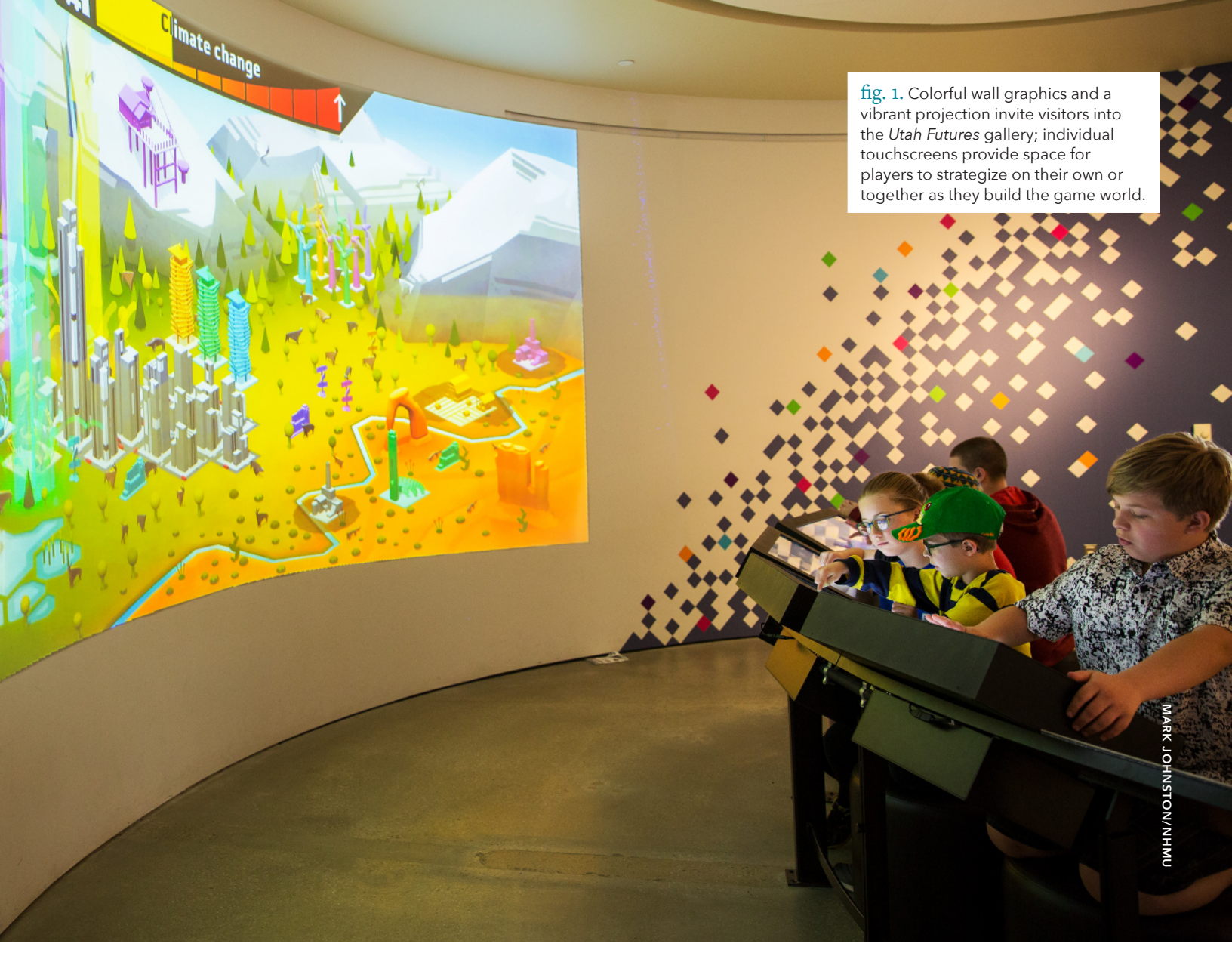


fig. 1. Colorful wall graphics and a vibrant projection invite visitors into the *Utah Futures* gallery; individual touchscreens provide space for players to strategize on their own or together as they build the game world.

MARK JOHNSTON/NHMU

Playing for the Future

Becky Menlove

In July of 2017, with a little fanfare and an enthusiastic crowd on hand, the Natural History Museum of Utah (NHMU) launched a new multiplayer video game called "Utah Climate Challenge." Located in the museum's *Utah Futures* gallery, the game invites visitors to work together to make choices about how to best sustain a growing population while adapting to or mitigating the impacts of a changing climate.

The game plays out on a vibrant panorama projected on the large curved wall of the gallery. Its colorful imagery evokes Utah's iconic landscapes and makes the space familiar and inviting. As play begins, visitors strategize on individual screens, make choices, stop to see their results, and play another round. Soon players are working together (fig. 1) to produce enough food, energy, and fun, while mitigating pollution levels, urban sprawl, impacts on natural resources, and the rate of climate change. It's not uncommon to hear a cheer go up when a group of players has ticked off all three production goals while reducing the upward creep of the climate change gauge. The panorama changes as rounds are played to reflect a world built together and provides a spectacle for observers and collective feedback for players.

The overall objective for the game is to create a healthy and sustainable future in the game world – and ultimately to effect genuine change out in the real world. The game's content is based on a variety of real-world data to bring authenticity to the experience, and while individual choices lead to the type of badge earned at the end of six rounds – from "Eco Warrior" to "Energy Baron" – the projected world reflects the impacts of all players. Each move can lead to larger consequences. Sometimes a choice will help to ameliorate earlier impacts, and sometimes, in "fun/failure" fashion, choices made will bring on terrible consequences such as wildfire, drought, or dust storms (fig. 2) that wreak havoc on the world.

The game is designed to encourage collaboration and to remind players that collective impact is a reality. We regularly witness complete strangers working together, encouraging each other and taking ownership of their shared outcomes. More than once we've watched as one group leaving the gallery imparts lessons learned on the incoming players as they settle in, shouting such advice as "try to reduce the sprawl," or "take care of my solar farms!" Along with powerful co-play and its benefits, the game illustrates cause and effect and encourages thoughtful decision making.

This article explores the long road that brought us to "Utah Climate Challenge," and the lessons we learned along the way.

NHMU

fig. 2. A screen grab from the game world shows a dust storm sweeping across the landscape. While players have reached their energy and food production goals, climate change has reached a tipping point. They'll need to work hard to reduce greenhouse gases.

How We Chose Game Play to Engage with Serious Issues

Founded in 1969, in 2011 the Natural History Museum of Utah opened its new home to the public. Situated in the foothills above Salt Lake City – a diverse and beautiful environment (fig. 3) – the museum's permanent exhibits celebrate Utah and illuminate the natural world and our place in it.

Conceptually linked permanent galleries introduce and reinforce the interconnected themes of evolution, ecology, and biodiversity. Inviting and playful interactivity is built into all of the galleries, encouraging multigenerational visitors to observe, engage, interact, and share. The exhibits include showcases filled with specimens from the museum's research and teaching collections and artfully rendered reconstructions of living habitats and ancient skeletons. Natural science content is amplified and enhanced by soundscapes, multiscreen videos, live specimens, and opportunities to step outside onto interpretive terraces and trails on our site. Visitors engage with the smells of nature, touch specimens, talkback stations, puzzles, games, and water-based interactives. We invite participation in scientific inquiry and illustrate the value of the study of natural history – the deep record of our living planet held in museum collections like ours.

The museum's open plan provides for a cascade of interconnected exhibitions with names like *Sky, Life, Land, and Past Worlds*. At the end of the sequence (or beginning, depending upon where you start) is *Utah Futures* – a small, circular gallery based on a big idea: "When we learn from the past and foster connections to the natural world, we are better prepared to make informed decisions for a healthy global future; through our decisions and actions, we can change the world." How to convey this big idea was among the biggest challenges we faced in creating interpretive experiences for our new home.

Back in 2008, as we finalized exhibition content development, we considered myriad approaches to deliver on this big idea, including displays of objects linked to contemporary issues; narratives about local sustainability practices; carbon footprint calculators; a sustainability game; and a video talkback station with prompts about individual hopes for the future.

We looked at urban planning systems and facilitated programs like "backcasting" (a planning process that begins with a desired future and develops programs and policies to get from the present to that future); virtual reality; decision-support software; and large-scale interactive video. When our design team suggested we produce an animated "digital diorama" that could be manipulated and nurtured by visitors, we began to see a viable direction: a jointly created visualization of Utah that would reflect visitor input.

We developed some baseline goals and a rationale for the project. In the new museum, *Utah Futures* would be a gallery in which visitors could strategize about their futures and the future of their communities, and together address some crucial issues about sustainability. Estimates indicate that within 40 years, the population of Utah will double. We'll have challenges relating to water, housing, transportation, air quality, and energy. We wanted our experience to illustrate that individual choices have a collective impact; to provide opportunities to see cause and effect; to create "ah ha" moments to engage visitors in reflection and action; to encourage conversation and cooperation; and to illuminate multiple perspectives and multiple solutions.


DANA SOHM

After lots of research, visits to other museums with future-focused exhibits, and conversations with colleagues, we decided to develop a Sim-like video game, a game that would be all about creating reality-based simulations. "Sims" are typically "built around problem solving in an environment that encourages playfulness and exploration,"[1] and we could see the potential for a game like this to provide an experience that would 1) encourage collective problem solving in a gallery designed to inspire thinking about our future in Utah and 2) be fully aligned with the interactive and playful nature of our broader exhibition program.

Building on Lessons Learned

When we opened the new museum in 2011, we launched with a game in *Utah Futures* (also called "Utah Futures") that focused on sustainable water and energy use. Its algorithms ran on datasets from local utilities, and the game played out on five touchscreens in sync with a projected backdrop – a watercolor of Salt Lake City. Some player choices brought new images to the cityscape – a large farm, a reservoir – but most choices resulted in a news headline whirling into place above the scene. It was far from the high-fidelity graphics and dynamic simulation I'd envisioned, but it was a pretty effective first attempt.

An evaluation in 2013 indicated that visitors were responding well to the experience. We learned that visitors liked the idea of a game in a museum and although a number of respondents noted shortcomings in the game, they reported both pleasure and new insights from playing. The majority of respondents found strong educational value in the game, enjoyed the big screen and the individual touchscreens, and "liked the fact that it was about conservation." Most participated in the collaborative way we had hoped for, and 80 percent of visitors rated the game positively overall. However, we also learned that players wanted clearer goals, more feedback, and greater flexibility in joining the game. And, most importantly, we found little evidence that players were making connections with their own lives and their own behavior.[2]

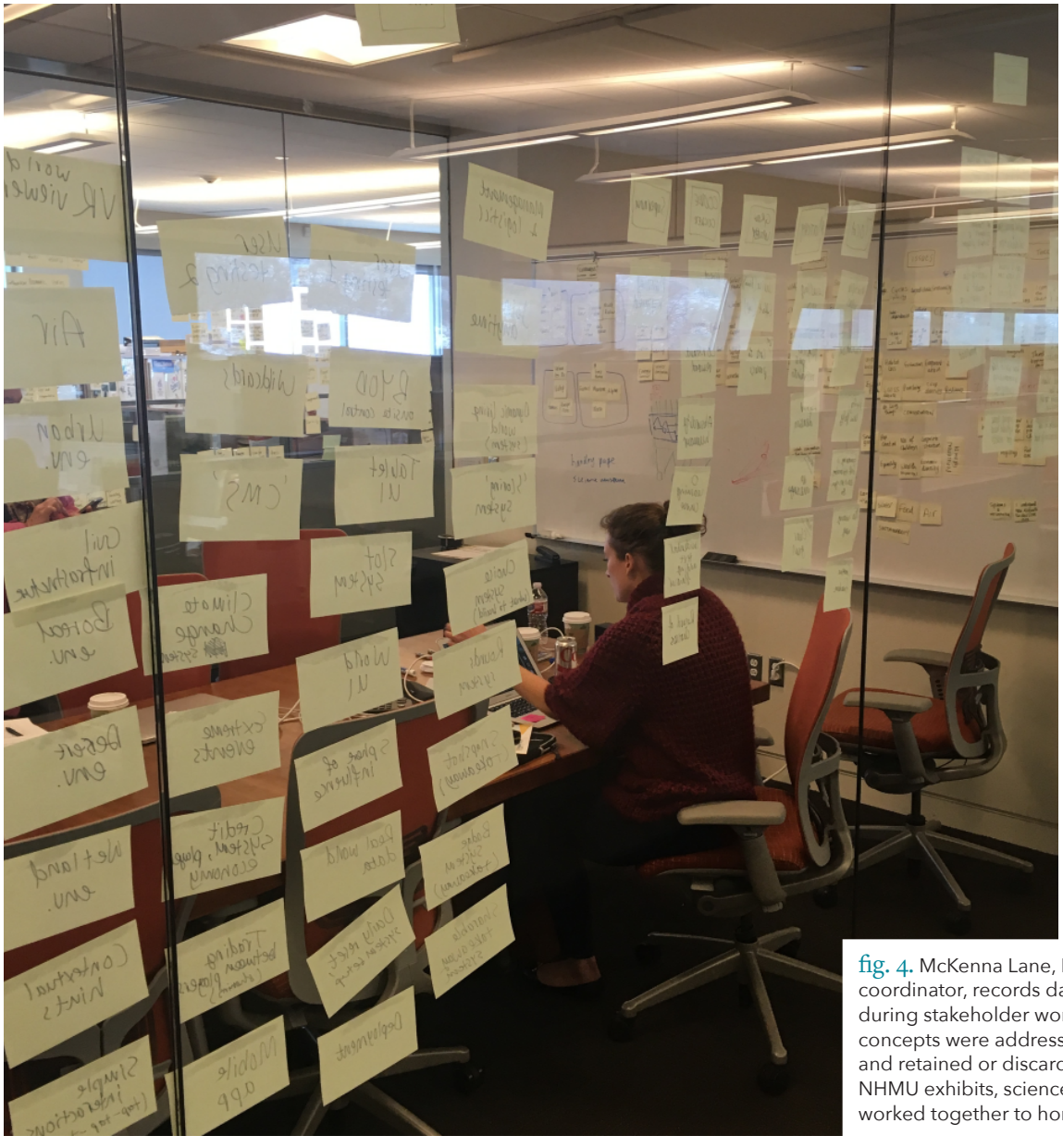
1 James Paul Gee and Elisabeth R. Hayes, *Women and Gaming: The Sims and 21st Century Learning* (London: Palgrave Macmillan, 2010), 7.

2 Frankly, Green + Webb, *Utah Futures Evaluation Report*, unpublished (October 11, 2013).

fig. 3. The museum is well situated to invite visitors to explore natural history in its interdisciplinary galleries and on its beautiful site in the foothills of Salt Lake City.

We had allocated funds for remediation, and we were ready for an update, upgrade, or replacement of "Utah Futures" to meet the needs of our visitors, but we needed clarity to decide on the right direction to take. We wanted to incorporate our learning from the first game and we wanted to test our earlier assumptions as well. So, along with delivery of the 2013 visitor study, we charged our consultants – Frankly, Green + Webb (a UK-based digital consultancy firm focused on visitor evaluation and advising) – with researching and preparing for a stakeholder workshop at the museum. We wanted to review the evaluation findings and explore data about the potential of games to impact comprehension, encourage collaboration, and influence behavior change.

In 2014, the museum's exhibit, science, and IT teams came together for a crash course in game dynamics, to explore a variety of game mechanics, and to learn about the strengths and weaknesses of games, including our existing one, for delivering on specific goals. We learned that while games are not typically great at conveying large amounts of complex information, they can pique interest and engage visitors in further exploration. And we learned that while inducing and measuring behavior change is



NHMU

fig. 4. McKenna Lane, NHMU project coordinator, records day-one results during stakeholder workshops. Myriad concepts were addressed, discussed, and retained or discarded as the NHMU exhibits, science, and IT teams worked together to hone content.

extremely difficult, clear, focused, and engaging games can disrupt habits of mind and effect such change.

The workshop resulted in multiple options for the next iteration of the *Utah Futures* gallery experience, from physical changes in the gallery to a plethora of game mechanics and foci. We chose to move forward with a new game, rather than an iteration of "Utah Futures." We were interested shifting the focus to climate change and the urgent and important issues it brings, rather than more diffuse sustainability messages. And we agreed that making the game fun ("not just worthy") and easily accessible was critical in order to engage visitors of all ages and to encourage participation of both players and observers.

We wanted to retain and expand on the high level of collaboration we had achieved with "Utah Futures," and it was clear the experience needed to include strong visual feedback to reflect player input. Additionally, if we were to move the needle even a little toward behavior change, the new game would need to provide personal relevance, links between game play and real-world experiences and choices, and opportunities for reinforcement and repetition through strong replay value, clear messaging and, potentially, scaffolded content in the gallery along with the game. We were ready to build a game embedded with "characteristics such as competition, rules, challenges, and choices [to] provide a structure for learning that still allows for a good deal of fun."[3]

The Importance of the Right Partners

The search for the right partner required a comprehensive request for proposals (RFP), and we once again sought support from our consultants at Frankly, Green + Webb to facilitate development of this document. A look back at the RFP process and outcomes for "Utah Futures" and several other digital projects helped us to develop clearer principles and learning outcomes than we had in the past. We were looking for a game developer that could create an experience that didn't just show how systems work, as many interactive exhibit developers can do beautifully, but rather an experience in which our visitors would play the system to discover cause and effect. We were looking for a developer with the potential to deliver on the engagement and learning that game dynamics have been shown to advance, such as broad abstract insights, system thinking, experimentation and collaboration."[4]

We also outlined the developmental and logistical needs of the project and partnership including ongoing and transparent communication, regular and ongoing testing and iteration – not only in the games studio, which seems to be typical of such projects, but with our own audiences – and a budget holdback (included in the total bid) for up to three years of remediation after beta testing.

The entire process was somewhat sidelined by other digital and exhibit projects, and we didn't release the RFP until 2016, but that summer, after a long search, we hired Preloaded, a games development studio from London whose tagline is "games with purpose." Their design philosophy of "low thresholds, high ceilings, and wide walls," coined by Mitchel Resnick in his book, *Lifelong Kindergarten*, spoke directly to our requirements for a game that would be easy to understand and instantly rewarding; provide opportunities for mastery and deep learning for committed players; and offer an experience with broad appeal.[5] The Preloaded philosophy provided solid footing for design, and building on principles set forth by the museum, we kicked off the development process in January 2017.

Making "Utah Climate Challenge"

Our work began with a three-day, in-person workshop with our stakeholder team (exhibit, science, and IT) and the lead designer from Preloaded. Despite having received an exciting design concept from the Preloaded team during the selection process, we had all agreed that we wanted to dig into the content together to be sure we were heading in a good direction. The workshop conversations were critical in setting the tone for our collaboration, getting all ideas and concerns on the table, and gaining confidence in authentic, open communication across all teams. It was three days of deep conversation, wide-ranging content analysis, walls covered in sticky notes, and amazingly, on days two and three, testing with our visitors using both existing games to investigate response to various game mechanics, and paper prototyping to test our content against potential game play (fig. 4).

3 Dennis Charsky, "From Edutainment to Serious Games: a change in the use of game characteristics," first published February 11, 2010, http://doi.org/10.1177/1555412009354727.

4 Cai Yiyu et al, "Immersive Protein Gaming for Bio Edutainment," first published December 1, 2006, http:// DOI: 10.1177/10468781062936777.

5 Preloaded, Technical Proposal for NHMU, July 1, 2016.

Like many digital designers, Preloaded works in a modified Agile development process,[6] so as soon as our workshop was over, the team quickly got to work on a first sprint. As they worked in London, we were developing the big idea and key visitor outcomes: 1) Utahns can adapt to a changing climate to create a sustainable future; 2) climate change is impacting life in Utah; 3) it matters to me; 4) I have agency to help create solutions; and 5) our collective and individual actions have real world impacts.

Climate change is a tough nut to crack. It often seems like something far away and out of our control. Many of us have established mental models about climate change that are filled with overwhelm, fear, or denial. In order to disrupt these habitual ways of thinking, our aim was to 1) provide an exciting, playful experience, and 2) focus on Utah and the climate impacts that are occurring close to home. We looked at some large survey data collected from over 50,000 Utah citizens and found that clean air, food for the growing population, reasonably priced energy, and access to recreation in our beautiful landscapes are what many Utahns want.[7]

The game would ask our visitors to experiment with cause and effect, mitigation and resilience, as they played individually and collectively across a familiar landscape that represented all of Utah. We began to imagine that if we could playfully experiment with existing systems and look at the impacts of our choices inside the game in new ways, we could potentially begin to talk about the realities of climate change in new ways, too.

It's easy to expect too much when you're in a process like this, but it's good to enter with your dreams intact, and be prepared to reign in the complexity. You won't know until you experiment how much content is too much. In just two weeks, we were beginning to review design direction and see firsthand where we needed to distill, simplify, and avoid overloading our visitors. This was a process that was repeated over and over through the weeks and months that followed.

6 Agile refers to practices and principles used to manage software development in a fast-paced, collaborative, and highly iterative way. See "Agile 101" from the Agile Alliance at www.agilealliance.org/agile101/.

7 Envision Utah, "Your Future," accessed April 2, 2018, https://yourutahyourfuture.org.

The Preloaded team playtested regularly in their studio and also directed testing in the gallery (fig. 5). The museum team composed extensive observational notes to discuss and share with Preloaded, who brought their expertise to bear on what could happen next. A lead designer at Preloaded noted that "it's best not to worry about getting it perfect for testing; ad hoc it and use some fakery to simulate the actual experience to get some meaningful results. It's an amazing experience to see you project in the hands of visitors so early on."[8]

We went from extremely complex content and an overwhelming interface to simpler and simpler user experiences. We gave up a lot from our long wish list, but we didn't eliminate without testing. Preloaded's rapid prototyping approach allowed us to see what could work and what might not. Our desire to use real-time data, for example, went by the wayside when we saw the degree to which these realities would eliminate players' experience of cause and effect of their choices in the game. Likewise, the Preloaded team gave up their urge to include currency in the game to limit progress and reward skill, when we learned through playtesting that the inherent competition of earning currency would dampen or eliminate cooperation.

We're Still Not Finished with *Utah Futures*

"Utah Climate Challenge" has proven to be remarkably successful. Since launch, over 67,000 players have logged in; approximately 32 percent of players play through all six rounds; and the average stay time is eight minutes – a remarkable hold time in the midst of an exciting visit to the Natural History Museum of Utah.

Through a pair of post-launch evaluations that included observation and interviews, we have learned that the game is welcoming and easy to join – 74 percent of observed groups started the game without hesitation and easily navigated through it. Collaboration and cooperation is at the heart of the experience for the majority of visitors observed (fig. 6), and while a lot of conversation revolves around game mechanics (e.g. "there's my windmill!") a good deal of conversation about broad climate topics were recorded, including these examples from the observational evaluation: "We have one more round to save the world...."

8 Preloaded, MuseumNext talk notes shared with author, June 8, 2018.

MCKENNA LANE/NHMU

fig. 5. Playtesting both the Alpha release of the game and new hardware was carried out in *Utah Futures* over several days. We rolled out the touchscreens, anchored on carts with sandbags, invited visitors to play, and took copious notes of our observations.

MCKENNA LANE/NHMU

fig. 6. With gameplay underway, players team up to sustain their bustling world. They've reached their energy, food, and fun goals, and the climate change bar is dropping.

"See, *we* should be in the current administration, not certain *other* people." "Nuclear power really doesn't create much pollution. If we want to take anything out, it should be the other power plant."

All visitors interviewed during the evaluation indicated that the game is fun and entertaining and provides the educational value they expect from NHMU. Most interviewed indicated that the game reinforced their existing understanding of climate change, and recognized the value in working together to address this problem. Audience members aged 20 and up demonstrated critical thinking about climate change by transitioning their conversations about the game to discussions of their day-to-day experiences and the role they can play in adapting to or helping to ameliorate climate change. And interestingly, a small group of users indicated that they return to the museum specifically to play the game, providing an opportunity for that all-important aim of reinforcement and repetition.

Because it's only a game, it's possible to experiment with cause and effect and extreme choices, to see how they will play out, and engage in open dialogue.

These last two outcomes begin to point toward hope for our goal of behavior change, but we won't know to what degree thoughtful conversations and strong statements will translate into action until we undertake a long-term study. In the meantime, we are hearing from visitors of all ages that the game is all about finding a balance and making thoughtful choices. And while we are thrilled "Utah Climate Challenge" provides players with feelings of agency and a chance to envision positive change in the face of one of humanity's biggest challenges, we are preparing to do more.

Following the visitor studies in late 2017 and early 2018, we held another stakeholder workshop that included the same museum players along with the lead designer from Preloaded to review evaluation findings, to brainstorm potential changes or additions to the game and/or the gallery, and we spent two days rapid-prototyping with our visitors. Eight months after the live launch of the game, we were remediating the user interface and beginning to develop plans for additional experiences in the gallery. We're eager to see where this work will lead, and we are hopeful that a long-term study is in our future.

Lessons Learned

At NHMU, we have used games in various exhibits for a variety of outcomes – from random adventure generation to ecological exploration. These are games where visitors can quickly learn about simple relationships, make comparisons, or explore connections and change over time. All of these games add value and access to the exhibits they occupy and are geared for multiple players to participate in one way or another.

"Utah Climate Change" goes further by offering an alternative entry point for families, friends, and strangers to engage in conversations about a difficult topic. I believe that this potential function of game play is a powerful one that is worth investigating. Games like "Utah Climate Challenge" can be designed to stimulate curiosity, invite and reward exploration, and provide fun and failure without focusing on blame. Because it's only a game, it's possible to experiment with cause and effect and extreme choices, to see how they will play out, and engage in open dialogue.

When planning for a game experience, as with all exhibit experience development, be sure to take into account the spatial and intellectual context of the game. Choose to make a game because it is the best way to engage your audience with your learning and experience goals. Consider your target audience, but understand that observers as well as players will engage with the experience. No matter how complex the subject matter of the game, keep it simple, limit options, and provide opportunities for players to tell their own stories. And remember that games should be fun.

Choose a game studio that shares your enthusiasm and your goals and brings a deep understanding of game play to the table. Come together to develop a clear shared vision and define your position – think about your game and how it compares with other experiences in your venue and within the wider market. Be clear about the concepts you want to address, come with your hopes and dreams intact, and then test and compromise. Don't be afraid to change course during the process. What works on paper won't necessarily be a win on the gallery floor. We made several major pivots during the six-month process of developing "Utah Climate Challenge," and all were critical to its success. And most importantly, engage your audience early and often. Many of our play testers returned to test multiple iterations and they remain champions for (and of) the game.

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