Storytelling in Augmented Reality to Discover Community in the Borderlands

by Lisa Falk

A Tohono O'odham clay pot spins around, sending drawings of traditional basket dancers aswirl; these figures step off the "friendship jar"—transforming into a 360 view of actual dancers as the sounds of a rattle and singers float into your space. As you watch, you hear Wynona Peters of the Wa:k Tab Basket Dancers explain that they dance to honor the Nation's basket weavers and that the hua (baskets) are significant to the Tohono O'odham.

About the image: Tohono O'odham friendship jar by Rupert Angea, c. 1970, ASM 2006-918-1. Photo by Jannelle Weakly, courtesy Arizona State Museum.

This is part of the Arizona State Museum's (ASM) augmented reality (AR)[1] mini-exhibit on Tohono O'odham basketry.[2] ASM's collection of basketry and fiber arts has been designated a National Treasure,[3] but it is more valuable when animated with the knowledge and voices of those whose traditions created these beautiful pieces of fiber art.

Wa:k Tab Basket Dancers and Singers being filmed at Arizona State Museum. Photo by Lisa Falk, 2023.

We do the basket dances to honor our weavers. In Tohono O'odham culture, weaving is a big part of our people. –Wynona Peters

As the AR experience starts, Amy Juan, a Tohono O'odham community organizer, in hologram form, welcomes you to the O'odham ha-jewedga (land) and invites you to enjoy "the many living, continuing, and resilient lifeways of the desert," including the basket dance. In this virtual experience, you meet the late Tohono O'odham basket weaver Terrol Dew Johnson and join him in looking at a few of his favorite baskets in the museum's vault, explore some of the baskets in 3D, and view a digital photo wall of Terrol's own baskets while he tells you about his art practice and the effects of climate change and urban development on his ability to find and gather basket materials. Finally, you hear the O'odham poet Ofelia Zepeda read her poem "Huataddam/Fibers on the Land" about basketry in O'odham and English while the words scroll across the space. All this unfolds after you simply scan a QR code and your space is augmented with the people and traditions of this land.

Jackie Ibarra experiences the AR basketry experience after scanning the QR code on Arizona State Museum's sign. Photo by Lisa Falk, 2025.

DCB.ARIZONA.EDU/PRAR1

The Tohono O'odham basketry experience is part of *Discovering Community in the Borderlands (DCB),* an innovative geographically dispersed project that invites visitors to explore the rich cultural communities of Southern Arizona through the lens of augmented reality. Led by the Arizona State Museum, part of the University of Arizona (UA), in collaboration with the UA Center for Digital Humanities (CDH)[4], and in partnership with five community organizations and the UA Poetry Center (PC), this exciting project transcends traditional boundaries—curatorial, geographical, and technological—to animate spaces with the stories of our community. The community-dispersed experience takes participants on a guided tour across six cultural histories at ten sites in the Tucson area. The project called on imagination, research, storytelling, and technological skills to come to fruition. The AR mini-exhibit experiences, accessed at each site by scanning a QR code on a sign, ask users to consider the people of this place over time—their history, relation to the land, creativity, traditions, and ongoing work that continues to shape this community. The hope is that these AR experiences serve as an introduction and prompt users to ask questions, be inspired, and seek additional information on the communities who call Tucson home.[5] In fact, one user commented: "There is so much hidden history in Tucson. This is the perfect strategy to introduce people to important history."[6]

Use your phone to scan the QR code for a taste of the *Discovering Community in the Borderlands* AR experiences. In this teaser, you are greeted by Marc Pinate as a hologram. He tells you about the AR exhibits and shows examples of 3D objects and 2D photographs and a map of the sites while encouraging you to go to the DCB website to get directions and learn more. The AR experience signs are dispersed across Tucson and accessible by scanning the QR code on them with your phone. You can also scan the QR codes on the DCB website. We use this introductory AR experience on postcards placed at libraries and given out by the partners, as well as on Tucson's trolley car plaques and advertisements in local newspapers.

The UA collaborators and community partners formed a cohort of learners who together explored AR as a medium to share community stories and traditions; historic photos; and cultural objects, languages, songs, and poetry. Community project developers included representatives from Dunbar Pavilion (DP, an African American community center), Mission Garden (MG, an ethnobotanical garden), Borderlands Theater (BT, a Hispanic theater company), Pascua Yaqui Tribe Department of Language and Culture (PYT), and the Tucson Chinese Cultural Center (TCCC). The excitement of AR for telling stories and engaging younger audiences in the cultural histories of place drew our partners to this collaborative effort. Marc Pinate, Director of Borderlands Theater, explained that he wanted to learn "how we can bring this history to life with AR—it was novel, cool, and younger people will probably really dig it, neat—like something out of a science fiction movie."[7] He said he'd tinkered with it, but realized the technology was beyond his abilities to master. When I approached him about joining the cohort, he jumped on. Robin Blackwood of the Tucson Chinese Cultural Center felt the same: "It was a great opportunity to publish the rich Chinese history of Tucson to a broader audience, a way to move into newer technology and bring the Center into the 21st century, and with it out around town a random passersby can experience Chinese history." Barbara Lewis of Dunbar Pavilion felt it provided an easily accessible way to entice people to want to learn about African American history and introduce them to DP. In hindsight, Barbara attributes the project to coaxing their board to go beyond the basics of raising funds for their building to wanting to do more to tell their history and share their community's stories. Daniel Vega, formerly of the Pascua Yaqui Tribe's Department of Language and Culture, looked at it as an enticing way to share who the Yaqui are with visitors who come to the Reservation, some with prior knowledge but "many people coming for the first time. It gives them a modern way to see our people, to hear our people, and this creates a sense of humanity—we're neighbors, we both live here."

As we simultaneously gained an understanding of what the technology could do and delved into the cultural stories of this shared geographical region of the Southwest Borderlands we call home, we began to discover new connections and deepened our relationships. Together we discussed what themes we wanted to explore in our dispersed but linked presentation of community stories. Ideas were shared at group meetings and then taken to each partner's organization to further discuss and refine with input from staff and volunteers. Looking at our community as a place of abundance, we focused on stories about:

- Resilience/adaptation/belonging
- Reconciliation/reparations/race and identity
- Plants and their use in the environment/foodways/healing
- Journeys/migrations/immigration
- Cultural expressions/celebrations/community gatherings
- Entrepreneurship/heritage businesses

At first, we thought we'd each take on one of the themes, and several groups would add to that story. But, in the end, each partner wanted their own story at their own site, not a mix of stories. However, sites often touched on several themes in their presentations and there were overlaps of cultural stories shared at various locations. Teachers, we hope, will encourage their students to make cross-cultural connections when reflecting on the AR experiences after using them.

University of Arizona student Amelia Matheson 3D scanning a basket by Terrol Dew Johnson for inclusion in ASM's AR experience. Photo by Lisa Falk.

Daniel Vega explained their process: "At the Department of Language and Culture, we sat together talking about what was the message we thought was important and then what kinds of people—backgrounds, generations, communities—would be best to share this message. We felt it was a great opportunity to be more inclusive in terms of whose voice is amplified, and the type of information shared. Our elders provide us guidance and shape our understanding of our history, but this gave us the opportunity to highlight different people from different pueblos, and different generations. We wanted to include young people, like Juan Narciso Bule, who is a rap artist. Our culture is evolving—beyond the important traditional and ceremonial ways, also evolving with contemporary music and sharing. The people we invited are not the regular individuals who share these stories—they are very organic of where they come from within the community. It is important to also give them this opportunity to share as Yaqui."

The UA Poetry Center chose to help each partner infuse their stories with poetry and to create writing prompts that families and school groups could use as a reflection activity after participating in the AR experiences. The prompts draw on historical and contemporary images as a way of encouraging users to reflect on their own experiences, cultural traditions, and how they, too, are a part of a community. The writing prompt for the ASM experience asks, "What does a basket hold?" with the hope that AR experience helps people realize the richness within the tradition of basketry and see that each basket holds plant knowledge, designs, skills, laughter, and stories, in addition to perhaps seeds, harvests, and laundry.

Each partner collected stories, researched historic photographs and cultural objects, identified people to serve as holographic ambassadors, and chose what languages to include (and translate). Working with the students at the UA Center for Digital Humanities, we figured out which AR tools would work best to share these stories. Most sites incorporated holograms and historic photographs; some also include 3D objects or 2D or 360 video, a few have digital photo walls, one has a rap song, another a slide dance you can join in on, and most have poetry being recited and sometimes projected. Commonly after scanning a QR code, you will experience only one item such as a hologram or a 3D object. Since we were tying together various items into one experience, after much trial and error, the student tech developers homed in on Blipper as the best software to link the items together as one experience. They also used specialized software and equipment for 2D and 3D scanning, regular and 360 video recording, creating animation, and editing. (Because the technology changes very quickly it is hard to recommend specific software.)

University of Arizona student Amelia Matheson records Amy Juan from San Xavier Cooperative Farm on the Tohono O'odham Nation to be made into a hologram for ASM's AR experience. Photo by Lisa Falk.

As we delved into our stories and connections, we realized that in the 1900s, the Chinese community was a link to all the cultural groups in Tucson as the over 100 Chinese markets spread throughout the broad downtown area of Tucson served O'odham, Yaqui, Mexican, African American, and Anglo community members. The project ended up including three Chinese American stories at five sites, including two former markets and one continuing Chinese market.

On an exterior wall of each store building is a sign that triggers the AR experiences. Users see historic photos of the places and watch video-recorded interviews, two that were recorded for the project and one that combines parts of past interviews from the TCCC archives. Robin Blackwood explained: "We tried to just give the community a taste of how these were scattered all over Tucson—they're everywhere. People can just come upon it and suddenly realize this is a Chinese grocery just embedded in this neighborhood—this is where it happened. It makes the past visible." Daniel Vega added that using this new technology on our phones creates an accessibility and immediacy to the information: "Someone can be at the site and immediately connect with the messages—hearing the voices and stories, and even though we are using historic pictures we also have contemporary people represented in 3D."

AR sign for Empire Market, one of the few remaining Chinese markets in Tucson. Originally it was Joe Tang's Market, established in the 1930s. The sign triggers a video that includes historic photographs and interviews with the current owner and community members for whom the store played a part in their lives.

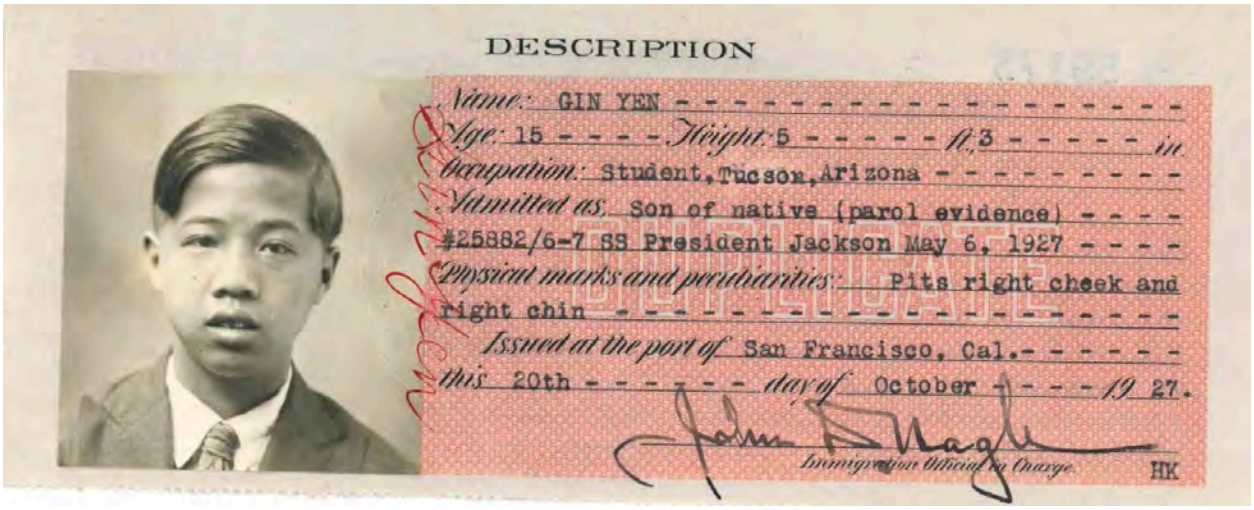
This idea of serendipity and curiosity as people encounter the AR signs at locations across Tucson is also something other partners hoped the project would do. Barbara Lewis likened the experiences to "a movie that connects you with other places—makes you want to connect and to investigate other communities. It piques your curiosity." Daniel Vega emotionally explained the deep value of what the partners realized and hopes users will also see: "We are all connected and living together, generations later we are still crossing paths. The stories help us. What I learned and gained was the love and appreciation for other communities and that love and appreciation they have for their own communities. We can celebrate that together." A user commented: "It gives access to so many more people and places," and another stated: "It's a quick, fun way to learn about our communities/community."

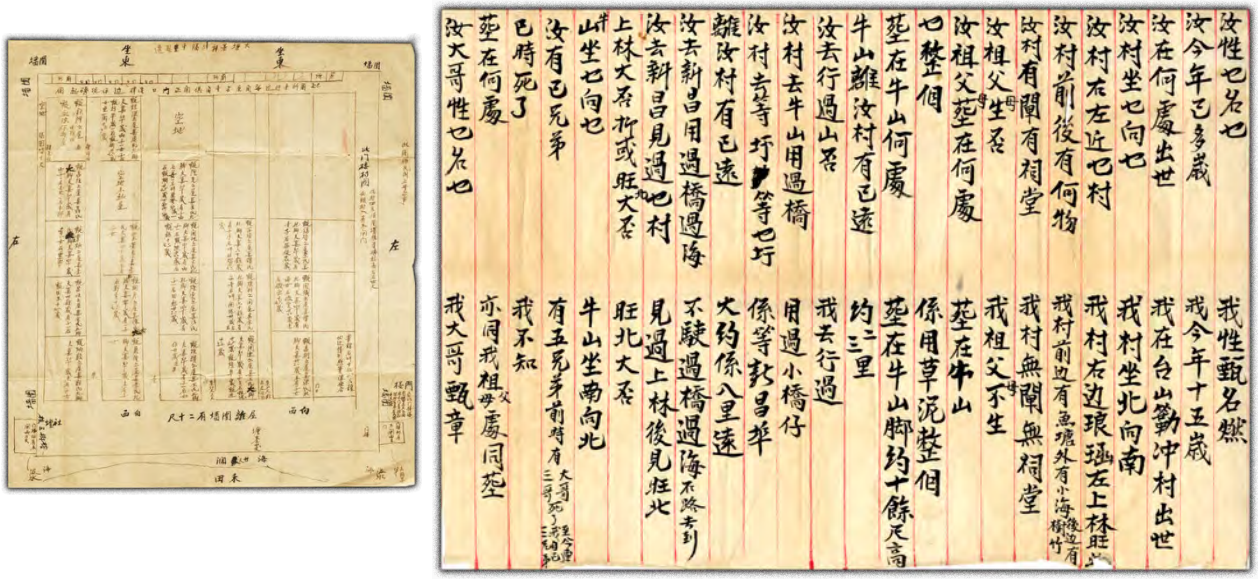
Website graphic for Tucson Chinese Cultural Center of young girl playing the guzheng. Art by Max Mijn, Arizona State Museum.

The TCCC site focused their story on the Chinese School, which, at one location or another, dates back to early last century. The Center was excited to present youth since so much of their work tends to be with elders. Their school story allows AR users to join a Chinese language class, watch a young master play the guzheng, read a poem about this "Chinese zither" in English and Chinese, explore a 3D model of a guzheng, and hear a young Chinese yo-yo master talk about the tradition while watching him and his students throw the Chinese yo-yo into the air and maneuver it with skill.

An additional Chinese American history site was added through an exciting collaboration between ASM and TCCC that resulted in bringing Chinese history back to where urban renewal erased it. In the late 1960s, diverse downtown barrios were knocked down to create a concrete spread of pathways and sterile buildings, including the Tucson Convention Center. ASM curates the collection of Chinese community objects that archaeologists collected at the time of destruction, and UA Library's Special Collection holds the documentary evidence of the several blocks where Chinese businesses and residents once lived. The AR experience brings these residents' presence back to that space. Family stories of ongoing connections with a village in China are shared through translated letters, coaching documents, and a village map Gin Yen used to prepare for his immigration interview in 1927, as well as his Certificate of Identity, which the 1882 Chinese Exclusion Act required all Chinese migrants to carry. Mostly likely Gin Yen was a "paper" son, not related to Gin Fong whom he was joining in Tucson. The AR also includes a 2D video overview by TCCC board chairwoman Tina Liao recounting the history. The 3D objects that illustrate how people lived include a box of tea, a ceramic bowl, opium pipes, and an O'odham basket indicating the exchange among peoples of the area. Robin Blackood emphasized, "Tucson

Chinese were right here where you are standing. It's an interesting, beautiful presentation bringing attention to a very important episode in the history of Tucson, not just for the Chinese but for Black, Hispanic, almost all the partners. We revealed hidden history that is under the Linda Ronstadt Music Hall. I like to be there so I can look at it and say that's where it was, which is more meaningful than looking at it online."





Coaching documents include a handwritten question and answer paper and a map of a Chinese village in Guangdong Province that Gin Yen used in preparation for his interview with U.S. Immigration officers in 1927. The Certificate of Identity for Gin Yen is from when he first came to Tucson at age 15. Coaching paper and map courtesy of University of Arizona Libraries, Special Collections. Certificate of Identity courtesy of National Archives San Bruno, CA.

Less than a mile west of the Convention Center area, visitors to Mission Garden are greeted by a hologram of a smiling gardener, Maegan Lopez. She explains that shared work and values are how this land has been cultivated for thousands of years, and today through the MG's efforts these heritage crops are being restored to the land and community. Users also experience a 360 video tour of the gardens and orchards while listening to the diverse voices of people who have farmed this land through time. They see a historic photograph showing an overview of Territorial Tucson

from that vista and can notice how the land changed as Tucson became an urban city. Passion for the land and its abundance can be felt while listening to a poem written and recited by a hologram of O'odham poet Ruben Cu:k Ba'ak: "In the soils of these lands I am connected to my people; in the fields I am the connection between past and future." Dena Cowen, curator at Mission Garden, feels that the AR experience is a good way to reach a younger audience or people who are more comfortable with technology than they are in an actual garden setting. The sign for the AR experience sits outside the MG main gate, peopling the space even when the garden itself is closed.

O'odham poet Ruben Cu:k Ba'ak on website graphic for the Mission Garden AR experience. Art by Max Mijn, Arizona State Museum.

A couple of miles away is the historic Dunbar School building, established in 1918 as a state-mandated, segregated school for African American students. Now as the Dunbar Pavillion, it serves as an African American art and cultural center. By scanning the sign for the AR experience posted on a fence surrounding the building, visitors can bridge its history with its current role. Barbara Lewis explains how they choose what to include in their AR experience: "I tried to look at the stories that were joyful, that involved groups of people. Historic photos of people gathering in joy. The slide dance class is joyful. This is important because sometimes you think back on our history and sometimes it can be very depressing, it brings you down. But you've got to think of the joyful times too and there were many." The AR experience includes a digital photo wall showing happy moments in the school community's history, listen to a 1987 Mayoral proclamation about the desegregation of the school, and join a dance class to learn the steps to a slide dance. Because of the experience, Barbara Lewis reports that people "have come in and said they have never heard of the Dunbar School and asked for tours, etc. And the slide dance class has gained members, 250-300 members! It has doubled in number since we put up the AR experience."

Meanwhile, the board has added historic information to their website and is developing an exhibit about the history of the Tucson African American community to hang in the building.

Dance at the Dunbar School, 1947, Front left: Della Devereaux, front right: one of the Fleming twins. Photo courtesy of Dunbar Pavillion.

Borderlands Theater is a theater without walls that often bases productions on ethnographic work they do in the Mexican American community of Tucson. They create "innovative theatre and responsive cultural programs ingrained in the heritage, narratives, and lived experiences of peoples rooted across the Sonoran Desert" (Borderlands Theater, www.borderlandstheater.org/about). *Stories of the Westside* was a production about the mainly Hispanic barrio residents. The Borderlands Theater AR experience drew from these stories, which were recorded by actors. Rather than one sign, they had various signs creating an interactive walkway through a park where they presented the play. The AR signs are now being moved to El Rio Neighborhood Center where more people congregate and elders can get personal help on how to access the experiences with their phones. Users can see historic photographs superimposed on today's landscape and listen to residents' memories of living in the adobe casas of the barrio. The stories include Patsy Lee's recollections of her family's Chinese Market, one of many that served the Mexican community. She recalled the specialized spices and cooking items they offered, including her father making chorizo and offering fish on Fridays during Lent for the Catholic community. She said: "The back of the house was our home, so we all worked [in the store]….Ninety percent of us Chinese grew up in the back of the store. …I didn't even know I was Chinese when I was a kid. I was like everyone, like my neighbors. I spoke Spanish like everyone. Of course, when I went to school that changed." Her words go on to explain how the barrio made everyone equal—all languages accepted, everyone poor, and all who didn't speak good English suffering discrimination in school.

One of the *Westside Stories* Borderlands Theater AR signs. Photo by Max Mijn, 2023.

Map of Yaqui pueblos in Sonora, Mexico, and Yaqui communities in Southern Arizona. Map created by Andie Zelnio, Arizona State Museum, in consultation with Pascua Yaqui Tribe Department of Language and Culture, 2019.

Marc Pinate welcomed how their AR experience park walk complements their presentation of the *Westside Stories* play: "A good play will make you go look something up on the internet when you get home—but with this you didn't need to wait to go home."

Located 13 miles southwest of downtown Tucson, the Pascua Yaqui Tribe's Department of Language and Culture wanted outsiders coming to the Reservation to have an introduction to Yaqui history and culture. They invited five representatives of different ages and Yaqui communities—from the Ocho Pueblos along the Rio Yaqui in Sonora and from four Southern Arizona Yaqui communities--to share words. All are presented as holograms, with historic photographs of the different communities shown next to the speakers. Calistro Estrella, an elder, recites a poem of love for being Hiaki (Yaqui) and Narciso Bule, a younger man, shares a rap song expressing his passion for his culture and home. Marta Yrigolla offers a message to youth coming up today: "We continue to strive to survive. Rather than live in fear, let's be hopeful. It takes people to make change. When you put your heart into a community your ancestors built, you have to remind yourself how important it is to be Yaqui in these times. We have survived through all the nuances in our adaptation and skills to continue to educate ourselves in this ever-changing world. Please celebrate yourself as a Yaqui." The writing prompt for the Yaqui AR experience reflection highlights those words and asks, "Think about your identity. What challenges do you have maintaining it? What can you do to ensure your culture is strong into the future?"

Yaqui man and child from historic photograph on website graphic. Art by Andie Zelnio, Arizona State Museum, historic image courtesy of Smithsonian Institution.

In addition to creating QR code-based AR experiences, we also produced a website making this content accessible to anyone, anywhere. The website also hosts the writing prompts, texts of the poems, and captions for some of the photographs in the AR experiences. It provides a short description of each partner group and links to their websites. Maps and location information for each site are also included. Using the website, individuals and school classes can easily jump from one community's AR experience to another and compare and contrast the stories and images shared.

The uniqueness and coolness of the app popping up a hologram, digital photo wall, or 3D cultural object into the classroom will draw students in to explore the stories. Perhaps it will also excite them to research, record, and produce their own community story projects. I'd love to see more of these AR stories pop up around town to illuminate other communities who make up the fabric of Tucson past and present and are part of creating Tucson's future. A Tucson archivist after experiencing the AR stories remarked: "I have always wanted more ways to share Tucson history with non-historians. This is an engaging way to teach and share this story."

Currently, I am working with two educators to develop lesson plans to encourage teachers in middle and high school to use the experiences with their students. Soon these will be added to the DCB website. The goals for these are for students to:

1. Learn more about the interconnected history of the Tucson community and the rich traditions of this diverse place,
2. Ask questions about people and places in Tucson and reflect on the different perspective that ethnographic research can provide on a community's history,
3. Develop documentary research investigations of their own neighborhood stories, and
4. Gain familiarity with types of material culture, historic photographs, documentary video, and words from interviews and poetry that can be used to illustrate and tell community stories.

Our partners were drawn to the project because of the uniqueness of learning how to harness augmented reality to tell community stories. Not only did we learn what we could do with this new tech medium, we also learned so much about each other and our connectiveness in this Southwest Borderland community. The technology changes quickly, but by collaborating with university CDH students we could focus on our stories and what images, objects, songs, poems, and people could best represent and share them. The students helped decide which tech tool to use and did the tech programming, and they had the necessary scanning, recording, and editing equipment. We didn't have to become tech specialists, although the apps for creating these digital products are getting easier to use each year. In the past, documenting with photography and tape recorders were engaging ways to lure students into researching community stories; today new tech media will have the same allure.

Daniel Vega best summarized the benefits of using AR technology in sharing and experiencing community stories. He pointed out that while people have told their own stories for eons not only orally but also through media such as murals, the immediacy and richness of the AR expands one's understanding: "In neighborhoods you see these beautiful art pieces on the side of store walls to convey messages. I remember growing up in South Tucson and you see images that are representative of these communities. On 10th Avenue you see a painting of the deer dancer and the conquistador on a horse. The community used what was available to them to share their story and convey messages of understanding and of pride in their history. This opportunity with modern media is a next step to that—this form has the potential to reach many more people. The murals have interpretations depending on the person who is viewing it, but you are lending your own interpretation to it. With DCB, you hear the passion, what is important to the people from the people directly: This is who I am, I'm proud to be who I am, a contributor to Tucson."

***Lisa Falk**, Head of Community Engagement/Curator of Education at Arizona State Museum, University of Arizona, is responsible for exhibits, programs, and community partnerships. Her innovative and collaborative projects weave together stories of culture, history, and science, and she embraces new technologies and media to tell these stories. Inclusiveness and community curation are key ingredients in how she approaches museum work. She was Project Director for* Discovering Community in the Borderlands *and curated ASM's AR experience and co-curated the Chinese History Downtown AR experience. For the Smithsonian Center for Folklife and Cultural*

Heritage, she wrote Bermuda Connections, *which guides students in investigating their own community stories, and for the Smithsonian's National Museum of American History she wrote* Cultural Reporter.

URLs

Ofelia Zepeda poem "Huataddam/Fibers on the Land" https://dcb.arizona.edu/ArizonaStateMuseum
Community in the Borderlands https://statemuseum.arizona.edu/online-exhibit/discovering-community
Arizona State Museum https://statemuseum.arizona.edu
UA Center for Digital Humanities https://digitalhumanities.arizona.edu
UA Poetry Center https://poetry.arizona.edu
QR Code https://dcb.arizona.edu/prar1
DCB website https://dcb.arizona./edu
Dunbar Pavillon https://thedunbartucson.org
Mission Garden https://www.missiongarden.org
Borderlands Theater https://www.borderlandstheater.org
Pascua Yaqui Tribe Department of Language and Culture https://www.pascuayaqui-nsn.gov/language-and-culture-department
Tucson Chinese Cultural Center https://www.tucsonchinese.org
Writing Prompts https://dcb.arizona.edu/WritingActivities
Blipper https://www.blippar.com
About Borderlands Theater www.borderlandstheater.org/about
Bermuda Connections https://folklife.si.edu/bermuda-connections/smithsonian

Endnotes

1. Augmented reality (AR) uses your phone's camera app to place objects within the space you are in, i.e., it augments the real space as you look through the camera screen. You access it by scanning a trigger such as a QR code.
2. The Tohono O'odham, one of the largest Indigenous communities in the U.S., call the Sonoran Desert their home, and Tucson and ASM sit within their ha-jewedga (traditional lands), which cross the political border of the U.S. and Mexico.
3. Save America's Treasures is a federal grant program administered by the National Park Service in collaboration with the Institute of Museum and Library Services, National Endowment for the Arts, and National Endowment for the Humanities.
4. The University of Arizona's Center for Digital Humanities is a research and innovation incubator for undergraduate and graduate students pursuing digital technology projects.
5. Funding for the *Discovering Community in the Borderlands* project came from the Institute for Museum and Library Services' Museums for America program, the UA Library's Digital Borderlands project funded by the Mellon Foundation, and Arizona Humanities.
6. Since the experiences are dispersed and primarily outside, it is difficult to collect data from users. This quote and others from users were submitted on an anonymous evaluation form at a launch event designed specifically to gain feedback.
7. All quotes from DCB partners were gathered during project evaluation interviews by Lisa Falk, April 2025.