MuseConnects

A Design Paper for MIT CMS.636/855 Extending the Museum

Jack Liufu
Harvard Graduate School of Education
JLiufu@gse.harvard.edu

Rachel Sawdy
Harvard Graduate School of Education
rachelsawdy@gse.harvard.edu

Lamees Rahman
Wellesley College
lr1@wellesley.edu

Amy Ni
Massachusetts Institute of Technology
haoni@mit.edu

CONCEPT OVERVIEW

With the move to MIT Museum's new location in 2022, we see increased attention toward revisiting what it means to engage with the MIT Museum. As it stands, the museum has much to offer in terms of visitor engagement: interactive components are commonly found throughout exhibitions and galleries, though much of this aims to facilitate interaction between a single visitor and something within the museum (a theme, idea, technology, object, etc). To foster connection and further the MIT Museum's mission, it's important for us to turn our attention toward facilitating meaningful visitor-visitor interactions. As John Durant, Director at the MIT Museum, has said, "One big theme of the new museum is conversation. We see the museum serving as a kind of forum or meeting ground for different groups" [8].

MuseConnects aims to encourage visitors to interact with each others' views of objects within the museum, even if indirectly. Our experience supports visitors in learning from one another, listening (and even responding) to differing perspectives, and engaging with objects in the museum. The MIT Museum serves as a place to learn, play, and engage with objects and each other [Debbie Douglas, personal communication, 20 March 2023]. It is a place to learn and experiment, and MuseConnects supports this mission. Through the MuseConnects experience at The Exchange, visitors will have the chance to interact with one another, co-creating knowledge and understanding of objects within the museum.

Because of our museum-based approach, our target audience will be MIT Museum's primary target audience: MIT students themselves. Based on experience and early testing and interviewing, the values we will capitalize on for this audience are interactivity, inspiration, and the opportunity to learn something new. Given these constructs, it is clear that MuseConnects offers a values-aligned approach to increased visitor-visitor interaction at the MIT Museum.

MuseConnects offers an approach to visitor-visitor interactions in museum spaces. At the MIT Museum, MuseConnects, in its current iteration, utilizes a tablet device to collect responses to a given prompt, which are then displayed on The Exchange screen. Currently, MuseConnects prompts visitors to consider their connection to and beliefs about a nearby exhibit in the museum, Tracing Threads, asking: "What are the benefits of knowing the story behind the production of a good, like the shirt on your back or the shoes on your feet?" Though the current iteration reflects just one exhibit at the museum, it can easily be built upon to include multiple means of engagement, based on various spaces and objects within the museum. Not only are visitors able to submit their response to the prompt, but they can also react and/or comment on the responses of others, generating conversation about what's inside the MIT Museum. As you'll see in further sections, we have also developed an app prototype to increase the ways in which visitors are able to access and use MuseConnects.

In this design paper, you'll learn more about how we developed MuseConnects, and the exciting plans we have for future development.

KEYWORDS

visitor engagement, museum participation, visitor-visitor interaction, collaborative meaning making

1 BACKGROUND RESEARCH

1.1 Existing Projects

There are several existing museum initiatives which incorporate themes and processes which formed a basis for our project. At the Harvard Art Museums, there is an opportunity for visitors to scan a QR code related to an art work and answer, in long response form, a question regarding that object. Scanning and response submission would be done on visitors' personal mobile devices, and submitted responses — from both the visitor and of other visitors — are not visible. This created a foundational basis for the kinds of questions to garner visitor engagement as well as validation for the existence of this form of participation within established museums. At the Dallas Museum of Art, visitors were able to relay their thoughts regarding a work of art, and their responses would be collated into a word cloud. It was unclear whether visitors were able to see the summative word cloud or their own contribution; this did demonstrate to us the established nature of having discussions where data was collected by an apparatus tethered to the space, as opposed to visitors' personal mobile devices, and the appeal of an aesthetic collection of visitor responses such as a word cloud. From the MIT Museum itself there were two initiatives we drew learnings from. The first was The Exchange initiative on the museum's website; visitors are able to record video responses to prompts about different exhibits, and presumably this would be done on visitors' personal devices and when not in the physical museum space. Similarly to the Harvard Art Museums, responses were

not accessible after submission and other visitors' responses could not be seen. From this initiative we learned about different modes of visitor input — not being confined to text but also expanding to audio and video — and also about the possibility of extending these participatory initiatives beyond the physical museum space. Lastly, the MIT Museum featured an AI poetry exhibit where visitors co-construct a poem with AI; the system of content moderation provides a basis for our own content moderation: having preset words that are not inputtable, having automated content moderation, and having periodic manual human checking of responses that are displayed.

From all of these projects, the learnings and transferable knowledge to MuseConnects were the ideas of: transparency for responses — visitors being able to view their own and other visitors' responses — as well as providing different modes of engagement for visitors: tethered and personal devices for submission, text and other media for mode of contribution, and in- and out- of the museum space for location of participation.

1.2 Literature Review

From the literature, a key element and theme regarding virtual discussions and learning communities is the importance of technical abilities of the users: users have to feel that the technical barriers to use are not too high, that they are able to intuitively navigate or readily learn the interface, and that they should be supported in their learning of the technical usage of the platform [5,6,9]. These robust findings parallel with research on how providing guidance and scaffolding for how visitors use their devices in museums and guiding them toward what to take photos of improves their experience [4]. In addition to this, many of the digital engagement tools at museums prioritize the individual visitor over collaboration and interaction with other visitors [7], while the most current research on museum attendance cites sociality alongside curiosity as the two most important and motivating factors for why people visit museums [3]. Lastly, to undergird the elements and ideas of participatory museum visiting, digital meaning making, especially in the context of the present-day museums, is key to visitor experiences and learning [2].

Key learnings and takeaways for MuseConnects are: to make the technical user interface as intuitive and guided as possible, to make sure collaborative and visitor-visitor elements are centered and meaningful, and to make sure the discussions are centered on exhibits and grounded in the museum's context.

1.3 Field Observations

When we started to consider what MuseConnects interactions might look like in the MIT Museum, we set out to understand what some of the museum's current engagement looked like. Utilizing principles of UX research and formative evaluation [1], we designed a small field observation protocol and were able to observe visitor engagement for thirty minutes in the Gene Cultures exhibit as well as with The Window. We decided on these two separate observations since they allowed us to get a glimpse of interaction at the object level as well as the exhibit level. To measure perceived engagement, we developed an observation protocol (A1) which looked for measures such as taking a photo, discussing with another person, and engaging with objects in the space. After we conducted our observation, we wrote a brief reflection of what we saw.

Based on interactions and perceived engagement levels, our main findings in regard to The Window were that many people did a cursory walk through the space, without interacting with many or any objects in the room. Of the two visitors who sat and completed The Window activity, neither stayed to watch their input be added to the screen. This made us wonder: do museum-goers want their responses shown so prominently and publicly? Or would they prefer less spotlighted work? In the Gene Cultures exhibit, we saw that many visitors looked and observed throughout the space. Those who took photos were less likely to participate in interactive components, and vice versa. There was clearly engagement with the technology that is provided in the space and visitors seemed inclined to want to keep or share a piece of the museum, e.g. taking photos, and this accounted for half of the visitors observed.

An important limitation and consideration of our observations is that non-interaction does not mean disengagement. Because our observations were separate from our interviews, it is important not to assume visitor perceptions. To account for this, we also conducted user interviews in reference to our project.

1.4 User Feedback

In order to further understand user wants and needs, and to supplement our observations and literature review, we interviewed three potential users. At this point in the development of MuseConnects, we were relying on Figma prototyping and description of further enabling technologies to describe the project to interviewees. To allow for ease of conversation, these were semi-structured interviews. This left us room to ask follow up or unexpected/unplanned questions, and respond quickly to what our interviewees were telling us. Since our interview method was semi-structured, the exact phrasing of each question may have been altered and the sequencing of interview questions was subject to change dependent on circumstances, including the interviewee's thought process and conversation. In the interviews, we followed the protocol in Appendix 2 (A2).

Interviewee 1 is a current graduate student at the Harvard Graduate School of Education. Currently, this interviewee is taking a class at the Harvard Art Museums: Learning in the Museum.

Interviewee 1 was compelled by the proposed movement from the tablet response onto the display wall. They said that they would be likely to engage with MuseConnects because of this component, and would be even more inclined if

they felt that it had something profound or aesthetic they wanted to share. They appreciated the simple interface of the user flow, but desired the possibility of interacting physically with the display wall.

Interviewee 1 was less attracted to the comment feature, prompt, and had moderation concerns. They said that the comment feature on other responses "feels weird" because the original poster likely would not see it; it felt less like a conversation. They also let us know that the example prompt, connected to the Tracing Threads exhibit, felt dry, and they would've preferred a more inviting, warm, and casual prompt. Further, Interviewee 1 brought up a concern for moderation. To make MuseConnects more engaging, they suggested being able to see the prompt more readily to provide context, and proposed a more colorful interface. They also suggested, in regard to the dynamic response projection, having responses with many likes stay longer on the screen.

Finally, Interviewee 1 emphasized intentionality in planning: they highlighted a need to make the project welcoming to multiple perspectives and allowing people to see things they wouldn't have thought of themselves.

The second interview conducted included two interviewees: Interviewee 2 and 3. Both Interviewee 2 and Interviewee 3 also attend the Harvard Graduate School of Education.

These interviewees found MuseConnects to be a cool, interactive, and safe way to digitize conversation in the museum. They found the concept attractive in its simplicity, and shared that it is attention-grabbing. Both interviewees stated that they would likely engage in this activity because they are interested in how others would respond.

These interviewees had concerns about cognitive load—they shared that something that would deter them from engaging is if they believed it to require too much effort to figure out how to use. They shared that it would be more engaging if there were other interactive components and/or if they could learn something about the people who were responding (i.e., where they're from and what their histories are). Similar to Interviewee 1, they had suggestions for organizing the displayed responses: Interviewee 2 and 3 suggested that responses with higher engagement could be larger.

Overall, Interviewees 2 and 3 loved the concept. They were interested in different ways to engage that aren't as text-heavy, and thought that this may be more inviting to visitors as well. They also prompted us to consider why visitors attend museums: to be passive? Or actively engaged?

Considering the feedback received from each of these interviewees, we were prompted to consider that users of interactive experiences are looking for aesthetically pleasing, low cognitive entry, and have some interest in others' responses.

1.5 MIT Museum Staff Interviews

In addition to user feedback, we were also able to interview other stakeholders: two director level staff members at the MIT Museum (Interviewee 4 and Interviewee 5). We approached these interviews similarly—we planned for a semi-structured interview with questions focusing on design feedback and feasibility. These were integral to our design development because we wanted to ensure that MuseConnects has real possibility of a life in museums. In these interviews, we asked slightly different questions, as seen in Appendix 3 (A3).

Interviewee 4 is a long-standing staff member at the MIT Museum and has been a support to the development of many projects throughout this course, CMS.636/855. She brings a wealth of knowledge about the history of MIT as well as the history of MIT Museum to the support of this project. As she was informed of our initial project ideas before the beginning of the interview, she came prepared with suggestions to further iterate our design.

Interviewee 4 was compelled by our project idea, and felt as though there was a place for it at the MIT Museum. Further, she suggested it could have a bigger space within the museum by utilizing The Exchange, a large screen in an open area of the museum's second floor. The Exchange, Interviewee 4, told us is the largest screen on MIT's campus, and could be an interesting space to utilize for MuseConnects. She informed us that MIT Museum staff have previously discussed The Exchange as a place for discussion, so MuseConnects would fit nicely there with the goals of the museum. Rather than a permanent or constant installment, she suggested having MuseConnects be featured at key times during the week or day.

One hesitation she raised for us to consider echoes some of what was shared in user interviews: some people may be afraid to offer their opinions if they know they'll be projected on a large screen for anyone in the museum to see. She suggested we consider interactive questions that are more accessible to those who might feel intimidated, such as, "How does this piece make you feel?"

Overall, Interviewee 4 was supportive of MuseConnects, and ultimately put us in contact with MIT Museum staff for field testing following changes made to our prototype.

Similarly, Interviewee 5 is another director-level employee at the MIT Museum. She reiterated and validated much of what Interviewee 4 shared.

Interviewee 5's feedback was grounded in visitor experience. Our project resonated with her in that she said we are aiming to solve the "holy grail" of what museums are trying to do: foster conversation. She shared Interviewee 4's sentiments that The Exchange ought to be an informal, experimental place, so our project might have a place there. She asked us to consider how to make MuseConnects feel fluid within the museum–raising the challenges of being outside of an exhibit or space that we are asking visitors to think about. She asked us to consider our prompts carefully so visitors are able to realize the

connection between the object or exhibit and MuseConnects at The Exchange.

Further, we discussed moderation concerns and logistics with Interviewee 5. Since she has worked directly with the MIT Museum's AI poetry experience, she has experience in navigating this challenge. Along these lines, she shared that "generally people try to be a bit more respectful if you ask the right questions."

Overall, Interviewee 5 seemed compelled by what MuseConnects offers. She shared that the comment feature could be fun; in thinking about watching the comment appear, she said, "Oh I do want to see it on the big screen." The prospect of sparking conversation within the museum is something that excited her: "There's nothing like human engagement." By the end of the interview, she noted, "If this works out, it could be a really cool model."

Both Interviewees 4 and 5 provided specific, actionable feedback and next steps that informed the further development of MuseConnects, explained in the next section: Project Development.

2 PROJECT DEVELOPMENT

2.1 Early Prototype

In the early prototyping stages, we considered a variety of paths that we could take MuseConnects in. In essence, the overall user flow of MuseConnects consisted of a prompt, response form, then an option to view and engage with a feed of responses from other visitors. Based on the user feedback, we thought about ways in which we could push our prototype further to deepen engagement. After constructing a prompt related to the Tracing Threads exhibit, we envisioned a MuseConnects tablet to exist in the exhibit space itself, dynamically projecting visitor responses onto a blank wall in the room, centered around the prompt(s). This would allow visitors to foster a more personal connection to their museum experience by witnessing a physical manifestation of their engagement become a part of the museum space itself. We imagined this projection to have dynamically moving responses populating the wall, creating an energetic and spirited display that visitors would be intrigued by and drawn to. We also thought about the possibility of including multiple prompt options per exhibit as a way to address the concerns raised by interviewees over cognitive load.

As previously mentioned, in the user research and feedback process of MuseConnects, we relied on feedback for early prototyping using Figma.

2.2 Pivots Made

After feedback received, our interviews with MIT Museum directors prompted us to pivot our design. Rather than a projection within one exhibit, we decided to utilize The Exchange screen (and larger space) to engage with our audience. Since this change was mostly in regard to the space utilized, much of our initial content planning remained.

From the user and stakeholder interviews, our plan for questioning around one exhibit, Tracing Threads, was validated. We were pushed to consider how we can make the connection between spaces clear, so we ensured that our homescreen on the tablet mirrored that of Tracing Threads, using images of the space. In our mobile app planning, there are prompts for users to explore the exhibit.

An important decision was made to focus on one prompt and one mode of engagement per exhibit; there was understanding that providing multiple means of engagement and interaction were important, following principles similar to universal design for learning, however we decided that incorporating multiple means of engagement for the same exhibit would increase the amount of steps needed to interact and contribute and would decrease the user experience overall. The amendment was made instead to allow for different modes of engagement for different exhibits, rather than one exhibit, to allow for maximal accessibility and interest.

There was also initial discussion around a "Share" button where a visitor's response could be sent to themselves or others; this was based on the exploration of existing museum initiatives where visitors were not able to see their responses after they submitted them. Given the public and aesthetic nature of how visitor responses would be displayed, though, this feature was deemed an unnecessary step and the pivot was made away from an explicit share feature and toward scaffolding for visitors to document the display itself.

2.3 Programming

After several rounds of initial prototyping using Figma, we began to develop a digital prototype of MuseConnects in the form of a web application. While we envisioned the project to become a self contained software application in its final stages, prototyping it as a web app allows flexibility in both development and testing. We chose to develop the program using Plotly Dash, a python UI library that is simple to use yet still can produce sophisticated websites.

The base dash library is powerful enough to create an UI that is simple and consistent with the overall aesthetics of the MIT Museum where we planned on installing the prototype. Dash's built in components also provided us all functionalities required for the application, mainly page navigation and user input. Additionally, in order to store user responses and display them across different instances of the website, we added the database library SQLite to keep track of all responses and the comments associated with them. Lastly, we hosted the website on the cloud application Render that has a free website hosting service.

While the web application is simple to build and fully functional, there are some limitations and future development considerations. Given the nature of the project, we are allowing visitors to freely write anything they wish as a response. Thus, it is possible that a visitor inputs a harmful or inappropriate

message that can end up on the public display screen. To provide more moderation, the website can make use of existing text moderation tools and integrate them into the response form. We should also add more staff end functionalities to allow museum staff to manually moderate and remove any inappropriate responses. Finally, while the SQLite database is powerful enough as a temporary storage of information for the website, we cannot easily view or edit any data stored within the database. In the future, a server based database can make sure that we always have access to the data, which can help with analysis and moderation.

2.4 Tablet Journey Map

The visitor experience for using the tablet tethered to the physical museum space is as follows. Visitors walking into the space would see a collection of the nine most recent responses displayed in the gallery page that the user can access through the tablet. The gallery page will also be displayed on a big screen close to the intended exhibit to attract visitors, encouraging them to approach the device and interact with the application (A4). They would see a tablet version of MuseConnects, where the user is first brought to the homepage of the exhibit. Displayed is the exhibit-specific prompt. They have the option to either add a response to the prompt, or view other responses and engage with them. The layout of the prompt page aims to bring focus and add emphasis to the prompt itself, with the prompt centralized on the screen. Large font sizes are also used to ensure accessibility, with the buttons filled in black to bring attention to them (A5). If the user chooses to input a direct response, they will be prompted to enter a short response. Optionally, the user can input their name, although we recognize that not everyone wishes to put their name in a public facing website. After filling out the response form, the user can then return to the home page where they can navigate to the gallery of all responses or leave the device for the next user (A6). In the gallery page, the user can view all of the different responses as well as comment on or react to any responses by tapping on the like or comment icons. The comment form looks similar to the response form where the user can input a short response. After submitting, the comment will also be displayed in the gallery underneath the original response (A7).

2.5 Testing

It was of utmost importance to gather data on real-user and real-visitor experiences and feedback regarding the core ideas of MuseConnects. The prototype of MuseConnects was developed as above and contained the core elements of the product: an attractive and appealing place for visitors to see their own and others' responses and contributions, a question to respond to regarding a very proximal exhibit in the museum, and a way to react and respond to others' responses. We were able to use a prototype of the Tablet Journey of MuseConnects in order to test the concept.

Two four-hour tests were conducted on separate days in The Exchange space, utilizing the large, wall-sized display, at the MIT Museum (A4). With around 120 total visitors moving through the space, about 20% of visitors responded and contributed their responses, and about 90% of visitors engaged in some way: stopping to read, taking photos of the screen, and other methods of engagement that weren't inputting their own response. The visitors encompassed both routine MIT Museum visitors and special visiting school groups. The percentages given are estimates, given the nature of the test and the context of being in an open museum setting. Some important findings and learnings from visitor interviews after they engaged with MuseConnects were: the publicity and aesthetic of seeing your own name are attractive, and the publicity of seeing your own response can be disabling because of fear of judgment for your answer since the question seems to have a lean toward what an "acceptable" response would be.

From the implementation test, important takeaways for upcoming iterations of MuseConnects would be to continue emphasis on the development of the aesthetic, to give multiple means of access and engagement, and to make the question more approachable while maintaining its meaningfulness.

2.6 Mobile App Journey Map

The MuseConnects Mobile App prototype expands on the tablet prototype, focusing on expanding visitor to visitor engagement across multiple exhibits and utilizing various modes of engagement. This prototype strives to improve accessibility by providing multiple entry points to engage with visitor responses - users would not necessarily have to find a tablet in the physical museum space to engage with, they can access the platform on their phone according to their own ease and convenience. The mobile app also addresses concerns regarding cognitive load. Users are given increased choice in finding ways to engage that feel most meaningful to them, either through short response, drawing, and so forth. Overall, the MuseConnects app creates a more individualized experience for the user.

Upon launching MuseConnects, the user is first taken to a mission statement that outlines the purpose of the app. This gives the user clarity regarding what MuseConnects can be used for. During testing of a low-fidelity prototype, some users expressed that they may feel confused when actually using the app in a museum setting. Some searched for context and information about exhibits or pieces in the museum like many existing museum apps provide. Providing the user with the mission statement therefore distinguishes MuseConnects from other guide-based museum apps as a conversational, engagement-based mobile app. Next, the user is brought to an explore page where they are given the choice to explore exhibits individually, or all together (A8).

After clicking "Individual Exhibits" on the Explore page, the user is brought to a list of ongoing exhibits at the MIT Museum (A9). Upon selecting a specific exhibit to explore, they are taken to the prompt page. Here, the user has a choice to

either respond to the given prompt, or explore other responses. Photographs from the exhibit are displayed on this page to remind the user of the exhibit. After clicking "Add Response", the user is taken to a simple form in which they can type their response and name. Note that only the response is required and adding their name is optional. This takes into account different visitor preferences. Some visitors may enjoy seeing their name and identity become a visible part of the museum, giving them a more personal connection to their visit. Others may feel more comfortable engaging anonymously. Different exhibits also have different engagement types. As shown, the Tracing Threads exhibit uses a short response mode of engagement, whereas the AI exhibit uses drawing as a mode of engagement. Again, this allows us to account for all types of visitors who may have different preferences. They are able to choose the engagement type most enjoyable and meaningful to them.

The gallery of the collated responses for a single exhibit is in a simple feed style. The prompt is re-stated at the top of the page, followed by responses that users can scroll through. Comments for responses are displayed below the respective response, outlined by the color code of the exhibit. More color was implemented into the design following the testing and feedback stage, in which users stated including color would make the system more dynamic, vibrant, and engaging. Users can engage passively by simply scrolling through the responses or liking ones that peak their interest, or more actively by clicking on a response and adding a comment to it. This accounts for concerns raised over cognitive load by interviewees (A10).

The previous few sections explore the user experience within the "Individual Exhibits" section of the mobile app. After clicking "All Exhibits" on the explore page, the user is brought to a centralized, multimedia color-coded feed of responses from all exhibits. This space creates a break in the monotony from singular response feeds, eg. only text responses, thus creating a more lively, energetic, and visually engaging experience for the user. The colors also allow users to quickly scan and see which exhibits may be of interest to explore further. In the future, we envision this feed to be populated with a wider variety of media through the response types for various exhibits, such as photographs, videos, long responses, and so on. Users also have the ability to filter by exhibit to personalize their experience to suit their interests (A11).

Upon clicking a response from the multi-exhibit feed, the prompt and exhibit are restated to contextualize the response. The user can also view the comments for the response. Note that the user cannot comment on a response from this page. Instead, they are encouraged to explore the specific exhibit further through the "Explore XYZ Exhibit" button at the bottom of the page. This brings them back to the home page for the exhibit, giving the option to view other responses or add their own. Our intention here was to motivate the user to learn from other visitors, gain new perspectives, and read and think about other responses so that they can be more open-minded when engaging (A12).

3 FUTURE DIRECTIONS

The foundational background and learnings from research, testing, and design illuminates a meaningful path forward for MuseConnects. Improvements to the aesthetic attraction of the Gallery page, which all visitors see first, will be made: improving this should bolster visitor engagement and motivation as well as provide visitors with scaffolding for what they may want to share or take photos of — improving their museum experience. Another step would be to consider questions that are still related to exhibits while also lowering the affective filter of responding and having a publicly displayed response; we certainly want the users to feel part of an important larger discussion while enabling as many as possible to contribute their voices to the conversation. Content moderation is an important next step as well: automatic systems for preventing certain inputs and for checking all stored content, and periodic manual mechanisms for reviewing all stored and displayed content.

MuseConnects is designed to be utilized in more modes than a tablet tethered to one museum space and exhibit. Future directions include different modes of engagement — drawing, short response — beyond the current long response and different access points — mobile app — beyond the current tethered tablet experience. These different modes not only give users ways to interact that may be more comfortable or meaningful to them, but also allow for visitor interactions and conversations around multiple exhibits within a museum and even across museums. Being in a mobile app means that visitors and users can interact even when not physically on site. The design and visitor experience of the mobile app is outlined above, and deeply utilizes the learnings from the research and testing. For the multiple means of engagement it provides different color codes, making it easy to connect across different exhibits within a museum and to create a larger understanding of the purpose of the museum and of the visit; these ideals of digital meaning making are central to visitor experience [2].

With the importance of visitor interactions and conversations and participation, MuseConnects intends to begin bridging the gaps between objects, visitors, and other visitors. If museums are intending to be the meeting grounds and conversation spaces for people [8], the direction of MuseConnects — one of digital meaning making, visitor-visitor interaction, and active discussion and connection — is one that we should be moving in.

ACKNOWLEDGMENTS

We would like to thank the MIT Museum team and staff, including Debbie Douglas, Ann Neumann, Kate Silverman, and Kevin Lind for their support in helping us to understand the MIT Museum, providing feedback for the idea, and helping us to run tests. We would like to thank the MIT CMS.636/855 learning

community of Spring 2023 for helping to inspire us and for creating an amazing learning space.

REFERENCES

[1] Baxter, Kathy, et al. Understanding Your Users: A Practical Guide to User Research Methods. 2nd ed., Morgan Kaufman, 2015, ai.google/research/pubs/pub43846.

[2] Charitonos, Koula, et al. "Museum Learning via Social and Mobile Technologies: (How) Can Online Interactions Enhance the Visitor Experience?" British Journal of Educational Technology, vol. 43, no. 5, Wiley-Blackwell, Sept. 2012, pp. 802–19. https://doi.org/10.1111/j.1467-8535.2012.01360.x.

[3] Cotter, Katherine N., et al. "Why Do People Visit Art Museums? Examining Visitor Motivations and Visit Outcomes." Empirical Studies of the Arts, vol. 40, no. 2, SAGE Publishing, Apr. 2021, pp. 275–95. https://doi.org/10.1177/02762374211011740.

[4] Hughes, Karen, and Gianna Moscardo. "Connecting With New Audiences: Exploring the Impact of Mobile Communication Devices on the Experiences of Young Adults in Museums." Visitor Studies, vol. 20, no. 1, Routledge, Apr. 2017, pp. 33–55. https://doi.org/10.1080/10645578.2017.1297128.

[5] Reinhardt, Jonathon. "Metaphors for Social Media-Enhanced Foreign Language Teaching and Learning." Foreign Language Annals, vol. 53, no. 2, 2020, pp. 234–42. Wiley Online Library, https://doi.org/10.1111/flan.12462.

[6] Reisinger, Deborah S., and Joan Clifford. "Community‐based Language Learning as a Transformative Practice: An Exploration of the Modes of Communication." Foreign Language Annals, vol. 55, no. 3, Wiley-Blackwell, May 2022, pp. 668–83. https://doi.org/10.1111/flan.12629.

[7] vom Lehn, Dirk, et al. Rethinking Interactivity: Design for Participation in Museums and Galleries. June 2005. ResearchGate, https://www.researchgate.net/publication/228769033_Rethinking_interactivity_design_for_participation_in_museums_and_galleries/stats.

[8] Winn, Zach. "'Whoever You Are, This Is Your Place.' Reimagined MIT Museum Encourages Visitors to Join MIT's Community." MIT News | Massachusetts Institute of Technology, 30 Sep. 2022, news.mit.edu/2022/mit-museum-opening-0930.

[9] Yeh, Ellen, and Svetlana Mitric. "Social Media and Learners-as-Ethnographers Approach: Increasing Target-Language Participation through Community Engagement." Computer Assisted Language Learning, vol. 0, no. 0, Dec. 2021, pp. 1–29. Taylor and Francis+NEJM, https://doi.org/10.1080/09588221.2021.2005630.

APPENDIX

A1. Table 1: Observation Protocol

Observation Protocol: MIT Museum	
The Window	Gene Cultures Exhibit
Metrics Observed	
☐ Number of people in group observed ☐ Length of stay ☐ Interaction(s) with The Window ☐ Take a photo ☐ Express confusion ☐ Express surprise ☐ Laugh or smile ☐ Look quickly ☐ Look extensively ☐ Talk or point ☐ Nod ☐ Write ☐ General notes/comments	☐ Look at/read signage ☐ Take photo ☐ Use interactive components ☐ Discuss concepts with someone ☐ Interact with guide ☐ Write ☐ General notes/comments

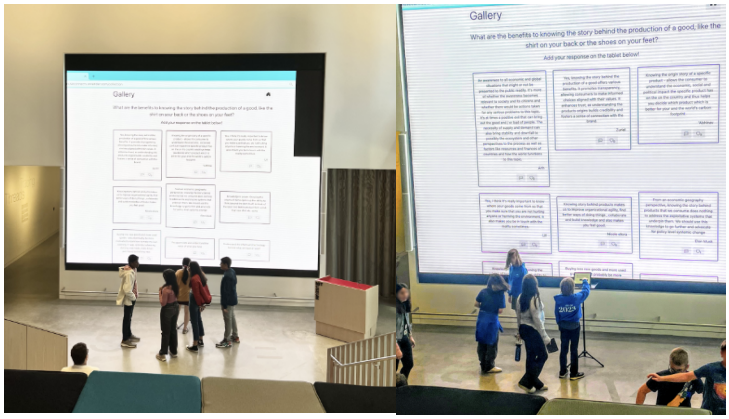
A2. Table 2: User Interview Protocol

User Feedback Interview Protocol	
Introduction	(Describe product and demonstrate user flow on Figma. While demonstrating, briefly explain the additional features of the user flow that will be developing later on.)
Questions to ask (take notes while discussing)	• What attracts you to this? • What doesn't attract you? • Would you engage with this product? • What would make this product more engaging? • How is the user flow? • Does the ability to share/keep your response, as well as see others', help? • Any other comments you'd like to share?

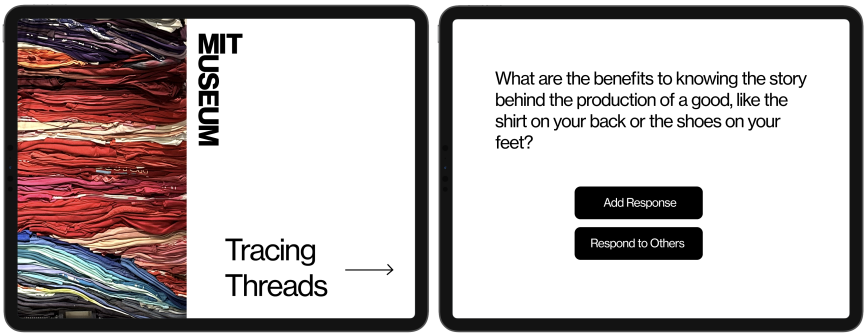
A3. Table 3: Stakeholder Interview Protocol

MIT Museum Staff Interview Protocol	
Introduction	(Describe product and demonstrate user flow on Figma. While demonstrating, briefly explain the additional features of the user flow that will be developing later on.)
Questions to ask (take notes while discussing)	• Would a projector and iPad be able to be set up in the space? • Does this idea of getting engagement / people to interact with each other seem feasible? • What evidence would you need to convince you that it's worthwhile? • What might prevent you from using this? What isn't attracting you? • What features do you wish this had? What would make it more engaging? • What similar things in the past have been ideated and what led them to succeed or not? • How is the user flow? • Does you think being able to share / keep your response as well as see others help? • Any other comments?

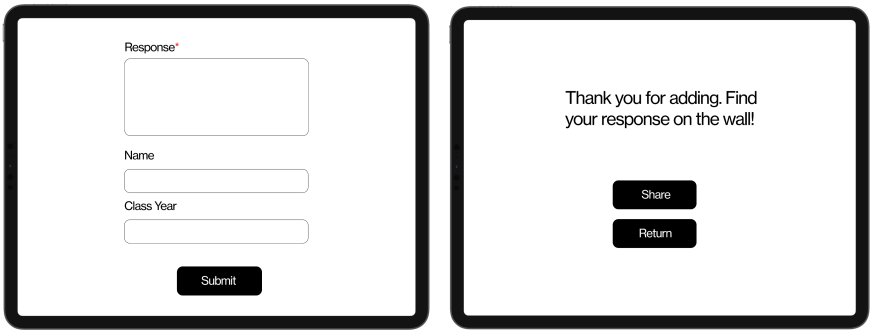
A4. Figure 1. Response Projection in The Exchange at the MIT Museum



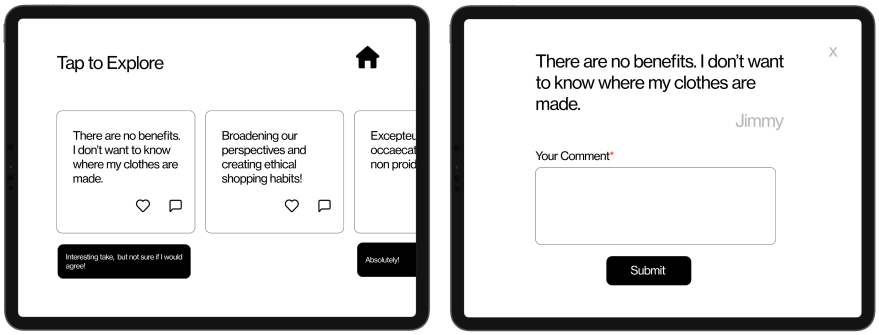
A5. Figure 2. Tablet Journey Map: Home and Prompt



A6. Figure 3. Tablet Journey Map: Adding a Response

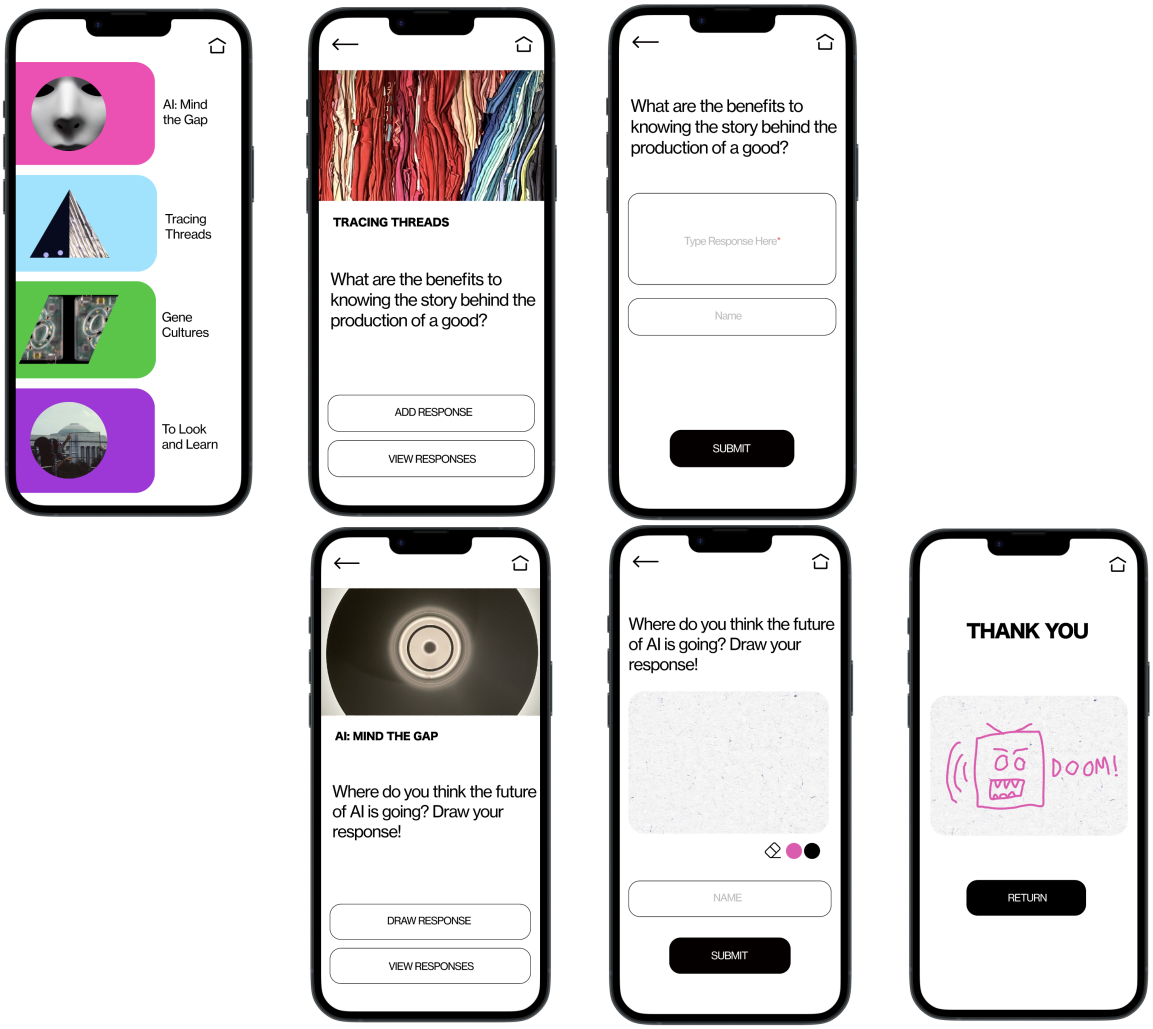


A7. Figure 4. Tablet Journey Map: Responding to Others

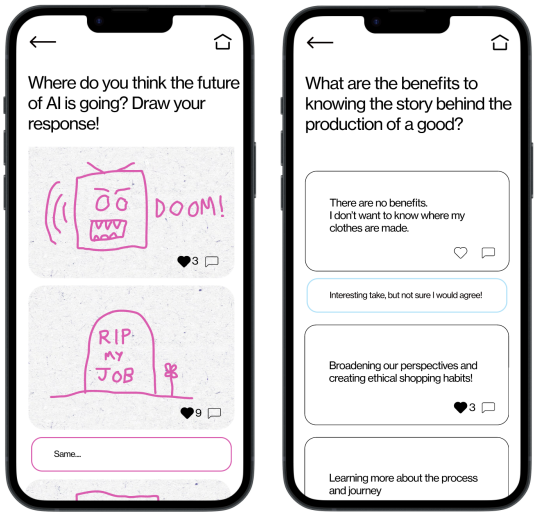


A8. Figure 5. Mobile App: Home Page, Mission Statement and Explore

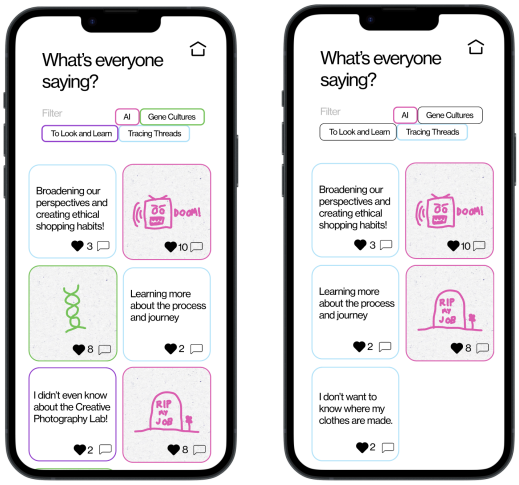
A9. Figure 6. Mobile App: Individual Exhibits — Prompting, Responding, Multiple Modes of Engagement



A10. Figure 7. Mobile App: Exploring Responses — Response Feed, Liking and Commenting



A11. Figure 8. Mobile App: All Exhibits — Multimedia Feed and Filtering by Exhibit



A12. Figure 9. Mobile App: All Exhibits — Linking Back to Individual Exhibit Responses