

FROM EVALUATION TO REIMAGINED ACTION

Adapting Digital Media in a COVID Hands-Off World

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Visitors explore color and light at the RGB shadow-wall interactive in *The Nature of Color*. This photo was taken pre-COVID; all visitors are now required to wear masks.



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When the status quo is completely upended, it can feel like starting from square one. With the COVID-19 pandemic, this was true for museums of all sizes and disciplines, including our team at the American Museum of Natural History (AMNH), a large natural history museum in New York City that serves as many as five million visitors annually. When the pandemic hit in 2020, the AMNH Emerging Media team,¹ which develops strategies to enhance visitors' in-gallery learning experiences using digital media, was in the midst of a six-month evaluation to better understand how these digital media – including virtual reality (VR), augmented reality (AR), gestural interactives, and touch tables – function in our exhibitions. On March 2, we were scheduling dates to complete testing. By March 10, testing was postponed, as handling shared objects seemed a risk for virus transmission. By March 13, the museum had closed its doors as New York City became the epicenter of the pandemic in the United States. In the span of two weeks, our plans for evaluation and prototyping were upended. This small project began a long process of figuring out how to adapt to this massive change, even pausing to question whether the past six months of data would have relevance in the face of new realities of COVID-19.

Background: The Pre-COVID Evaluation

At the AMNH, we have been expanding our use of digital technologies and emerging media for several years as a way to layer current scientific content onto permanent exhibitions. In 2019, we began a formal evaluation to better understand how visitors use these media and learn from their experiences. The study planned to examine six in-gallery media: interactive collaborative VR, gestural interactive, AR via handheld device, touch-table interactive, 360-VR video, and AR merge cube (see [fig. 1](#) for definitions). Prior to March 2020, we conducted 242 naturalistic observations of visitor groups using five of the media pieces (including visitors who did not engage) and 192 group interviews after using the stations. Due to the pandemic, we could not collect data with the AR merge cube and only some data with the touch table.

Although a truncated study, evaluation findings covered many nuances of in-gallery media use amongst visitors;² in this article, we share what resulted when our team engaged in a reflective process to think through how we could apply evidence from this pre-COVID study to reconsider ideas for a way forward in the current

conditions. We viewed these data as a rich pool of information from which to reimagine strategies that respond to the new reality for museums. For our team, thinking about a “post-COVID” world largely focused on the immediate need of reopening and operating during a pandemic, when it would likely be a long time before the country would see widespread vaccination rates. It also incorporated more long-term considerations, including the likelihood that visitors may have dramatically heightened sensitivity to physical proximity and touching shared surfaces, particularly in a 21st-century world where the emergence and spread of diseases may be more common. We draw on evaluation findings throughout the article in the context of reflecting on what we learned to inform future decision making.

Process: Making Meaning from Data in a Virtual World

We designed the evaluation as a collaborative process in which our internal stakeholders (i.e., our team of exhibit and media designers, educators, and internal evaluators) participated at each stage, from developing questions, to facilitating data collection, to unpacking findings. Although the pandemic cut data collection short, our team was committed to our plan to engage staff in a data-reflection and meaning-making process. This also had to be reimaged during the museum closure, when staff worked remotely at reduced time and capacity. In May, nearly 20 AMNH staff met virtually with external evaluators, using Zoom videoconference and Mural virtual whiteboard platforms, to

Medium	Description
Interactive Collaborative VR	Multiplayer interactive and immersive experience using a headset and handheld controllers to interact in a virtual environment
Gestural Interactive	Kinetic experience where visitors use movement to interact with the content and activity
AR Via Handheld Device	App that superimposes life-size images, models, and animation on top of the actual environment of the exhibit
Touch-Table Interactive	Facilitated experience where visitors interact with a touchscreen to control, move, and interact with content
360 VR Video	Short film experienced with a VR headset that is visually and auditorily immersive; by turning one’s head or body, visitors can see the film in 360-degrees around them
AR Merge Cube	When this cube is held in front of a tablet’s camera, the screen shows the object it is programmed to display; by manipulating the cube, viewers interact and appear to hold the object on the screen

Fig. 1. Types of in-gallery media included in the pre-COVID evaluation.

Fig. 2. A visitor models the constellation Scorpius, the Scorpion in “Star Pose,” a gesture-based interactive in the Dorothy and Lewis B. Cullman Hall of the Universe in the Rose Center for Earth and Space. This photo was taken pre-COVID; all visitors are now required to wear masks.



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circulate around virtual “stations” exploring preliminary data (analyzed, but without added interpretation) and annotating comments and questions with virtual sticky notes. In two hours, we began generating insights about the relevance of findings to exhibit strategies, including preparing for a still uncertain reopening.

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This process continued over the summer of 2020, as internal evaluators facilitated discussions about findings across departments, aiming to deepen the practice of regularly using evaluation and research. Built into discussions were prompts to consider ideas and thinking in light of COVID restrictions and constraints. Unexpectedly, the pandemic provided an opportunity to dive deeply into what we have learned over the years, engage in extended discussions, and work to articulate design principles for creating new exhibitions and incorporating media into existing displays.

Emerging Inspiration: Implications for Post-COVID In-Gallery Digital Media

The Three I's

One cross-cutting evaluation finding was that visitors are looking for “the three I’s” from in-gallery media experiences – that they are immersive, interactive, and informative. Visitors rated these qualities

as most important for media in general and were what they identified as most enjoyable about the media they used. Rather than seeking “fun” games to play, visitors were interested in media that created authentic experiences with new ideas, places, and people. This finding is consistent with much of the research in the field of visitor studies, indicating that visitors’ conceptions of an enjoyable or satisfying museum experience are highly subjective and often overlaps with learning, discovery, and novelty.³

In considering these results, the conditions and delivery mechanisms that feel safe may change during a pandemic, but interest in interactive, immersive, and informative experiences would not. While communal VR headsets are out of the question, if immersive and rich experiences can be recreated safely, visitors, we believed, would likely be thrilled. This led to another insight from applying evaluation findings to current conditions: to not silo media by type (VR, AR, etc.) in planning. Instead, we started considering how principles and findings cut across media types and apply to non-media exhibits. As we adjust plans, setting clear goals for both experience and content can become a filter for identifying an appropriate medium. In the time of COVID, one can imagine a feeling of almost desperation to find *anything* interactive that could work safely. This study was a reminder that although there are new

filters of resource availability and safety, the importance of articulating principles – such as drawing connections to prior knowledge and making learning goals explicit – should not be lost.

Redefining Participation

In the past, creating opportunities in which visitors cluster around touchscreens or wait for interactive VR experiences was fairly standard. Now, with physical distancing a top priority, we are thinking about how to redefine participation as we operate during and after a global pandemic. One media station we evaluated, “Star Pose,” provided hints about how to approach this challenge. “Star Pose” (fig. 2), a gestural interactive, uses a 13.5-foot-wide screen in an open space in AMNH’s Cullman Hall of the Universe to

illustrate that stars exist on a 3D plane and are distributed across vast distances of space. On-screen instructions challenge a visitor to physically position their body in the shape of a star constellation; spatial recognition technology then assesses if they matched the shape. While gestural technology is ideal from a physical-distancing, non-contact perspective, the evaluation found that not all visitors (particularly adults over 40) were comfortable participating in a kinetic interactive that put them “on stage” or required that level of physicality. Conversely, the large-screen display allowed more visitors to engage as *observers*, before, after, or instead of engaging as *players* (fig. 3). While the performative nature of the design may have hampered comfort for some visitors, there is evidence that it broadened engagement with content, particularly when

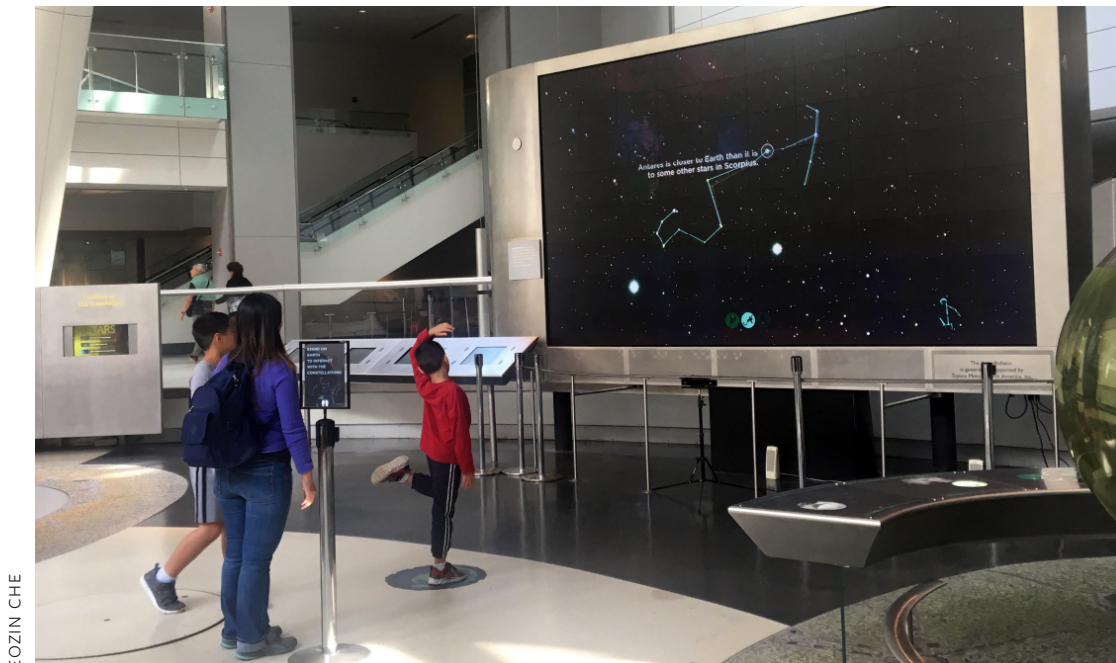


Fig. 3.

A small group of visitors engage in and observe “Star Pose,” displayed on a large screen. This photo was taken pre-COVID; all visitors are now required to wear masks.



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Fig. 4. Exploring a non-messy way to paint the walls and floor in “Color Play,” a virtual paint interactive in *The Nature of Color*. While the kiosks were turned off due to COVID restrictions, visitors can still engage today using gestures and movement. This photo was taken pre-COVID; all visitors are now required to wear masks.

contrasted with VR films viewed via headsets, which can limit opportunities for social, shared experiences.

From these findings, two important themes surfaced. At a simple level, there is value in interactives that leverage a variety of senses and modalities, including gesture. But we also see importance in designing media experiences for shared participation, including mechanisms for large-scale displays that allow for engagement by doing, observing, collaborating, and interacting, in ways that maintain physical space.

The museum reopened to the public in early September 2020 (at limited capacity, timed entry). Before reopening, we assessed interactives to maintain health and safety, to promote physical distancing, and reduce contact, in accordance with Centers for Disease Control and Prevention guidelines. As a result, several exhibitions featuring hands-on interactives and other touchable elements remained closed. However, an interesting case study emerged with *The Nature of Color*, a temporary exhibition that debuted days before closure. *The Nature of Color* explores the diverse roles that color plays in nature, across cultures, and individual expression through feelings and communication. Each section of the exhibition displays a color matched with a theme (e.g., yellow explores color and emotion, green examines color in nature), and includes interactives, artifacts, models, live animals, and video. After its safety assessment, *Color* has several gestural and multisensory interactives that support physical distancing and therefore could be maintained. For instance, the white room features an immersive light-changing RGB shadow wall ([intro image](#)), in which red,

green, and blue lights can be combined to create other colors to convey how the interaction of light creates perception of colors. Visitors experiment with this idea by physically blocking lights with their body. “Color Play” ([fig. 4](#)), another example, is a virtual paint interactive where visitors move their bodies to manipulate colors projected on the walls and floor, “painting” in an immersive fashion.⁴

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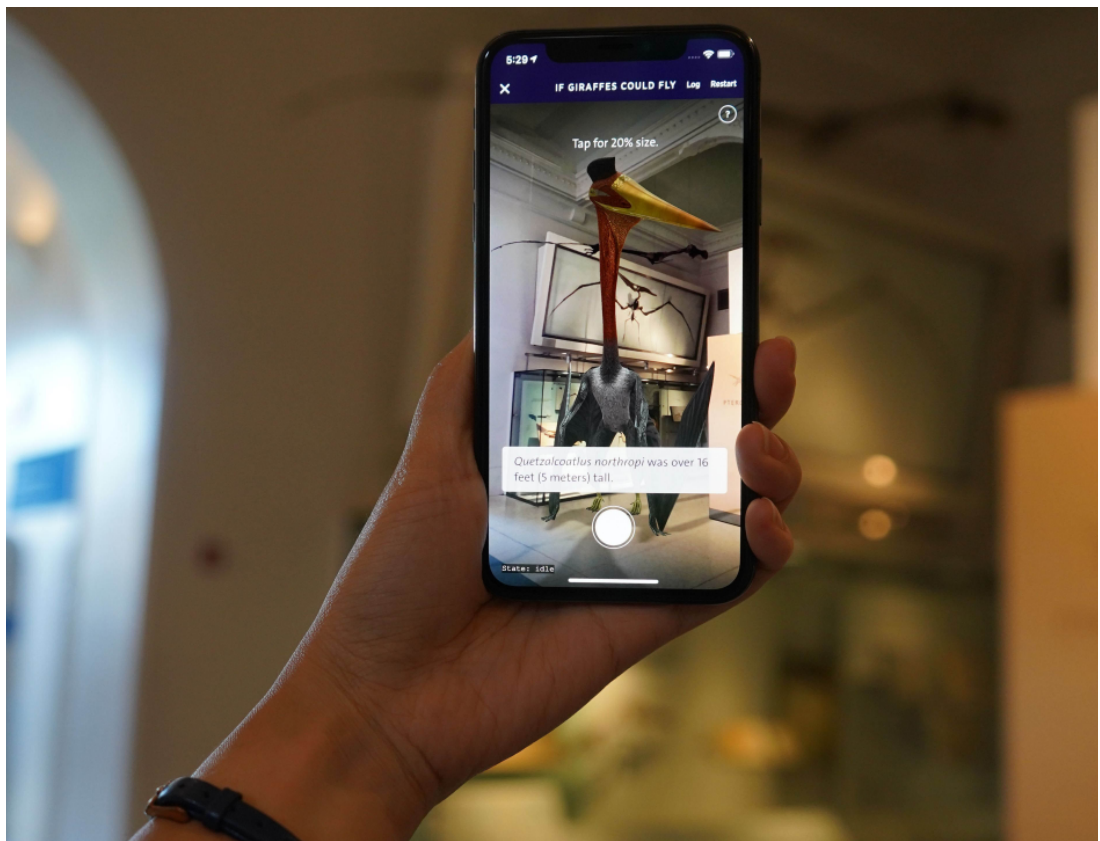
These interactives were incorporated in designs long before the pandemic, as the museum had begun to internalize the importance of having a variety of ways for visitors to interact and immerse in the content. These were lessons learned from past temporary exhibitions that experimented with projected media and visual experiences, including *T. rex: Ultimate Predator*, *Unseen Oceans*, and *Our Senses*, and informed by previous evaluations. As we moved forward in 2020, we added to that thinking scientific research about the pandemic, disease transmission, and awareness of visitors’ perspectives on safety, particularly space for movement and safe multiuser experiences.

Rethinking the Personal Device

Many museums have mobile phone apps that visitors download, in theory, to enhance their experience. App functions include navigation, ticket purchases, custom recommendations of what to visit, and content-rich features such as videos, quizzes, or AR – to see objects “come to life,” as within AMNH’s Explorer app (fig. 5).⁵ Some museum professionals have expressed concern that use of personal devices can distract visitors from objects and “real” museum environments. Referred to in the field as a “heads-down” experience,⁶ where

visitors direct their attention down at a device instead of up at objects and exhibits, we have heard similar sentiments from visitors in past evaluations, who note that they don’t want to be distracted by a device that may detract from the in-person experience. As we reassess our view of emerging media in a post-COVID world, we see potential in reframing mobile devices as a “heads-up” tool for (safe) interaction and collaboration with fellow visitors. For example, how can we turn mobile phones into personal controllers, offering visitors ways to contribute to a larger, multiuser experience?

Fig. 5. Visitors can encounter the *Quetzalcoatlus northropi*, a pterosaur the size of a giraffe, in augmented reality (AR) in AMNH’s Explorer app.



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Fig. 6. Pre-COVID, visitors engaged in the “Feeling Color” quiz show using mobile devices in the yellow room of *The Nature of Color* exhibition. While the kiosks were turned off due to COVID restrictions, visitors can still play today using their personal devices.

The Nature of Color experiments with this approach. Posing questions about personal reactions to color, the “Feeling Color” quiz-based, multiplayer, game-show interactive uses touchscreen kiosks and mobile phones. A large-screen projection reveals collective results, showing participants where their responses fall in the big picture (fig. 6). While kiosks remained off at reopening, the collective experience is maintained from the relative safety of personal devices. Beyond present conditions, mobile inputs allow far more participants than kiosks alone, physically distanced, at no additional cost.

This approach could be implemented immediately for new interactives using available and accessible resources. *Color* essentially projects a poll of participants’ collective feelings, attitudes, and thinking

on a big screen. For instance, any museum could create similar types of interactives by developing compelling polling questions appropriate to the content using mobile-friendly polling and data-display technologies, such as Poll Everywhere and Mentimeter. With “how-to” signage to explain instructions for using personal devices, QR codes to easily access poll participation, and an internet-connected large-screen TV or projector to display the collective results, which are updated by the polling software with each new entry, a low-cost interactive could be created with resources likely already around the museum. Reimagining the personal device, however, raises questions about designing experiences accessible for all visitors. For instance, do all visitors have access to smart phones or personal devices to have the opportunity to participate and feel included?

Conclusion

As jarring to our sense of normalcy as the pandemic has been, the process of reflecting on our pre-COVID evaluations has provided critical grounding and reinvigorated thinking about possibilities and the future. It was a reminder that reimagining doesn't start from zero; our knowledge of visitors, their preferences, and how they learn is a consistent foundation from which we can generate strategies and innovations that perhaps will spur even further innovation for the post-COVID world.

Looking across these reflections, we have drawn two evergreen conclusions. First, there is great value in ensuring exhibitions provide a portfolio of experience types. From touchscreens to gestural to VR to traditional graphic signage, each offers affordances and limitations, attracting different types of visitors for slightly different reasons. As the study evaluated multiple types of digital media experiences in halls, together they created distinct interactions and learning opportunities and were well-used by visitors for their specific strengths, which is an asset at any time. And in a world when unforeseen complications – such as global pandemics – can upend the status quo, this diverse portfolio of experiences provides a foundation of multiple workable options to maintain interactivity and immersion. In the case of the pandemic, while both “Star Pose” and collaborative VR created interactivity that visitors enjoyed, the logistics meant that one could continue to be safely used while the other was no longer possible. Uncertain of what next barriers or potential risks to health and safety will emerge, having a diverse portfolio gives a

greater chance of having something that can readily adapt to new needs and conditions.

Another evergreen conclusion from our reflections on how to apply pre-COVID study findings to mid-COVID conditions was that, at any time, evaluation is not prescriptive. Evaluation does not tell an exhibition designer exactly what should be done; it tells you about visitors – how they use, interact, and learn from experiences. To be most useful, teams must think critically about what has been learned with and about visitors and creatively apply it in the context of goals, current conditions, and educational research. This also helps position visitors at the center of the experience, understanding and honoring their experiences as essential to our work.⁷ We encourage museum professionals to revisit evaluations for through-lines and consistencies. While it will not provide all the answers, and will inevitably reveal new questions and challenges, the process of reflection is invaluable. By carrying forward broader principles to future projects, we have greater ability to adapt rapidly while being responsive to visitors. ■

Acknowledgements

We would like to recognize and thank the members of the AMNH Emerging Media team for their invaluable contributions to this effort: Eozin Che, Ruth Cohen, Bella Desai, Preeti Gupta, Rosamond Kinzler, Nickcoles Martinez, Laura Moustakerski, Albeliza Perez, Brett Peterson, Corrie Roe, Vivian Trakinski. We also express deep appreciation to the evaluation team for significant and insightful work: Michelle Lentzner, Victoria Winters.

1 The American Museum of Natural History's Emerging Media team consists of staff from the Education Department's Science Visualization, Youth Initiatives, Public Programs, Research and Evaluation, and Exhibition.

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