consideration, audio production editor Connie Corley and Williams worked with Gaines to tailor the program to fit 13 volunteers, who completed the training over a week in May.

'Notes on Blindness' is an XR experience about being blind. Using a collection of audio recordings from philosopher John Hull, the experience provides a minimal but compelling artistic visual representation of how the blind use other senses to decipher the world around them. Hull's audio diaries are descriptive, compelling, and guide the user through different chapters in his journey with blindness. The user is immersed in situations that can, for example, illustrate the profound joy in music and the sheer panic at losing one's way in a snow storm, thus inducing empathy and understanding.

Feedback on the training was positive, both from staff and volunteers, although some did acknowledge the current limitations of the technology to truly illustrate what it is like to be blind.

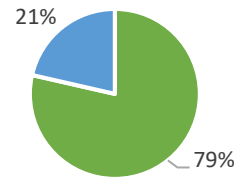


Did using VR increase your engagement with the topic?



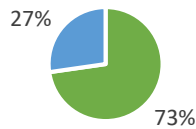
■ It increased my engagement a lot  
■ It slightly increased my engagement

Do you think VR has the potential to help you prepare for a job?



■ Yes ■ No

Would you like to see more or less VR in the library?



■ More ■ Less

Some selected quotes from participants:

- "The emotional impact is inescapable."
- "Gave me a great understanding of the world of sound to a blind person."
- "[The use of VR] was a wonderful experience and I am (at 84 years old) an enthusiastic supporter."
- "Easier to more fully experience embodiment and my own sense of presence."
- "Provides similitudes to those with less sight."

## Next Steps

### PHASE 2

Thanks to the generosity of the Nevada Legislature, we have secured additional funding to ensure the longevity of the Nevada XR Libraries project and the Libraries=Education component through June 30, 2021. In the next two years, we intend to:

- Continue the Libraries=Education program, finding new ways to collaborate with teachers to integrate educational XR content into formal learning groups.
- Bring additional libraries into the Nevada XR Libraries program. There is also a dedicated effort to bring XR equipment to rural Nevada's bookmobiles.
- Expand the technology and expertise available to participating Nevada XR libraries by adding 360 video technology and training.
- Send additional VR equipment, Oculus Go devices, to each library as a supplement to the 360 video technology and training.



Patron Lynsy helps fire marshals with XR equipment as part of their Bi-State Evacuation Emergency Drill held at Incline Village in May 2018.

### CSN DIALYSIS PROJECT

The Nevada State Library is partnering with the College of Southern Nevada's Allied Health in Workforce and Economic Development to increase interest in and accelerate engagement with their dialysis laboratory technician program. Dialysis techs operate kidney dialysis machines and are responsible for direct patient care. More than 485,000 Americans are being treated for kidney failure in 2018.

Prospective students are provided a virtual "fieldtrip" with XR technology. This makes it possible to efficiently explore the Dialysis Patient Care Technician (DPCT) program at the College of Southern Nevada (CSN). This tool will assess one's individual aptitude for a DPCT career. Once enrolled, students will engage with 3D immersive content and learning modules provided by partners NCLab, Lifeliq XR Libraries and the Medical Education Institute (MEI) as an adjunct to formal course instruction provided by CSN.

The XR equipment for the DPCT enrichment experiences will be an in-house public library resource. Access to the Nevada Career Explorer, a job matching software already provided to Nevada libraries, will also be actively promoted to increase DPCT job placements. The proposed program will address local labor market needs and training opportunities with the end goal of enabling jobseekers to potentially pursue employment training.

*Accelerating Nevada's Healthcare Workforce Development* is the title for the second phase of this initiative. Nevada has 1.3 million library cardholders, with two-thirds of those in the Las Vegas metro area. This positions libraries as a prime leader in career exploration as they provide free internet and Nevada Career Explorer access.