

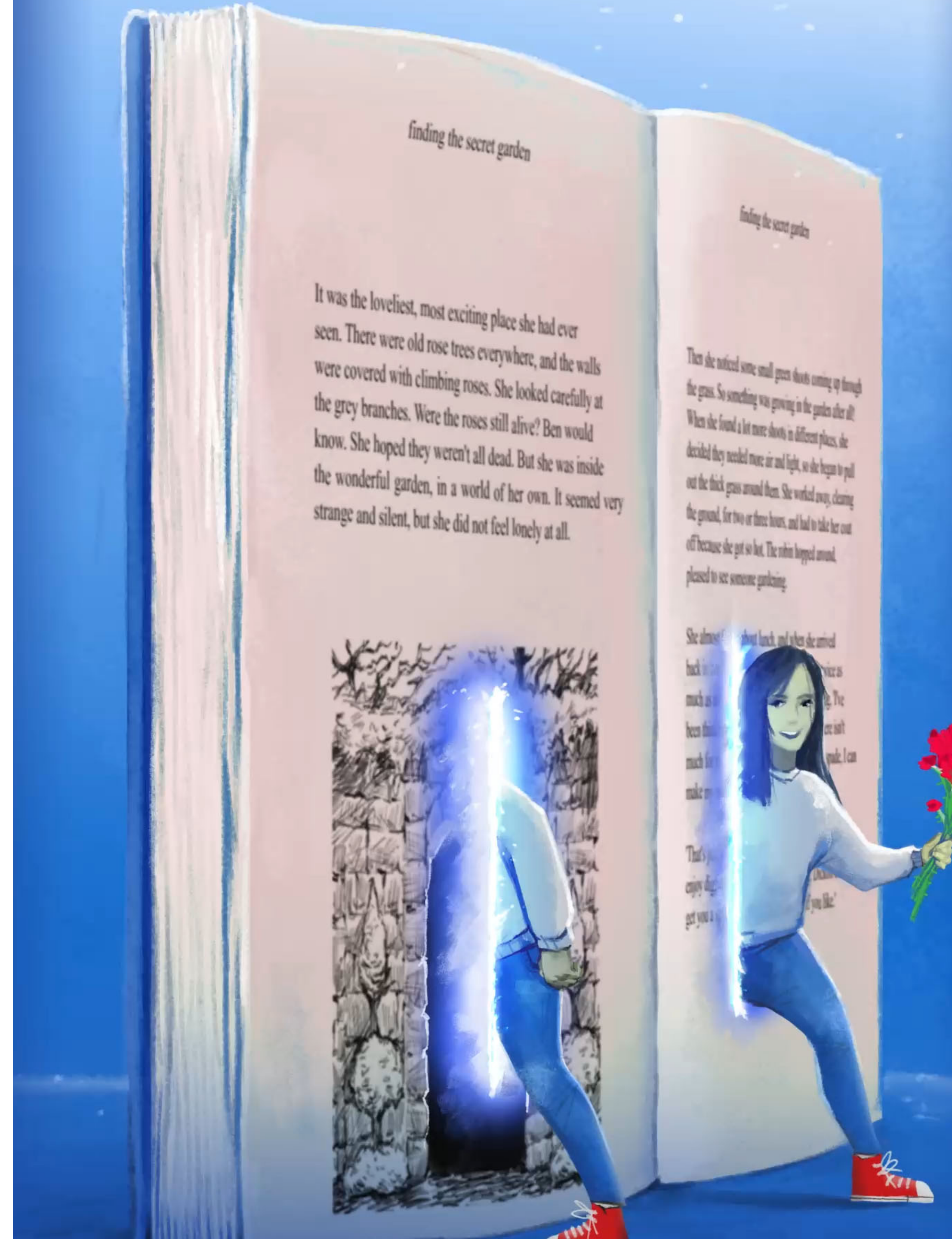
Cultural Heritage and XR

Dr. Susan Lechelt, CDI1



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First - a bit more on Design Fictions

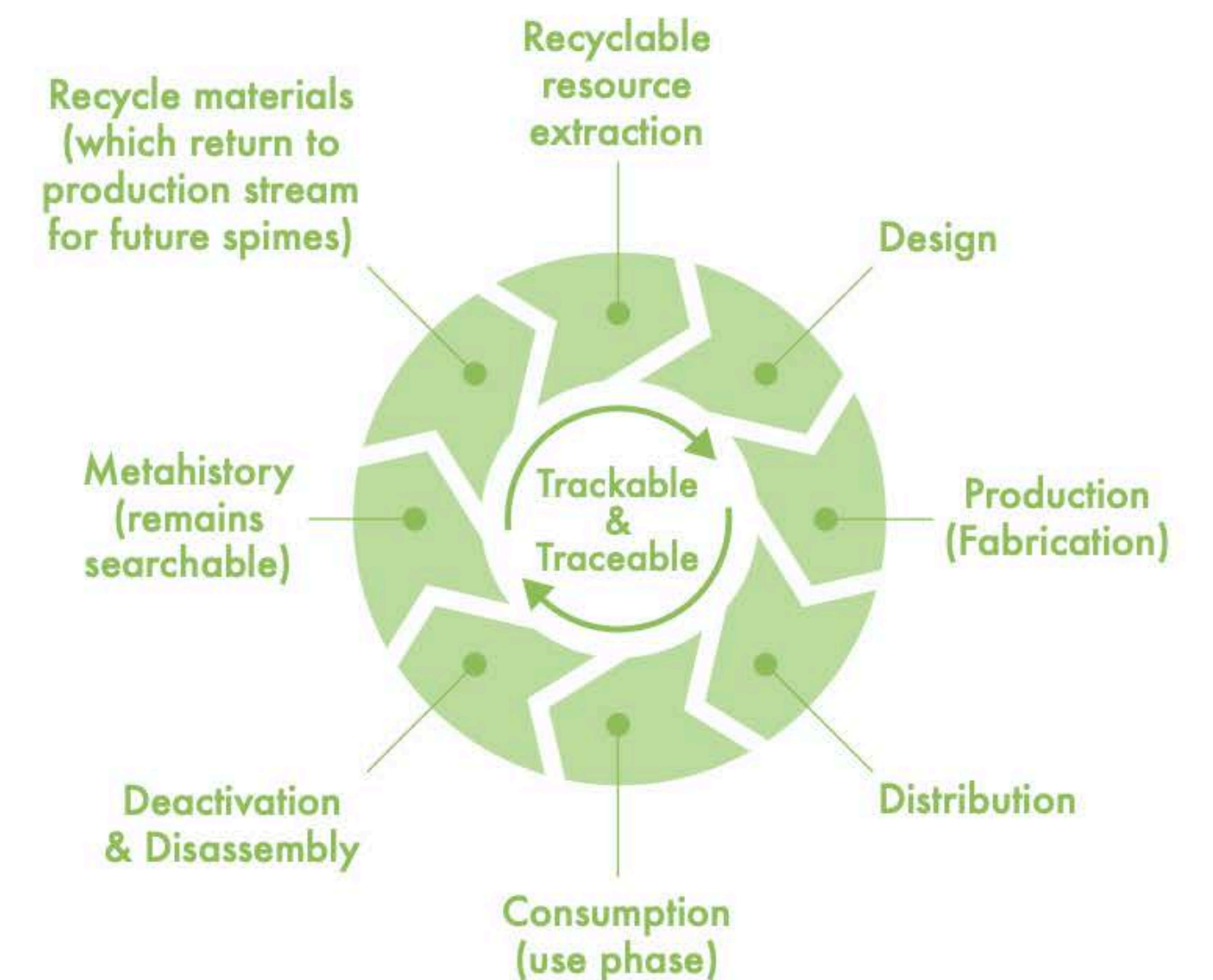
- Student questions:
 - What is the difference between design fictions and other types of design?
 - What is the difference between Design Fictions and Spimes?
 - What are some other examples of Design Fictions?

Recap: design fictions vs. other types of design

- Design fictions don't aim to create design that is intended to be used in the real world
- Instead, they create speculative designs (imagining future scenarios and possibilities), that ask questions about potential futures
- Design of **entry points** into a future world (e.g., physical objects, sketches, storyboards, news articles, videos)
- The design concept is situated in a near future, everyday world

What is the difference between Design Fictions and Spimes?

- Spimes are just **one example** of a Design Fiction
- Specifically critiques current IoT design and manufacturing in context of sustainability, and questions what an alternative might be in the future



What are some other examples of Design Fictions?

- **Hyper-Reality**
- Created by Superflux: design studio specialising in imagining hypothetical worlds
- Dystopian vision of the future in which augmented reality takes over all aspects of life, influencing how we interact with the world around us



<https://www.youtube.com/watch?v=YJg02ivYzSs>

Student question!

- This is a problem that has been bothering me for a long time - if these technologies are used to guide people to pay more attention to virtual reality and spend more energy on online life, is this correct, or is it in line with natural laws?

What are some other examples of Design Fictions?

- **Our Friends Electric**
- Created by Superflux and Mozilla
- Challenging typical command/response interaction styles with voice interaction
- Exploring what it would look like if voice interfaces took on personality and identity



<https://www.youtube.com/watch?v=PsjunTAH-2A>

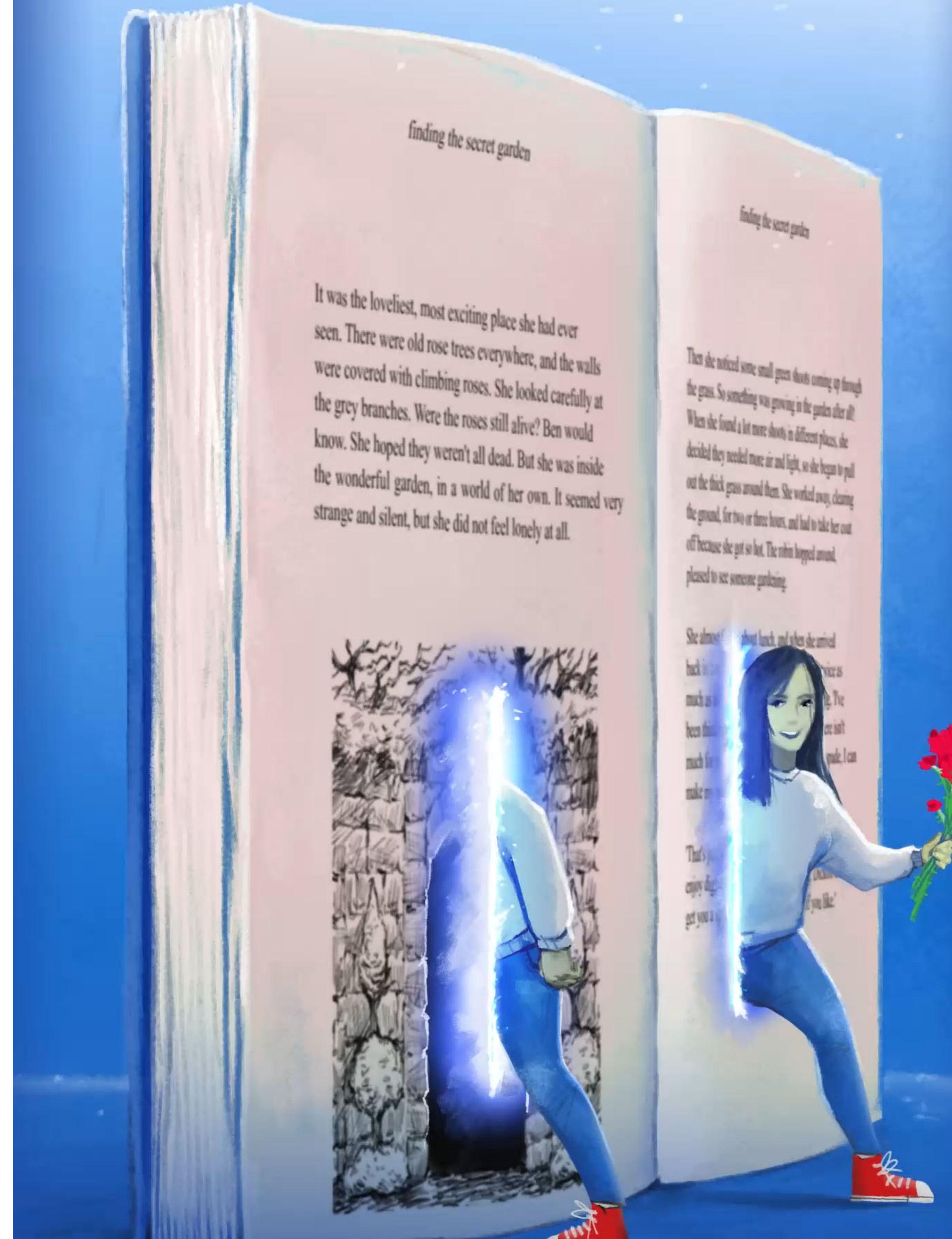
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In today's lecture...

- Define XR and Cultural Heritage
- Think through potential applications
- Dig deeper into opportunities, considerations and implications for Augmented Reality and Tangible Culture

What is Extended Reality? (XR)



What is Extended Reality? (XR)

Augmented Reality (AR):
Overlaying digital elements on
the physical environment; less
interaction between physical
and digital

Mixed Reality (MR):
Blend of physical/real
elements and digital elements;
More interaction between the
physical and digital

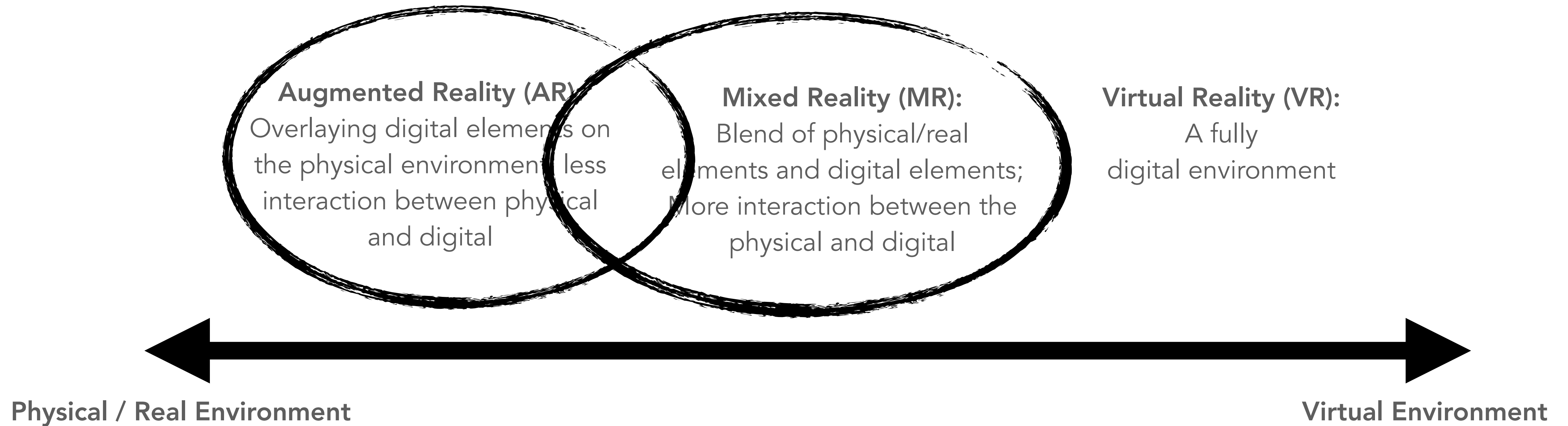
Virtual Reality (VR):
A fully
digital environment



Physical / Real Environment

Virtual Environment

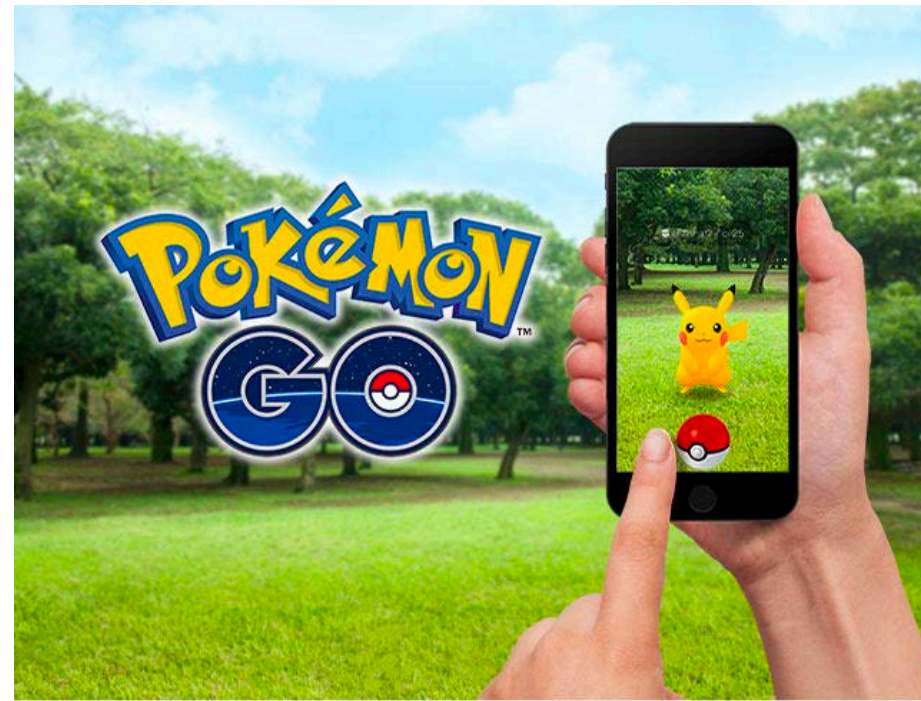
What is Extended Reality? (XR)



What is Extended Reality? (XR)



Van Gogh Immersive Experience



<https://pokemongolive.com/>



Microsoft HoloLens



Oculus Quest



Physical / Real Environment

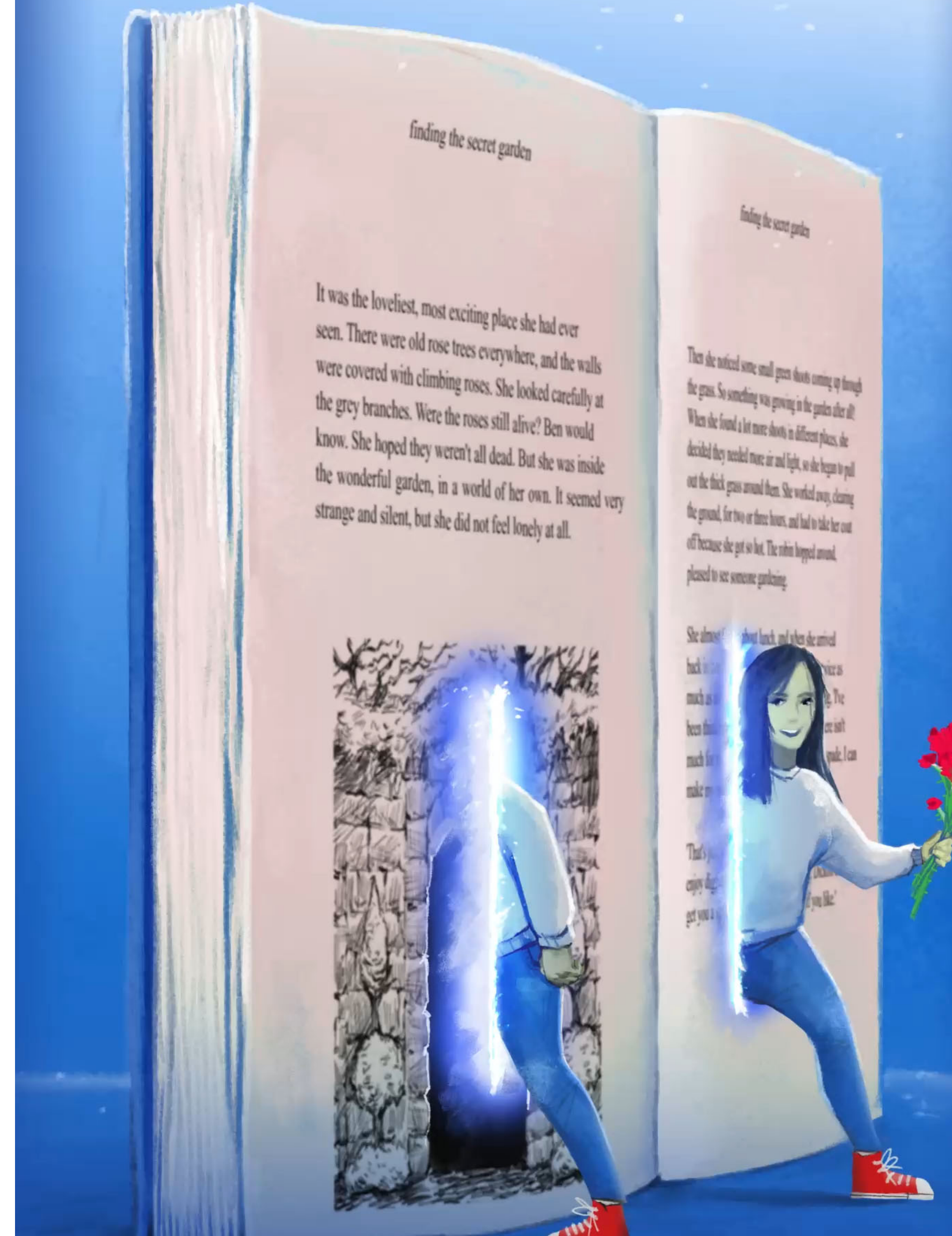
Virtual Environment

What Technologies are Used in XR?

- Mobile phones
- Head mounted displays (HoloLens, Oculus Quest, etc.)
- Cardboard VR
- Free-standing devices
- Projection mapping

Immersion and Presence

- **Immersive technology** - sometimes used interchangeably with XR
- Can the system trick you into thinking what you are experiencing is real? E.g., is the sensory feedback quick enough? Is the visual resolution sufficient to make you feel like you are there?
- Does the world you are experiencing feel real? Are objects where you would expect them to be? Is the experience engaging?

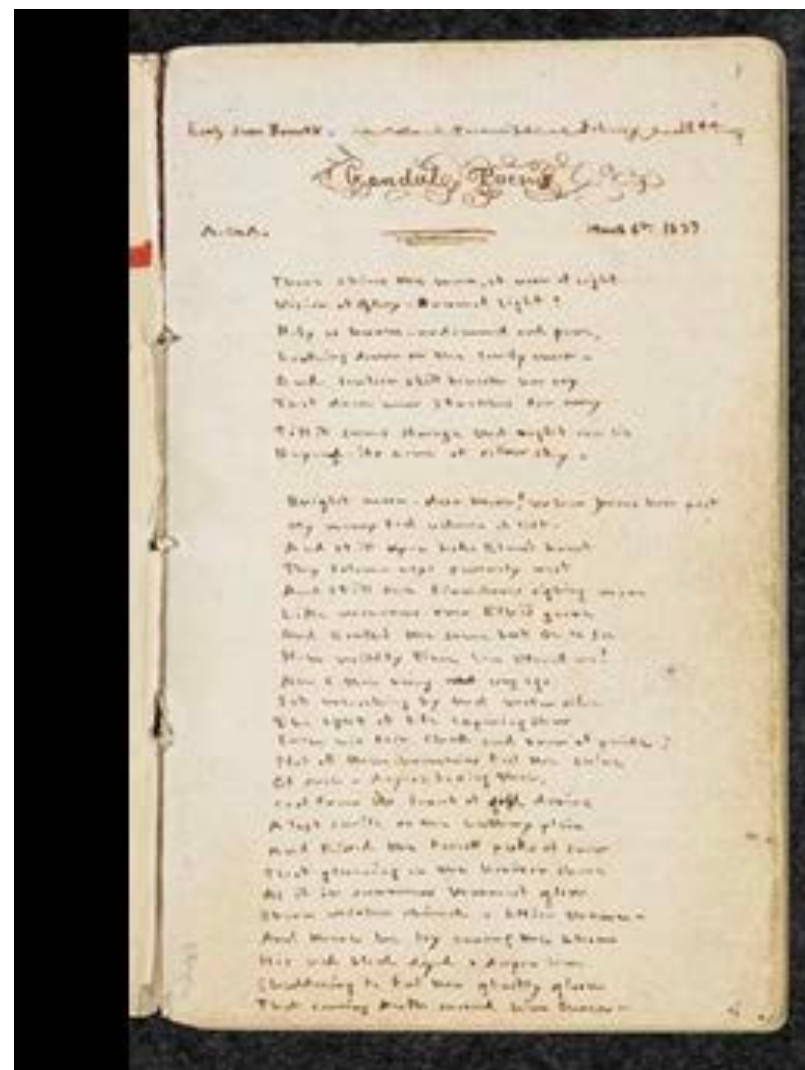


What is Cultural Heritage?

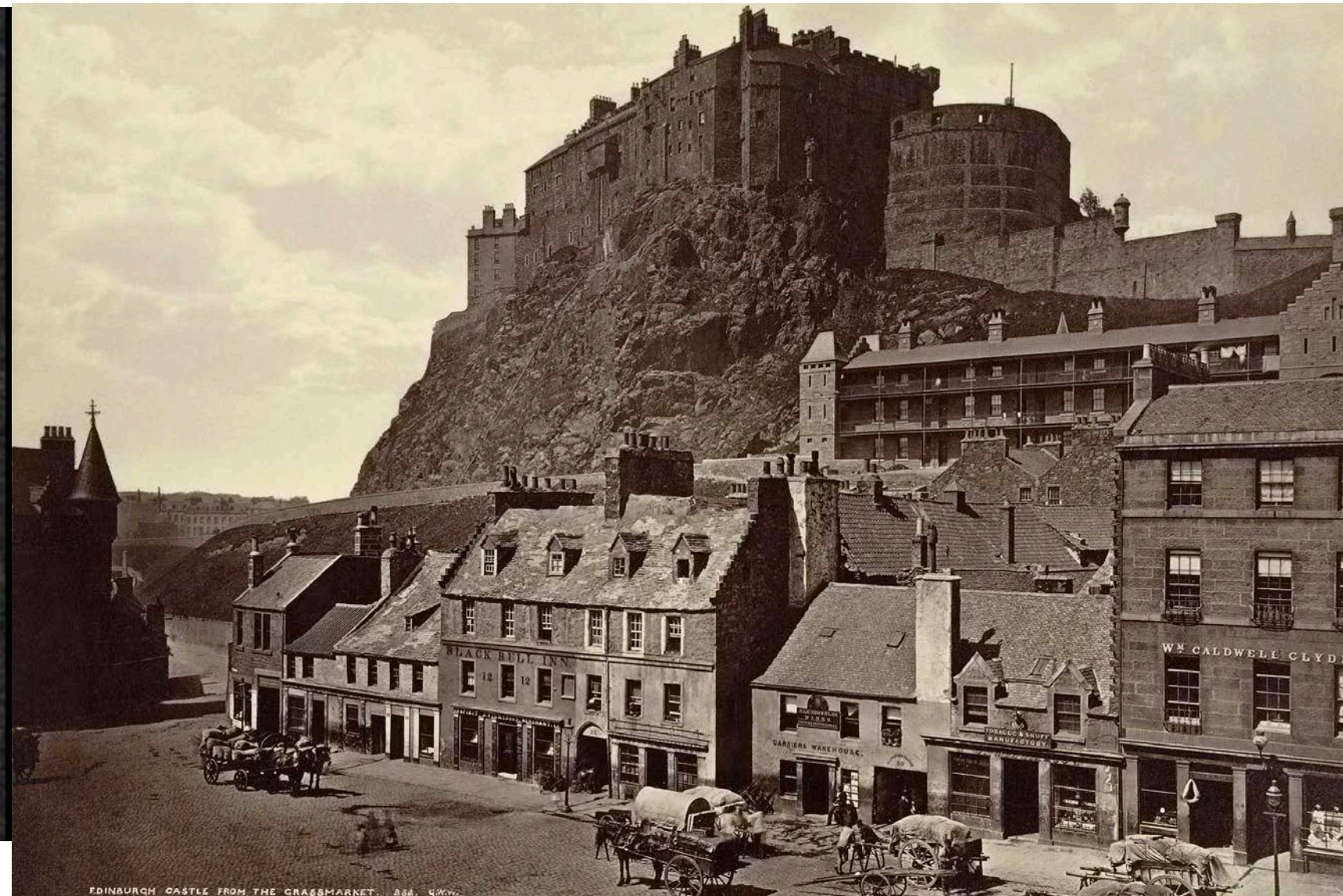
- **Cultural assets inherited over generations that contribute to our cultural identity**
- Tangible Culture
- Intangible Culture
- Natural Heritage

What is Cultural Heritage?

- **Tangible Culture:** Buildings, monuments, art, books, museum collections, etc.



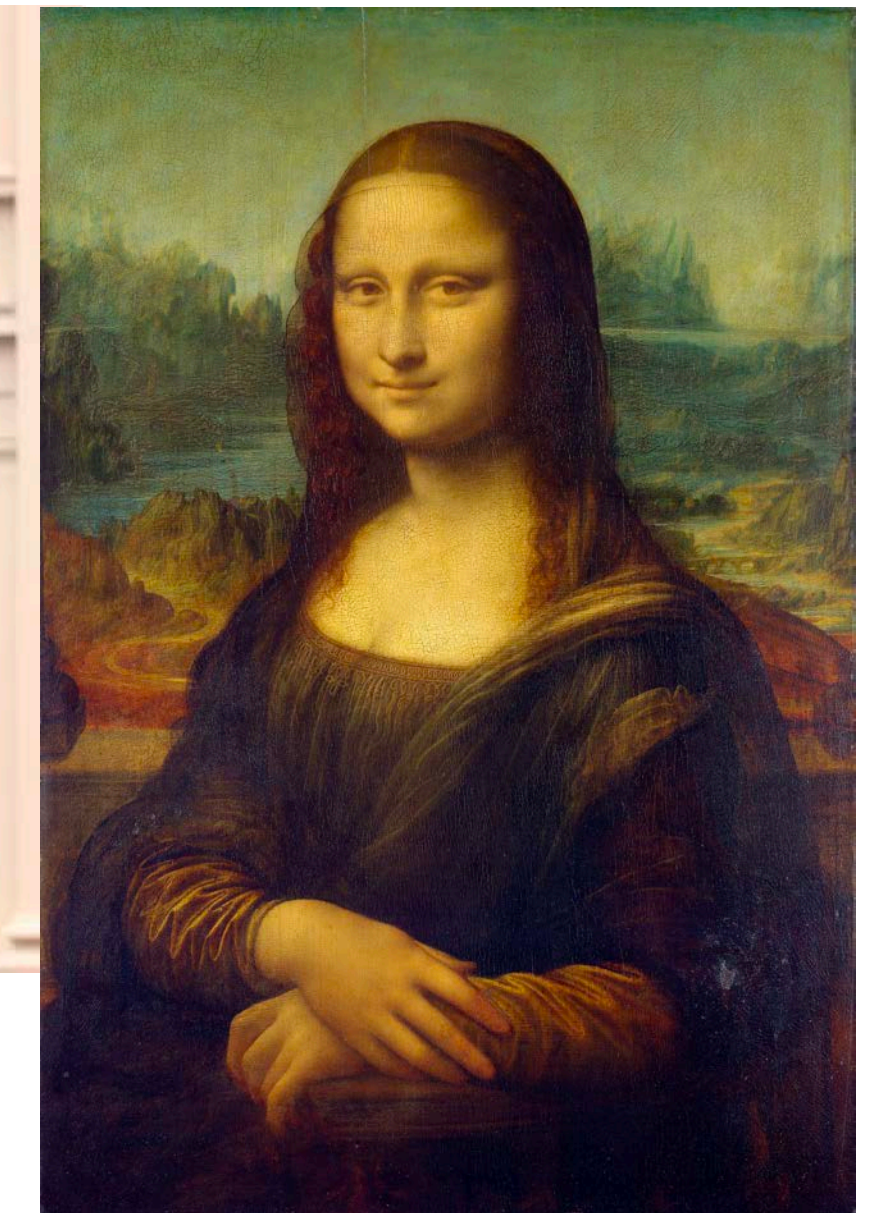
Emily Brontë's notebook
<https://www.bl.uk>



Edinburgh Castle



Duke of Wellington Statue
PA Media



Mona Lisa

What is Cultural Heritage?

- **Intangible Culture:** Language, knowledge, oral history, folklore, storytelling, performing arts, rituals



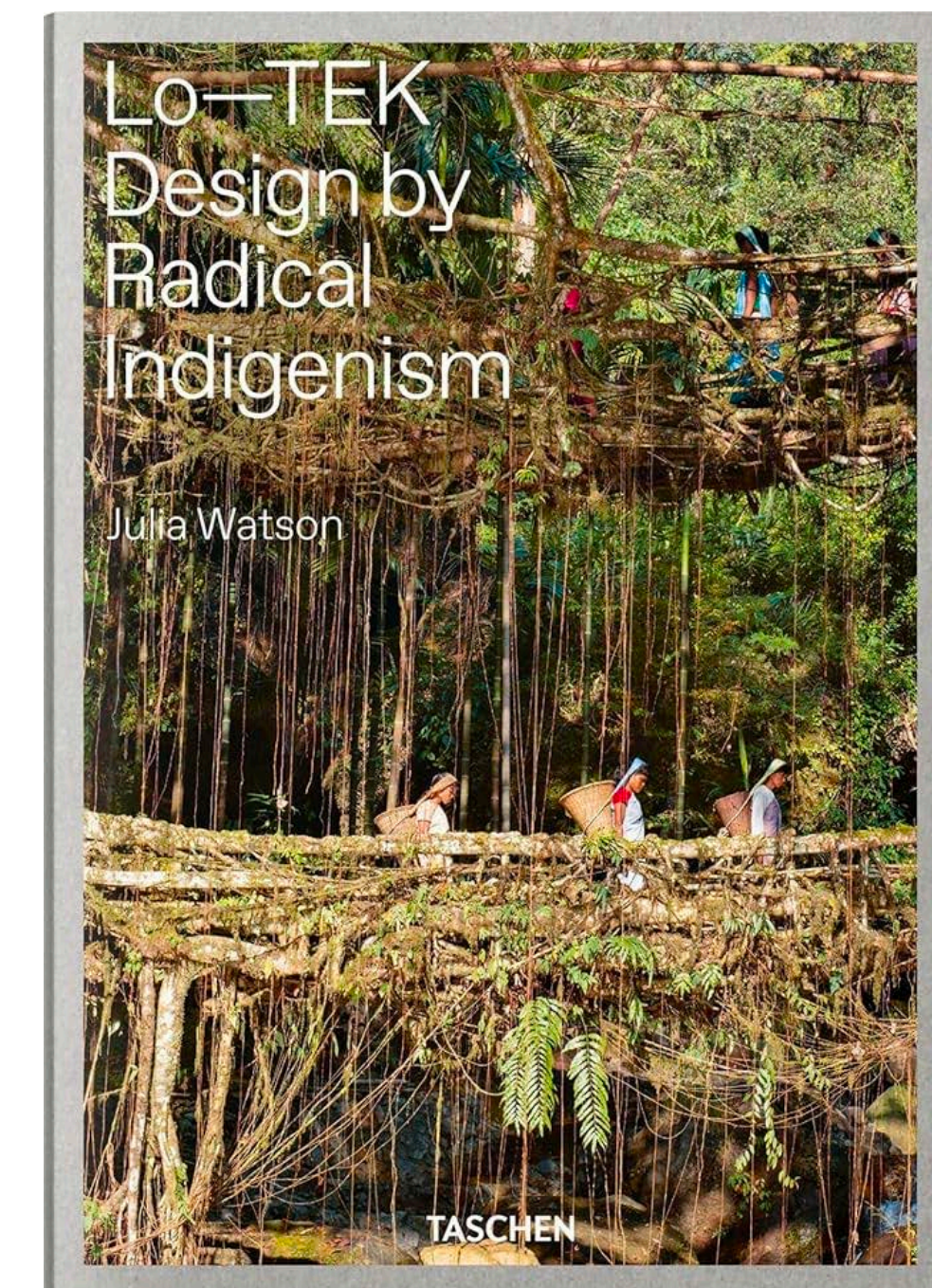
Selkies: Mythological creatures that can shapeshift between seal and human forms

Image: 2007 Faroese stamp depicting a *selkie*



Traditional dance in Poland

Image: https://en.wikipedia.org/wiki/Polish_folk_dances#/media/File:Krakowiak_-_Polanie_Ottawa.jpg



Indigenous knowledge of Khasi people in Northern India

Image: Watson, J. (2019). *Lo-TEK: Design by Radical Indigenise*. Taschen.

What is Cultural Heritage?

- **Natural Heritage:** private and publically protected natural areas, zoos, aquaria and botanical gardens, natural habitat, marine ecosystems, sanctuaries, reservoirs etc.



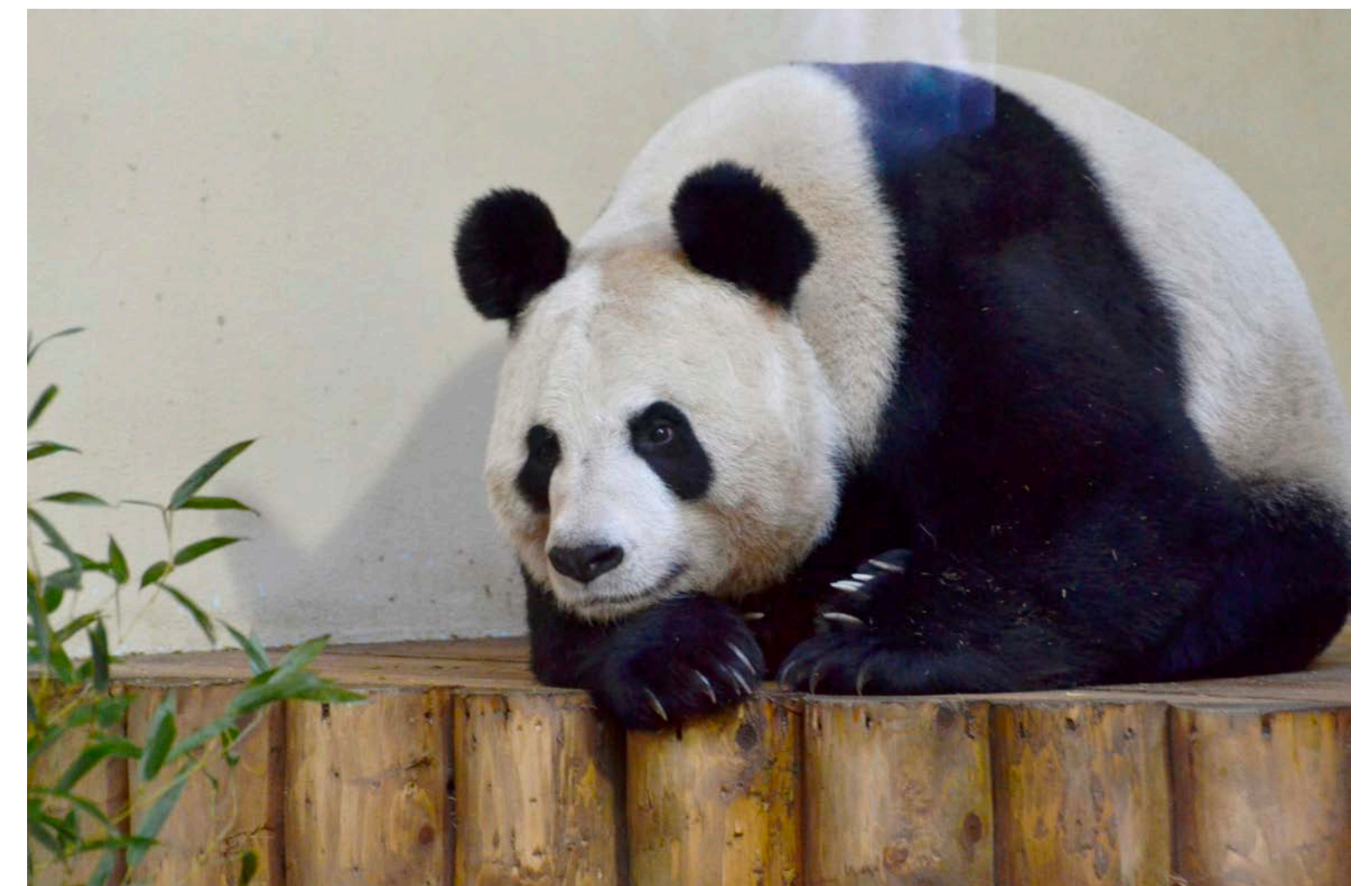
Great Barrier Reef

https://en.wikipedia.org/wiki/Great_Barrier_Reef#/media/File:Coral_Outcrop_Flynn_Reef.jpg



Amazon Rainforest

<https://www.flickr.com/people/38476503@N08>



Edinburgh Zoo

https://en.wikipedia.org/wiki/Edinburgh_Zoo#/media/File:Tian_Tian.JPG

How might XR and Cultural Heritage be combined?



miro

https://miro.com/app/board/uXjVNbya0MM=/?share_link_id=667063125483

Be Our Guest: Intercultural Heritage Exchange



Figure 3: The different shapes a detected drinking utensil morphs into (left to right): Iraqi, Indian, and Senegalese cups.

- A user is “digitally” invited to the houses of people from different cultures and asked to help with one of their cultural rituals around simple everyday objects
- E.g., making hot pot or making tea
- Intangible heritage and AR

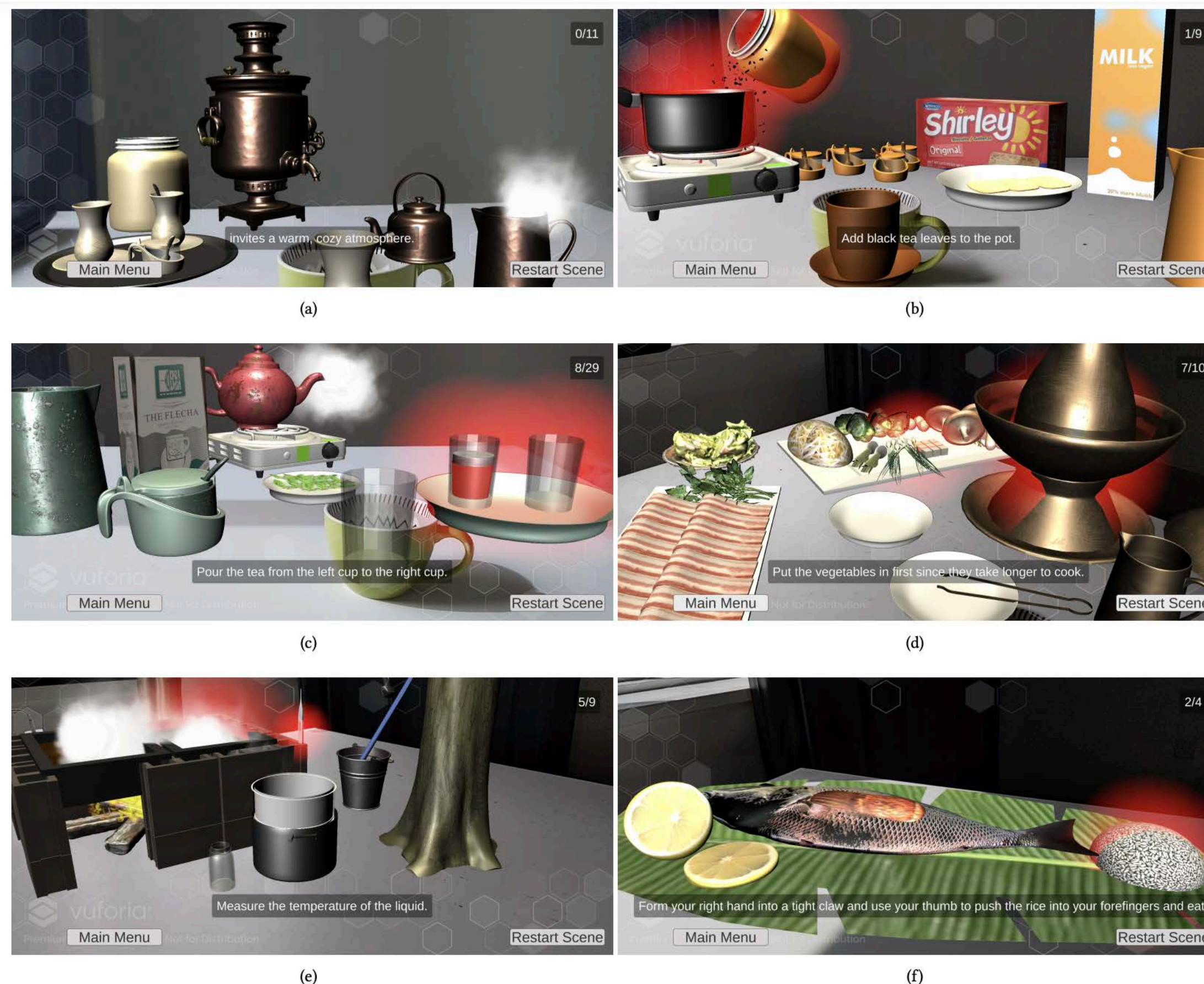
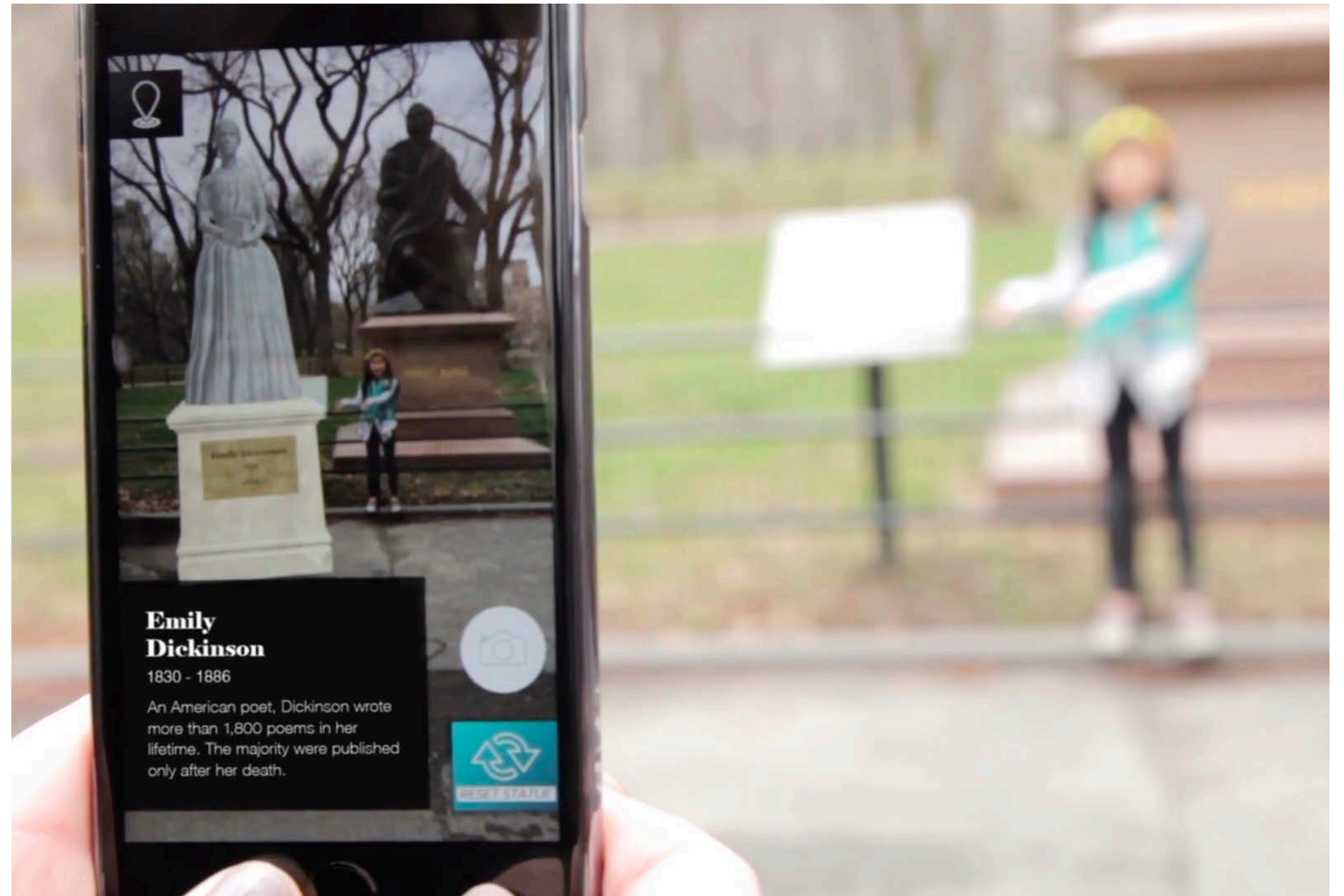


Figure 4: Scenes from the application: (a) Iraqi, (b) Indian, (c) Senegalese, (d) Taiwanese, (e) Canadian, and (f) Indonesian.

Sabie, D., Sheta, H., Ferdous, H. S., Kopalakrishnan, V., & Ahmed, S. I. (2023, April). Be Our Guest: Intercultural Heritage Exchange through Augmented Reality (AR). In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (pp. 1-15).

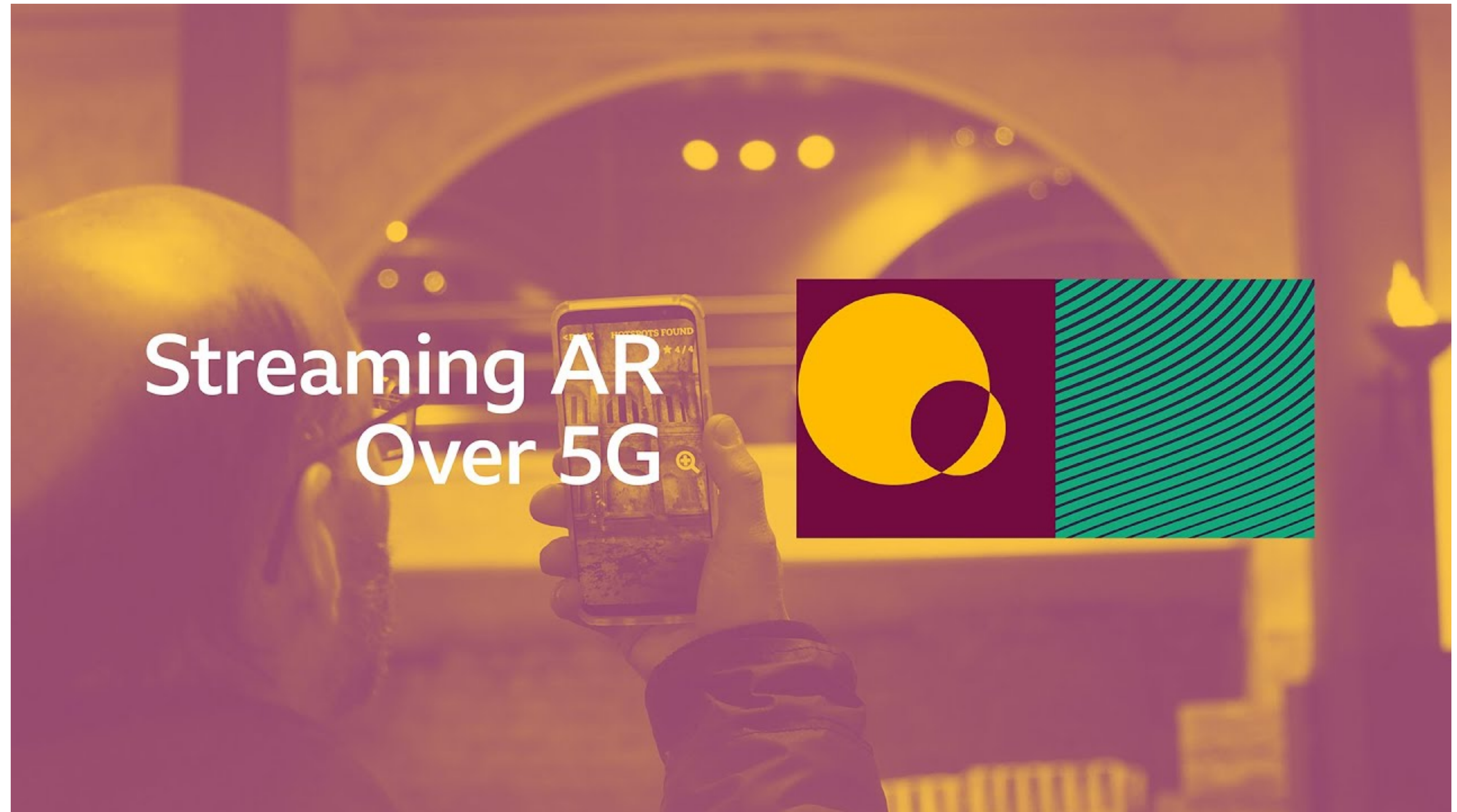
The Whole Story

- Digital overlay of sculptures of women and descriptions of them, next to existing sculptures of men
- Tangible heritage + AR



Roman Baths and BBC

- Overlays animations and text descriptions based on historical events in the Roman Baths
- Tangible heritage + AR



<https://www.youtube.com/watch?v=OC4rER-BFZo>

REVIVRE: Saola Studio at National Museum of Natural History, Paris



<https://www.saolastudio.com/en-gb/revivre>

- Visitors use head-mounted display to interact with extinct species
- Now part of permanent museum exhibit
- More direct interaction between the physical and virtual world
- Natural heritage + MR

Alice in Wonderland in VR at the V&A Museum



- Created as part of an Alice in Wonderland exhibition at the V&A
- Supports immersion in a classic book
- Brings in illustrations inspired by Victorian engravings and paper theatres
- VR + Tangible Culture

<https://www.youtube.com/watch?v=j1maAW2F2Ug&t=51s>

Key takeaways

- Extended reality is a continuum!
- Mostly categorised in terms of Augmented Reality, Mixed Reality and Virtual Reality
- Tangible culture, intangible culture and natural heritage all make up cultural heritage
- The intersection between XR and Cultural Heritage has a large array of applications

Deep Dive: Augmented Reality and Tangible Culture

Google 3D Animals and Objects

- Using the Google app, search for an animal or cultural site, and click 3D then "view in your space"
- Full instructions and list of searches: <https://support.google.com/websearch/answer/9817187>
- **Reflect:** How can you interact with the object? What is the difference between experiencing them in AR and viewing 2D images (if any)? What is the added value of the experience?



Image: Scott Stein/CNET

Deep Dive: Augmented Reality and Tangible Culture

How to decide what to augment in AR?

- How do we start thinking about how AR can support engagement with tangible culture?
- Look to museum studies:
 - How do people interact with museum artefacts?
 - What is the experience of attending a museum?

How to decide what to augment in AR?

- How do we start thinking about how AR can support engagement with tangible culture?
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 - How do people interact with museum artefacts?
 - What is the experience of attending a museum?
- **Model of the Activity of Visiting a Museum**

Sensitisation:

- Immersing self in the artefact
- Linking the feelings evoked by the artefact to feelings of everyday life
- Imagining what's beyond the artefact

Analysis:

- Diving into details of an artefact
- Analysing the artefact and putting it into context with its history
Raising questions about the artefact

How to decide what to augment in AR?

- Taxonomy for considering what the interaction might look like
- For example, how might AR provide a richer context about an artefact?
- How might AR support immersion, and a closer connection?

Sensitisation:

- Immersing self in the artefact
- Linking the feelings evoked by the artefact to feelings of everyday life
- Imagining what's beyond the artefact

Analysis:

- Diving into details of an artefact
- Analysing the artefact and putting it into context with its history
Raising questions about the artefact

Extended taxonomy: AR for Tangible Culture

Communication:

- Communicating with the institution
- Communicating with other visitors
- Communicating with the outside world

Sensitisation:

- Immersing self in the artefact
- Linking the feelings evoked by the artefact to feelings of everyday life
- Imagining what's beyond the artefact

Analysis:

- Diving into details of an artefact
- Analysing the artefact and putting it into context with its history
Raising questions about the artefact

Personalisation:

- Personalising content
- Personalising engagement with the artefact
- Personalising visit

Tillon, A. B., Marchal, I., & Houlier, P. (2011). Mobile augmented reality in the museum: Can a lace-like technology take you closer to works of art?. In *IEEE Mixed and Augmented Reality-Arts, Media, and Humanities*.

Čopič Pucihar, K., & Kljun, M. (2018). ART for art: augmented reality taxonomy for art and cultural heritage. *Augmented Reality Art: From an Emerging Technology to a Novel Creative Medium*, 73-94.

Extended taxonomy: AR for Tangible Culture

- Four concepts that can be focused on
- Not prescriptive
- Aimed as a way of inspiring designers' thinking about the potential of AR for cultural heritage

Sensitisation

Personalisation

Communication

Analysis

How might you use this framework to design AR for Tangible Heritage?



https://miro.com/app/board/uXjVNbya0MM=/?share_link_id=667063125483

Sensitivities in Cultural Heritage

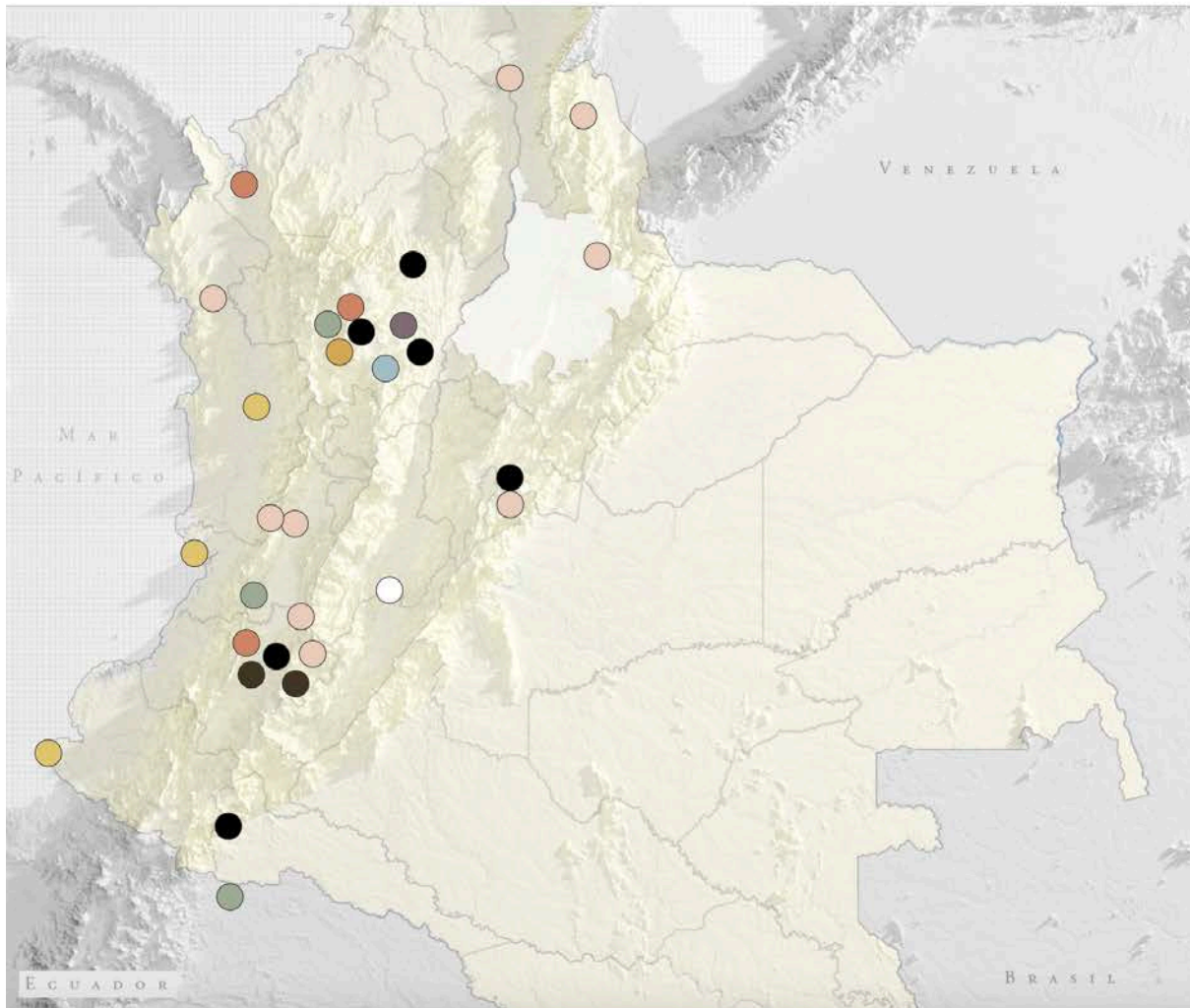
- Cultural heritage can be a sensitive topic - especially in cases where it is about recent history, or history that shapes our cultural identity
- Colombian conflict: ongoing since 1964, fighting between government, far-left and far-right groups and crime syndicates
- Ceasefire in 2016 but fighting still ongoing with new groups emerging



Sensitivities in Cultural Heritage

- Museum of Memory in Colombia:
- Concerned with **memorialization**: documenting and preserving memories of people or historic events
- Currently lacks a physical space

..: Museo de MEMORIA de Colombia



Ataco Mayor's Office

Forest of memory of Ataco, Tolima The forest of memory is a natural site adorned by sculptures that remember all the martyrs who lost their lives during times of armed conflict.



Caminando la memoria

<https://museodememoria.gov.co/caminando-la-memoria/>

Minga muralista

<https://centrodememoriahistorica.gov.co/micrositios/minga-muralista/>

Sensitivities in Cultural Heritage

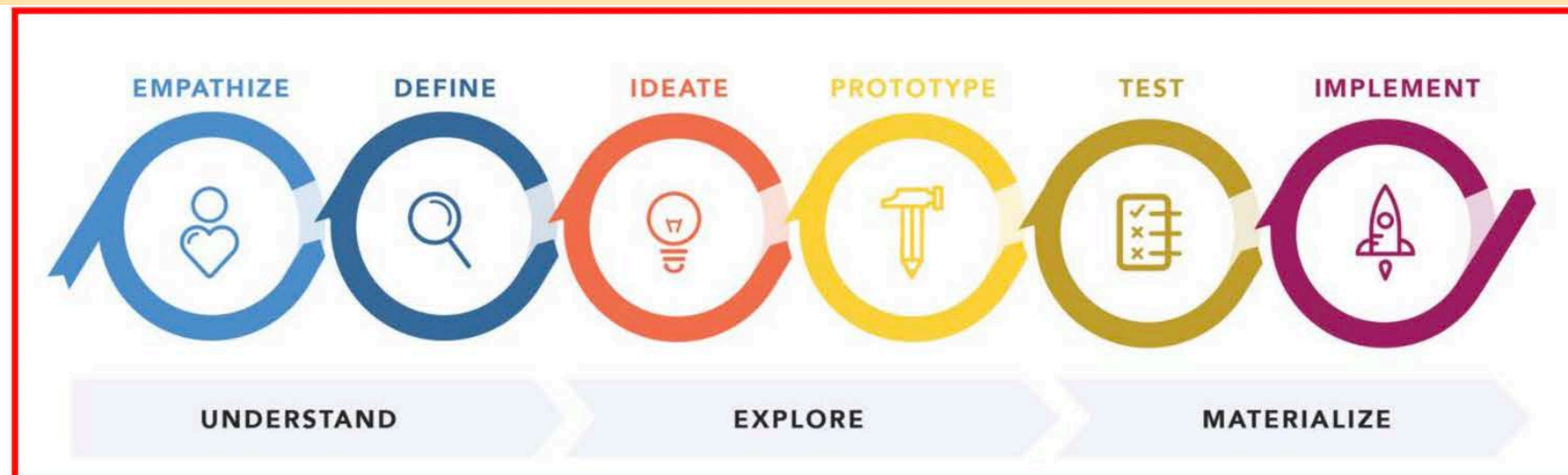
- Challenge: design an AR experience to engage people with museum's memorialisation efforts
- Main contribution: reflections on the design process and considerations for AR experiences for sensitive contexts
- Example of a **Research Through Design** study: where reflection on the design process generates new knowledge

Research for, into, through Design

RfD = You conduct research without designing something. You have the intention of designing something later on, or to pass what you find out to someone else to design something.

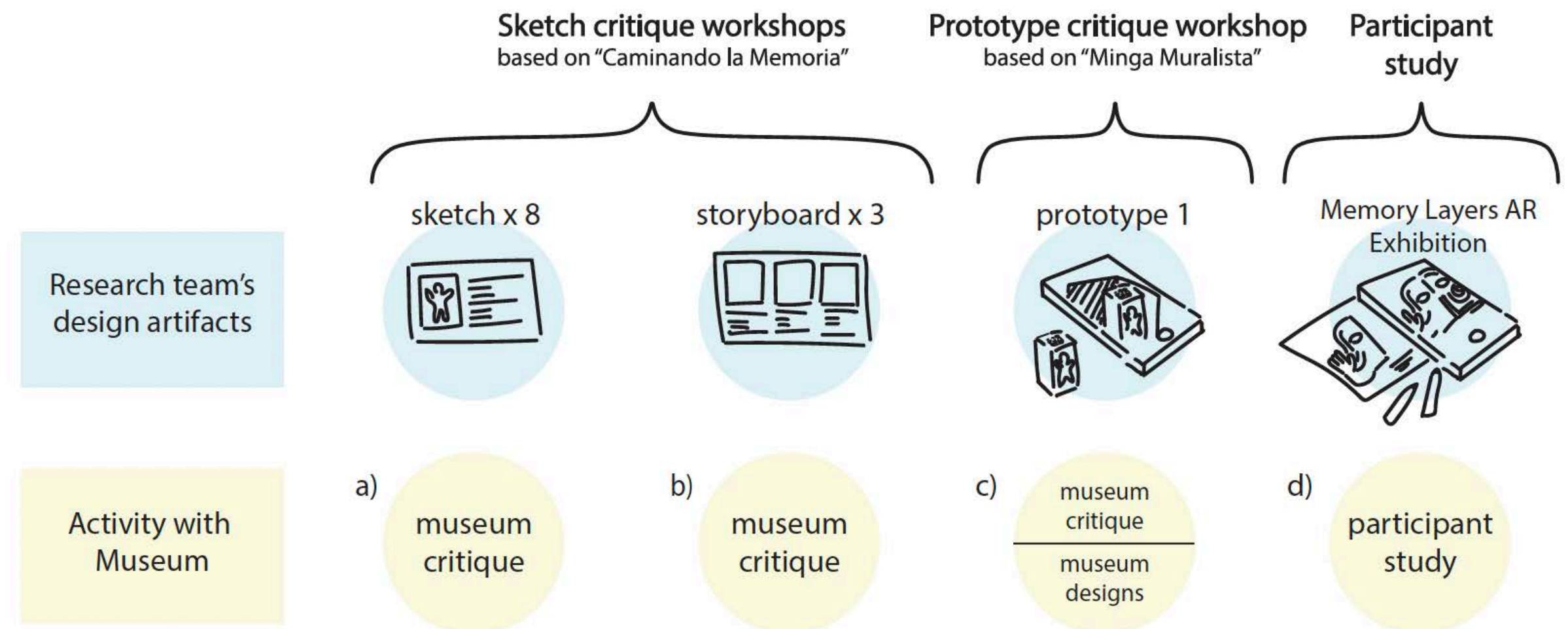
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RtD = You conduct research as part of an iterative design process. You realise / materialize / represent aspects of a design and use research (e.g., engagements with users) to develop your ideas and design as you go along, eventually leading to a refined design.

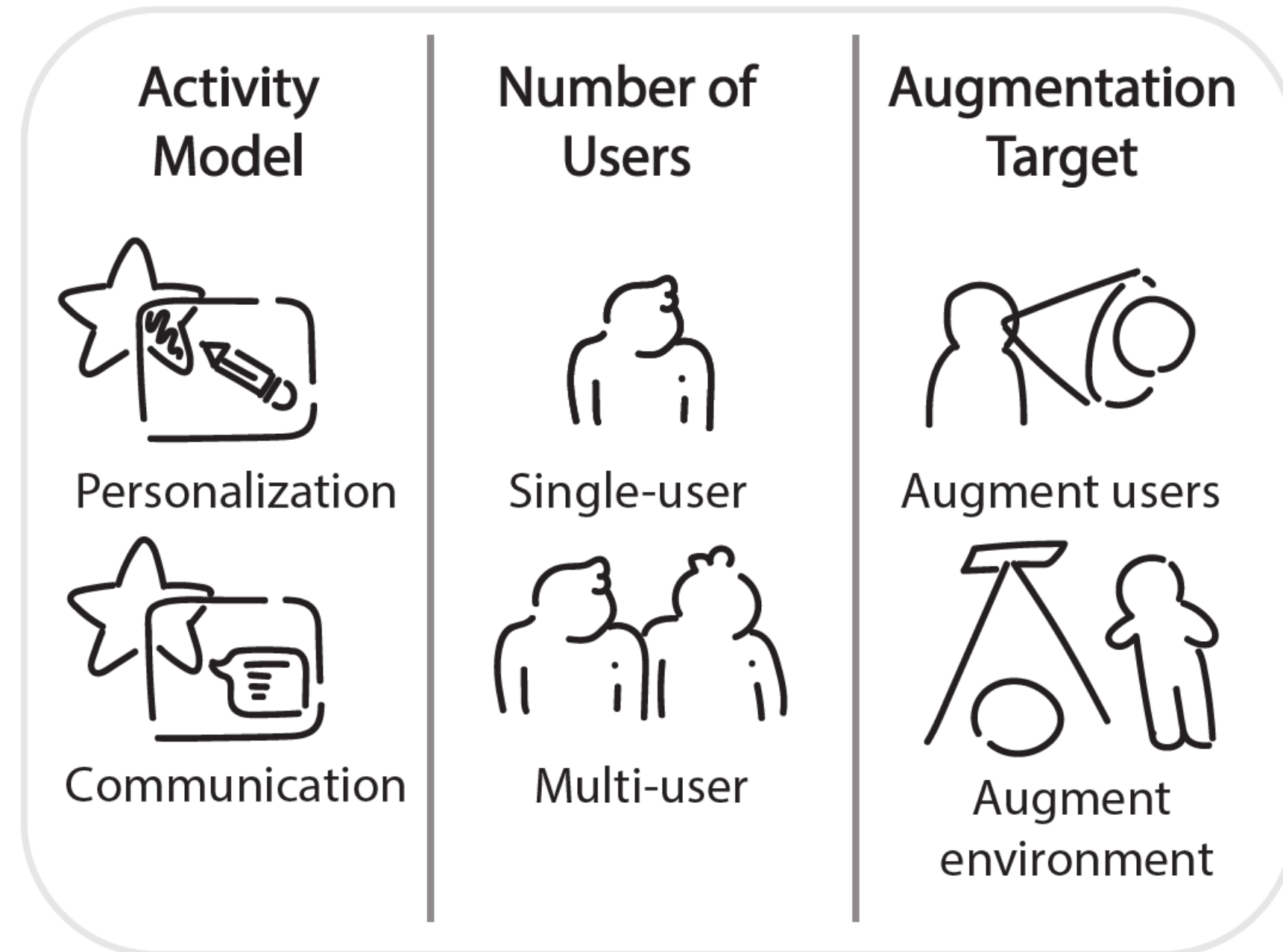


Sensitivities in Cultural Heritage

- Approach: design with significant input from the museum experts
- Sensitising the museum experts to what is possible
- Co-critiquing alternatives
- (Bear this in mind for the Co-Design lecture in a few weeks!)

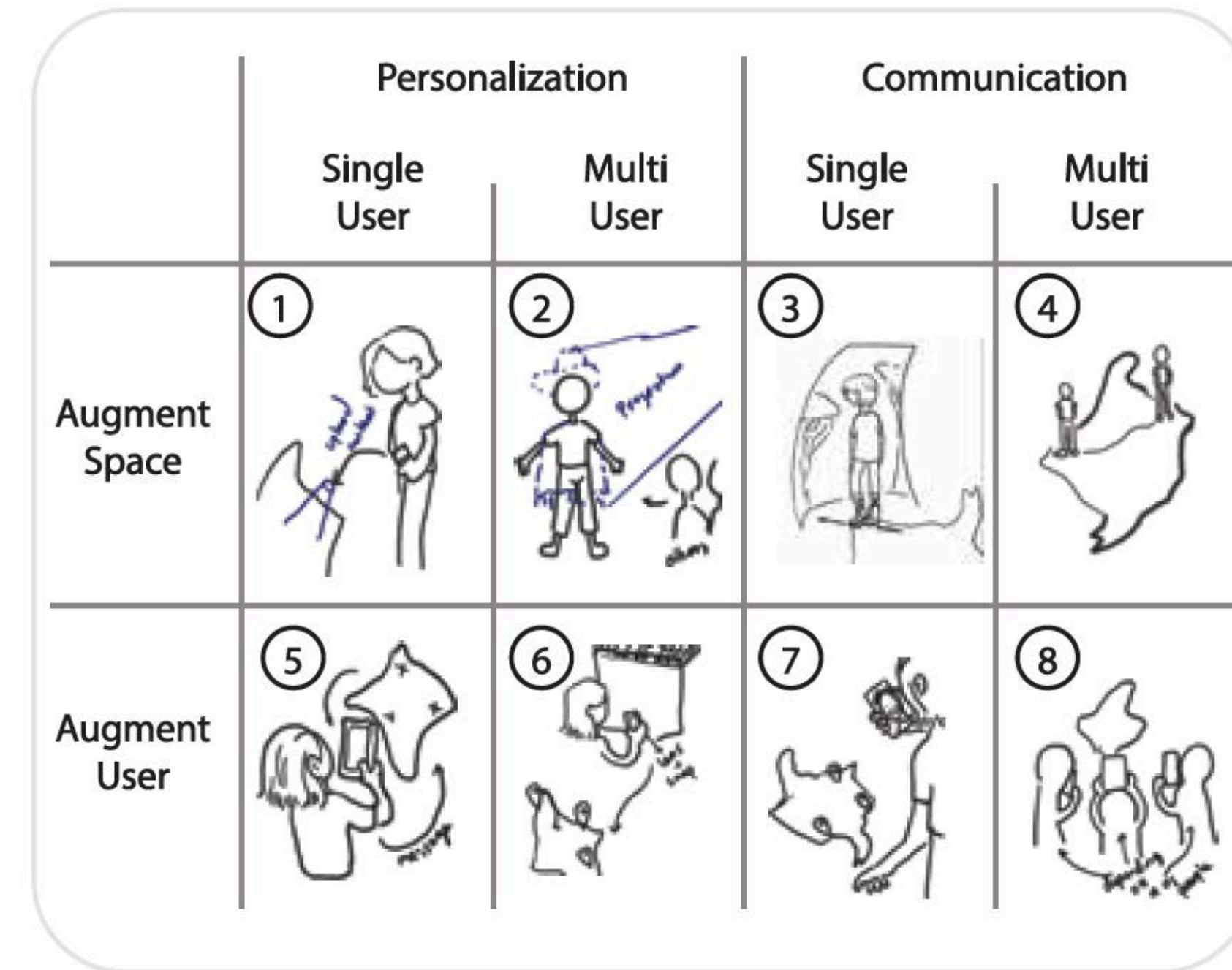
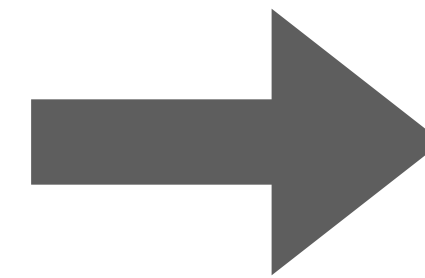
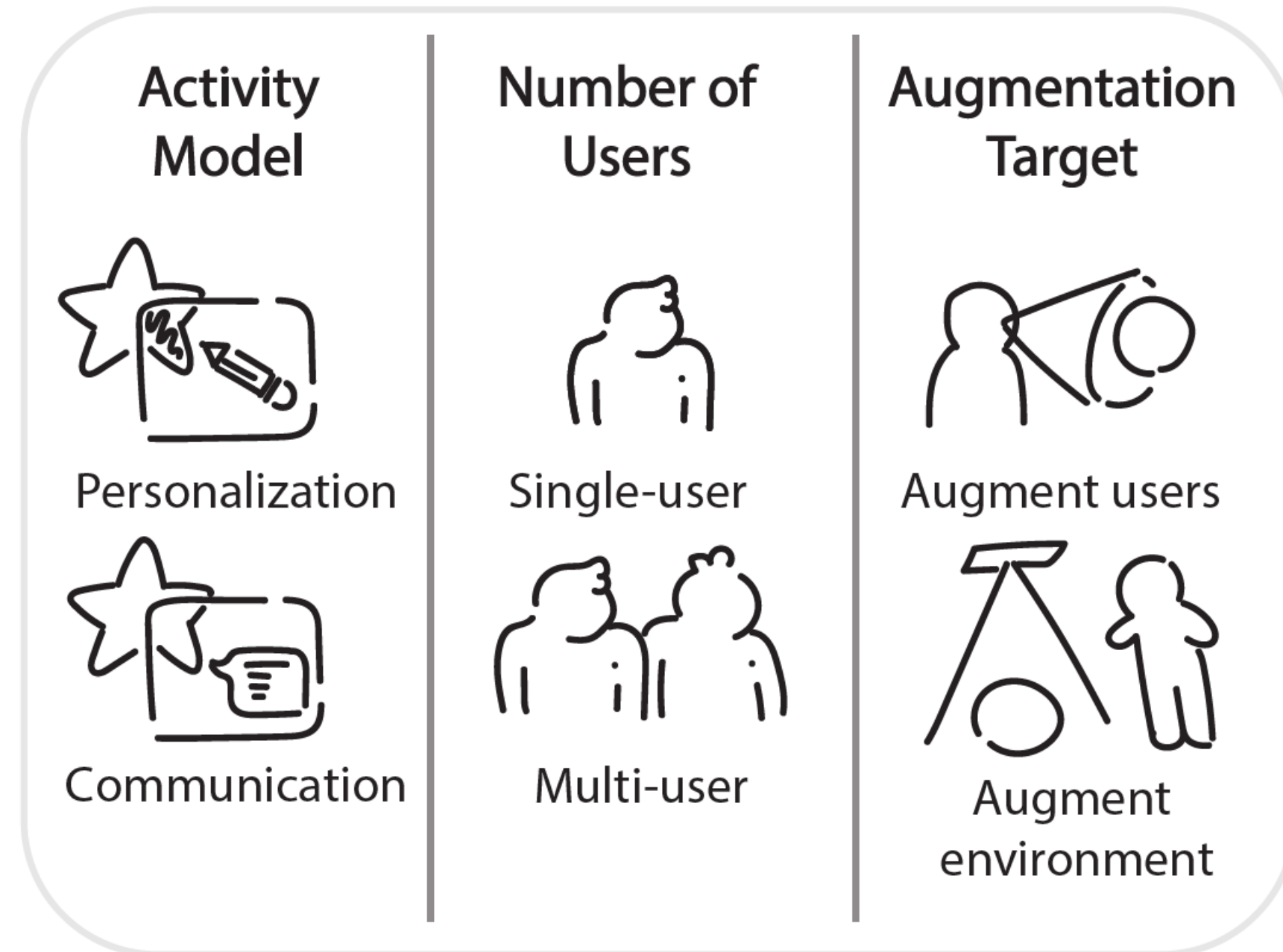


Sensitivities in Cultural Heritage




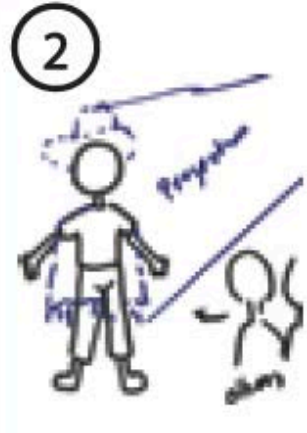






Using taxonomies to scaffold ideation

Sensitivities in Cultural Heritage




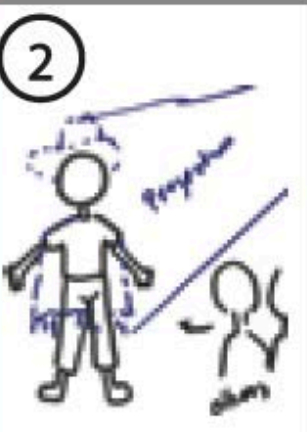






Generating alternatives

Sensitivities in Cultural Heritage

	Personalization		Communication	
	Single User	Multi User	Single User	Multi User
Augment Space	① 	② 	③ 	④ 
Augment User	⑤ 	⑥ 	⑦ 	⑧ 

Critiquing with museum experts









Sensitivities in Cultural Heritage

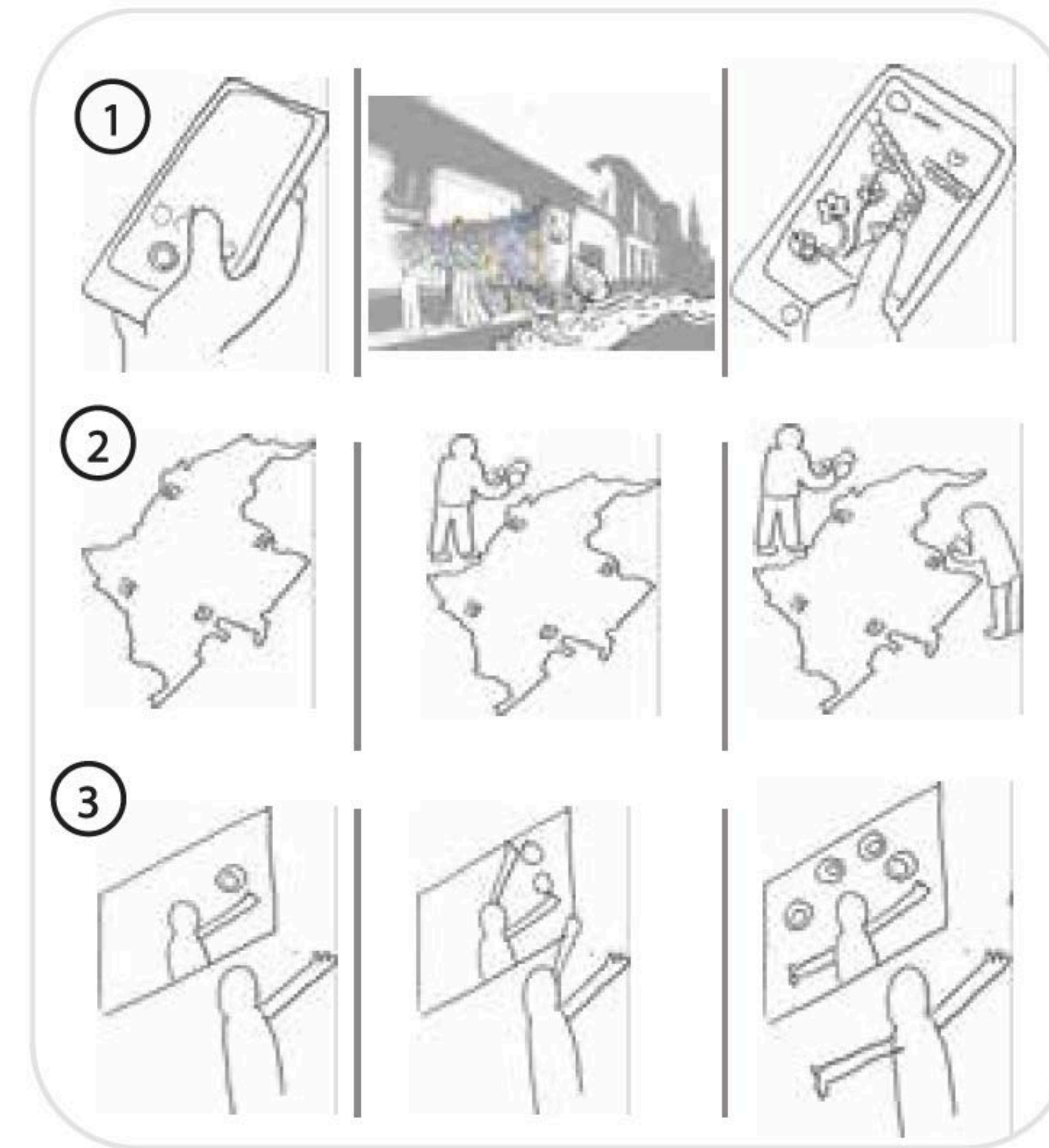
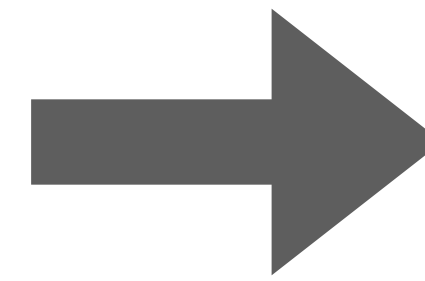
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Augment User	⑤ 	⑥ 	⑦ 	⑧ 

Critiquing with museum experts

- Surfaced considerations about:
 - Museum's core goal of creating connections between audience members
 - Technological gaps in some places - if the exhibition is aimed to be distributed geographically the tech shouldn't be too complex
 - Access to internet being challenging in some rural places
 - Avoiding designs that literally put users "in the shoes" of the victim - recognising audience's privilege

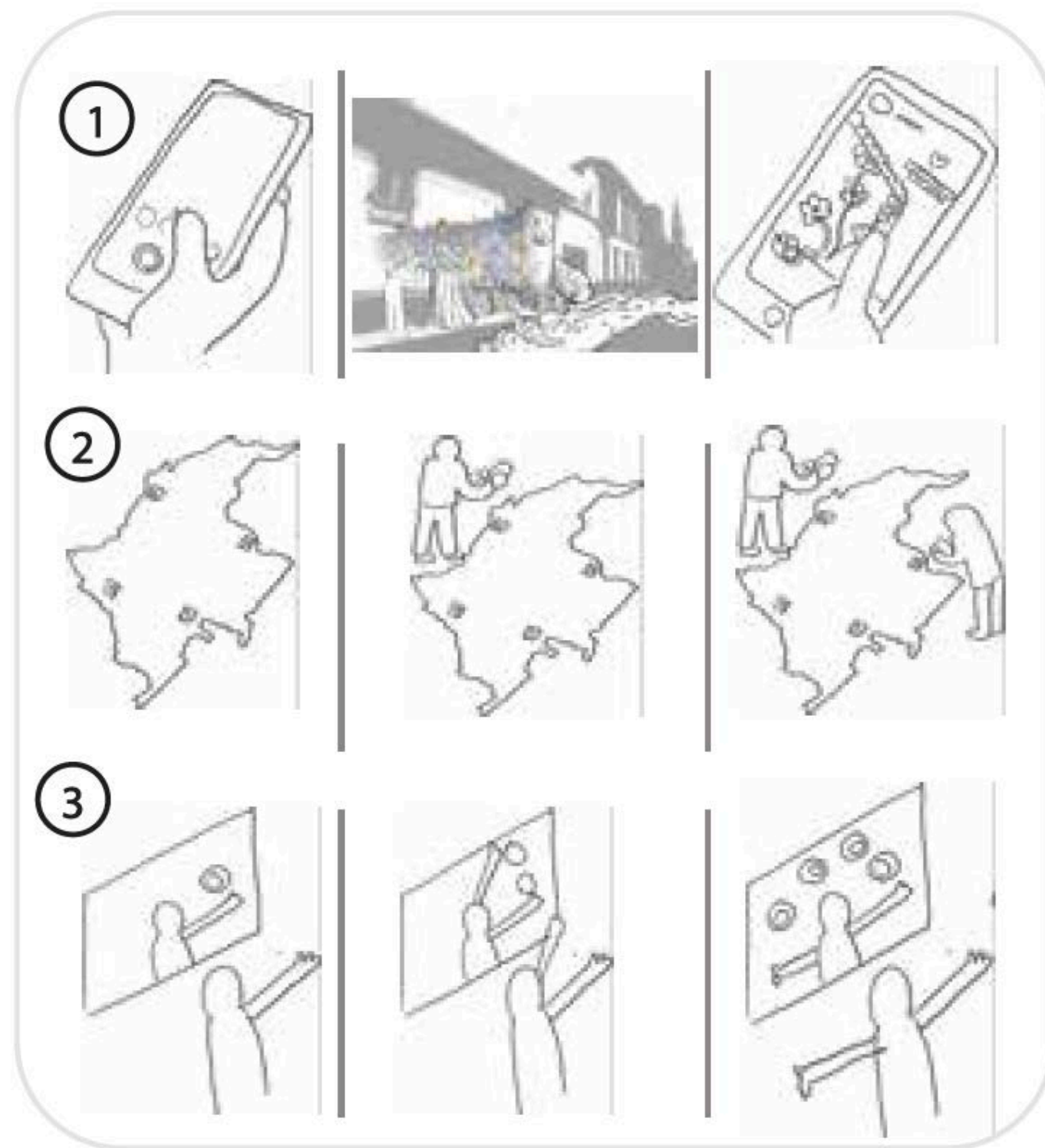
Sensitivities in Cultural Heritage

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Refining concepts

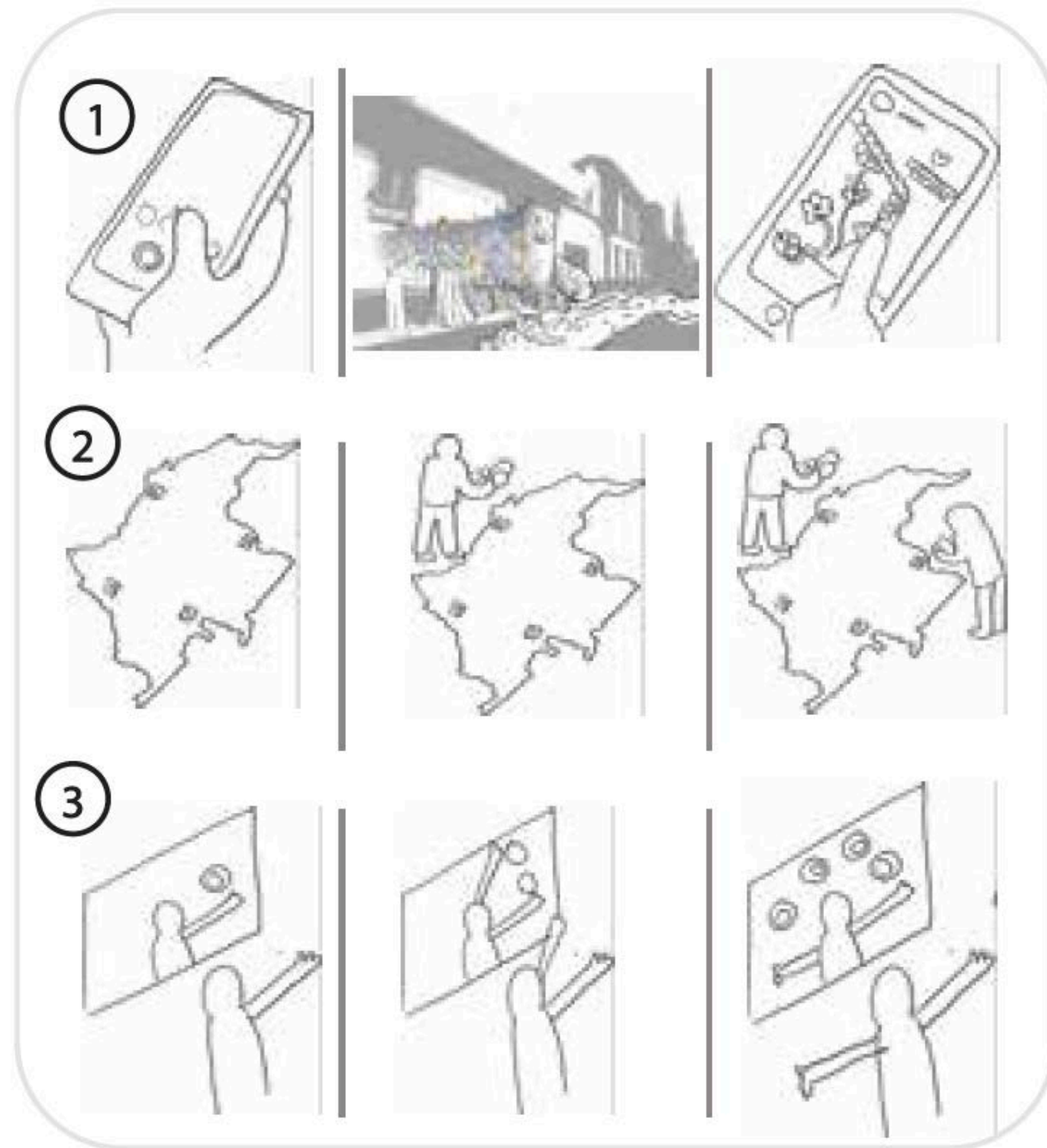
Sensitivities in Cultural Heritage



- 1 - An app that uses AR camera filter together with a photo-sharing social media platform.
- 2 - A map augmented with markers. Draws information about the connections between the locations on the markers.
- 3 - Position of arm used to control the experience of listening to a testimony story.

Critiquing with museum experts

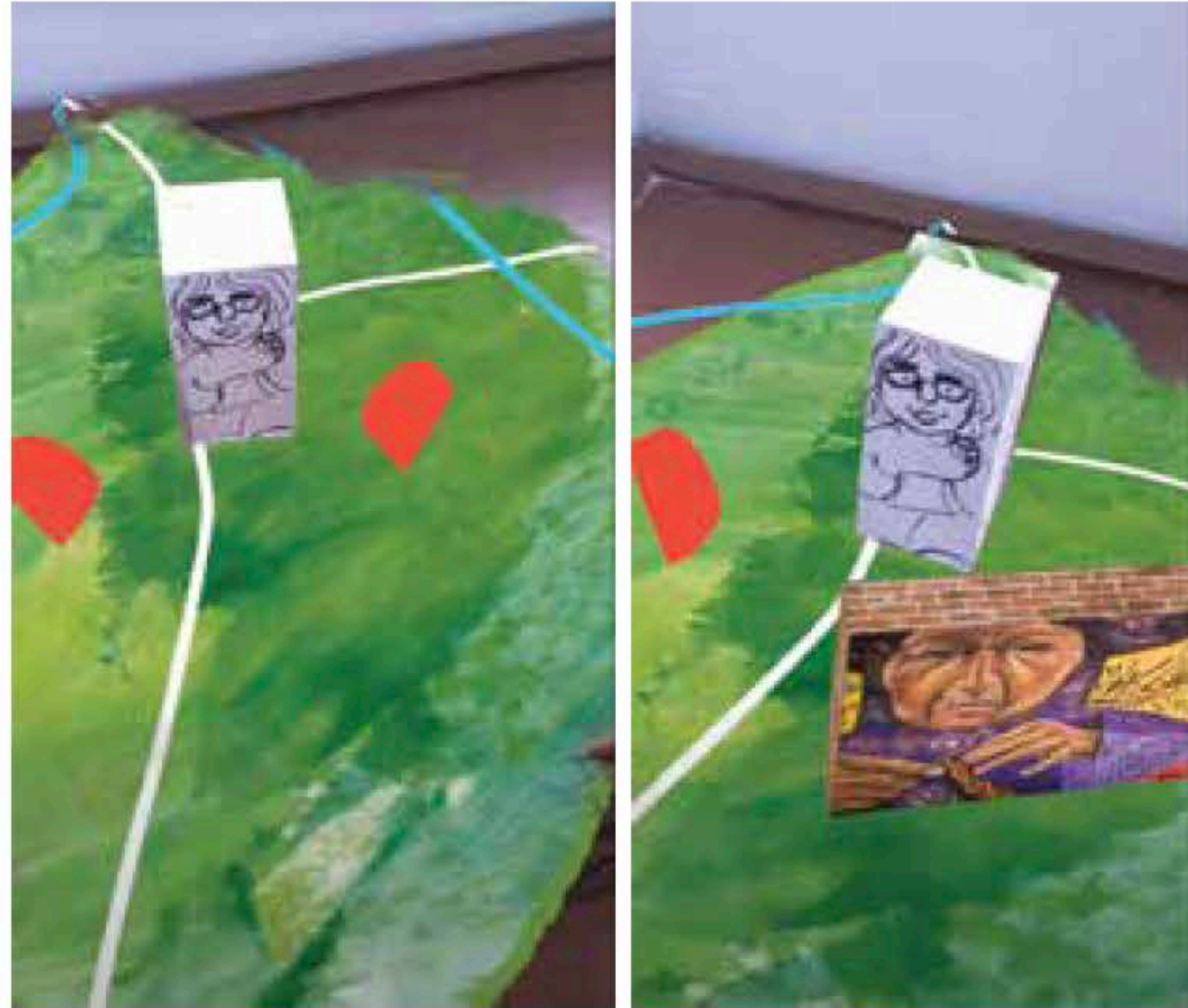
Sensitivities in Cultural Heritage



Critiquing with museum experts

- Surfaced considerations about:
 - Audience technology literacy
 - Experience not just being aesthetic but promoting reflection
 - Having audience connect with each other reemphasised as core goal

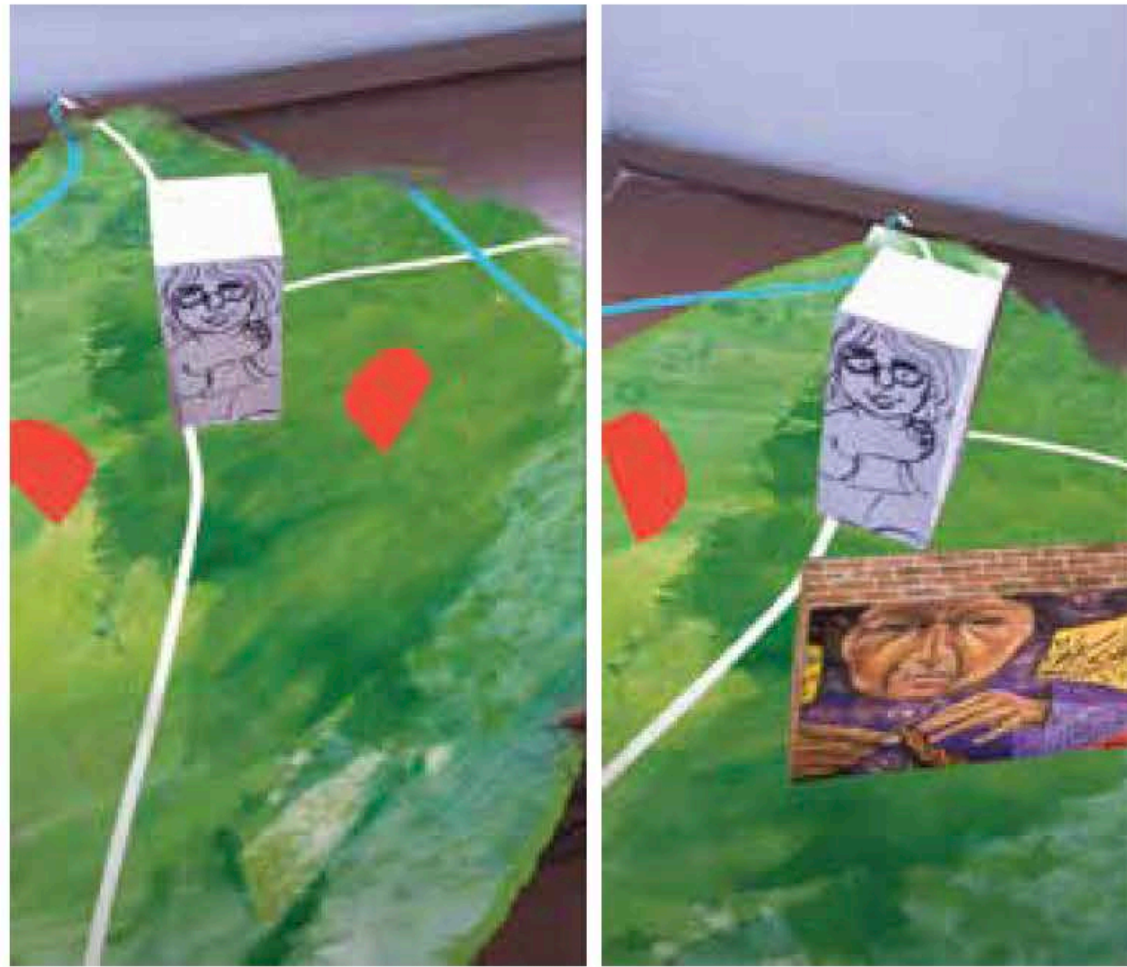
Sensitivities in Cultural Heritage



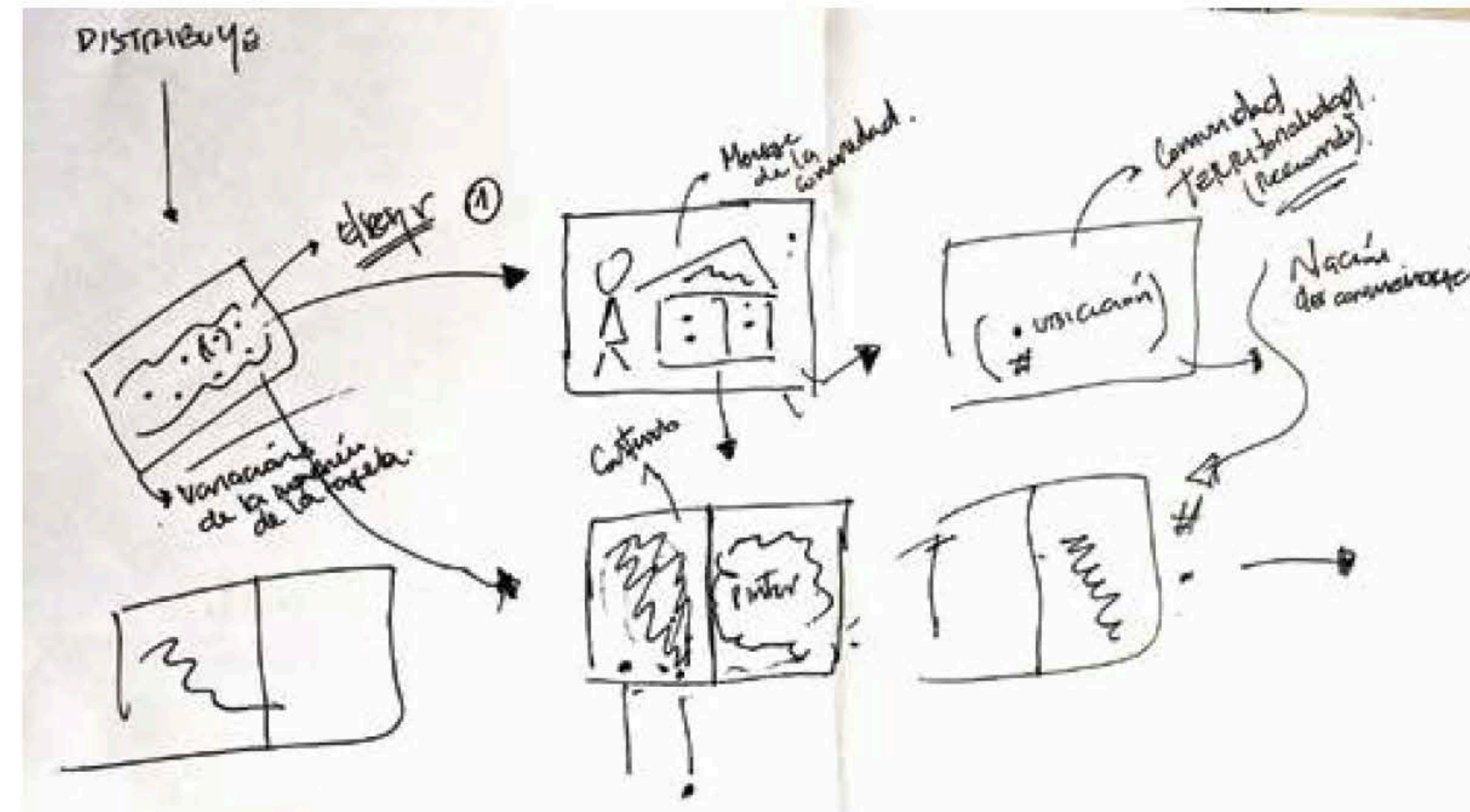
a) Prototype shown in the workshop

One design concept implemented: Paper handout with a cutout character that users can personalise by drawing on the paper. Connected to an AR app that can recognise where the character is on the map, and display 3D representations of murals in those places. Idea to connect via social media.

Sensitivities in Cultural Heritage



a) Prototype shown in the workshop



b) Workshop participant sketch

- Surfaced considerations about:
 - Engaging people in sharing their AR experience on social media
 - Engaging people more deeply in the content of the murals (not just showing them)
 - Filtering potentially inappropriate content

Critique and co-design with museum experts

Sensitivities in Cultural Heritage

- Final artefact:
 - Paper artefacts distributed to visitors
 - Participants colour in the mural, and read explanatory text, then access the AR experience through the Museum's social media. They can share the recording of the experience on social media.



<https://youtube.com/shorts/EPt46euMpl4?feature=shared>

Sensitivities in Cultural Heritage

- Includes features that arose from critique/iteration of previous concepts
 - Promotes sharing
 - Relatively easy to use (via Instagram)
 - Doesn't require specialised tech to take from place to place
 - Doesn't put audience in the victim's shoes
 - Text description aims to support deeper reflection on murals



<https://youtube.com/shorts/EPt46euMpl4?feature=shared>

Sensitivities in Cultural Heritage

Reflections on the design process

- Design process was *iterative* where the concept changed and evolved based on feedback
- Involved domain experts at every stage
- Helped the designers more deeply understand the context and the intended audience
- Museum experts were attuned to sensitivities of the memorialisation project, to a deeper level, as well as the needs of the audience
- E.g., important not to put the viewer in the victim's shoes

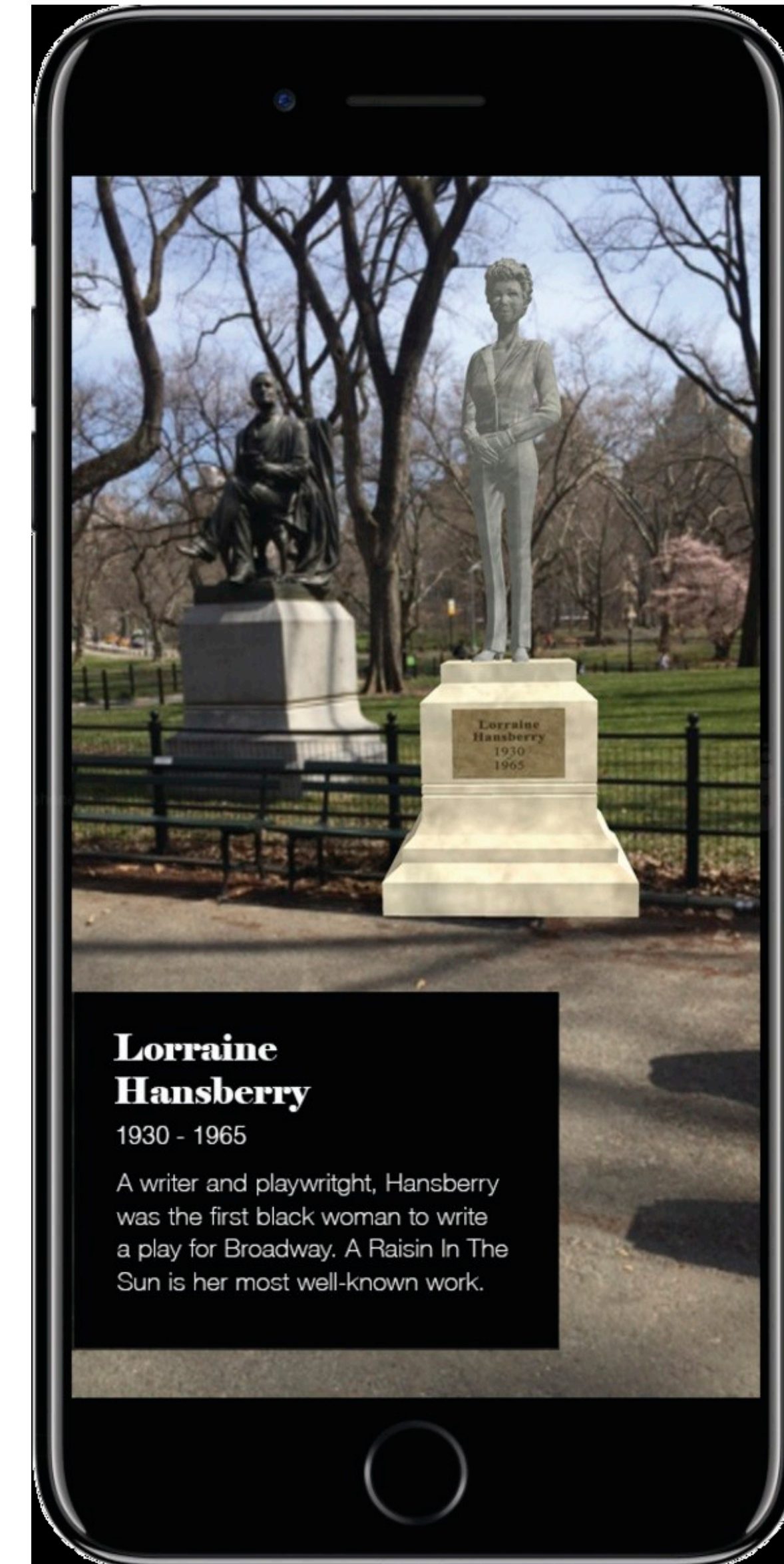
Sensitivities in Cultural Heritage

Reflections on the design outcome

- Importance of not providing a purely aesthetic experience but one that promotes analysis and reflection on the content
- Importance of providing context about the artwork (in this case, via text)
- Taking into account the technology infrastructure of intended settings, and the technology literacy of intended audiences

AR & Activism in Context of Cultural Heritage

- Interview study with 20 creators who use AR for **activism**: *action to promote social change*
- In USA and Western Europe
- Diversity of cases:
 - Art democratisation: Overlaying digital guerilla art (artwork that appears unannounced) over physical paintings in a museum (Netherlands)
 - Celebrating women of colour: Displays an artistic holographic monument consisting of images, audio, and animations at a specific location (USA)
 - Indigenous cultural awareness: Overlaying videos on cultural sculptures to tell stories (Canada)
 - + range of non-cultural heritage cases (e.g., combatting political corruption, environmental awareness, etc.)



<https://www.commarts.com/project/11275/the-whole-story-project-ar-app>

AR & Activism

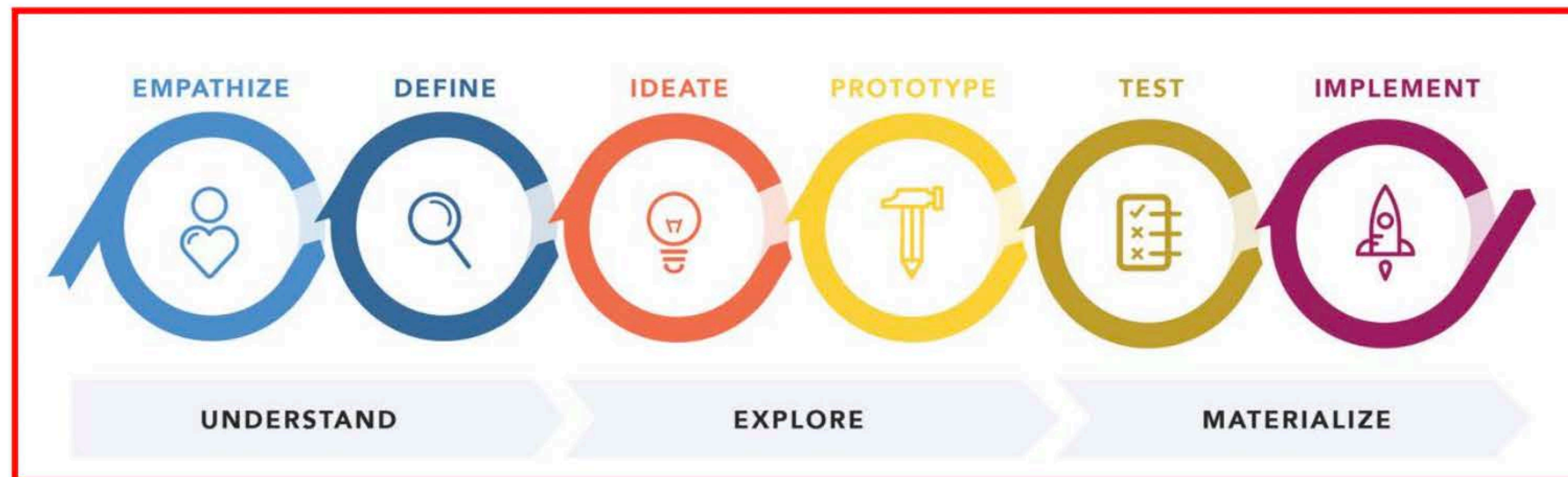
- Why do the creators use AR for activism?
- What are the **benefits** and **disadvantages** to using AR in this context?

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AR & Activism

Why do creators use AR for activism?

- Ease of creating content
 - Large range of platforms available that don't necessarily require programming expertise
- Potential legal and ethical consequences still being shaped:
 - Overlaying digital information "seems less risky" than changing physical environment
 - Lack of certainty about legal ramifications due to lack of precedent

AR & Activism

Advantages

- Adds new layers of understanding to tangible cultural heritage
- Context and meaning

AR & Activism

Advantages

- Potential to empower underrepresented/marginalised individuals
- Helps question who has a say in what cultural heritage is prioritised? (e.g., statues, artworks)



The Guerrilla Girls
Photo: George Lange

AR & Activism

Disadvantages?

- **Audience reach!**
- When the experience is restricted to a particular physical space, this can limit reach
- It can be hard to browse for AR experiences on digital platforms (e.g., App Store) - how will people know it's there?
- AR can experiences might also exclude those across digital divide:
 - e.g., Who has access to the required device? Who has access to the internet? Who has the digital literacy skills to engage?

Student question! (Teams)

- How can AR be designed in a way that makes it more accessible to a wider amount of people?
- Think about: where and how people will access the experience, what digital skills are required to access the experience

Student question!

- What can be done if AR technology is used for political propaganda and extremist ideologies, stimulating support for certain individuals or, even worse, inciting hatred against specific groups?

Key takeaways:

- Framework for AR for Tangible Culture: Personalisation, Communication, Sensitisation, Analysis
- Example of RtD involving domain experts for AR in sensitive contexts
- Value of AR for democratising representations of tangible culture and making visible marginalised voices/stories
- Value of AR for giving context and history to tangible culture
- Questions of inclusion: who is able to access AR experiences?
- Questions of sensitive narratives: how to choose what to represent?

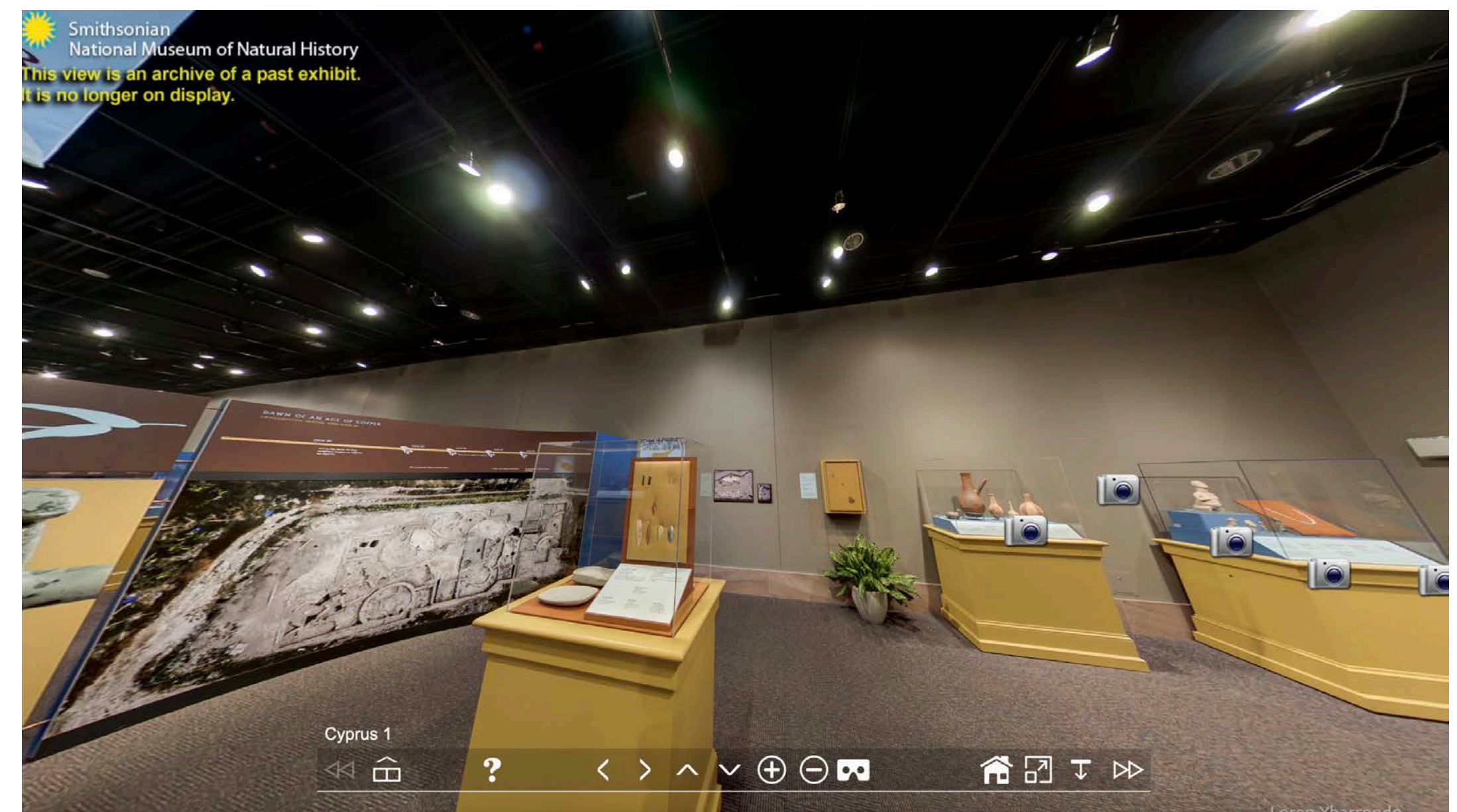
There's always more!

- Much more to XR and Cultural Heritage
- E.g., VR for Cultural Heritage
 - Enabling people to experience cultural heritage from a distance
 - Storing immersive records of past physical exhibitions
 - Immersing people with intangible culture from other cultures



Hua'er (Traditional Oral Performance) in Virtual Reality

<https://doi.org/10.1145/3491101.3519761>



Smithsonian virtual tours

<https://naturalhistory.si.edu/visit/virtual-tour/narrated-virtual-tours>

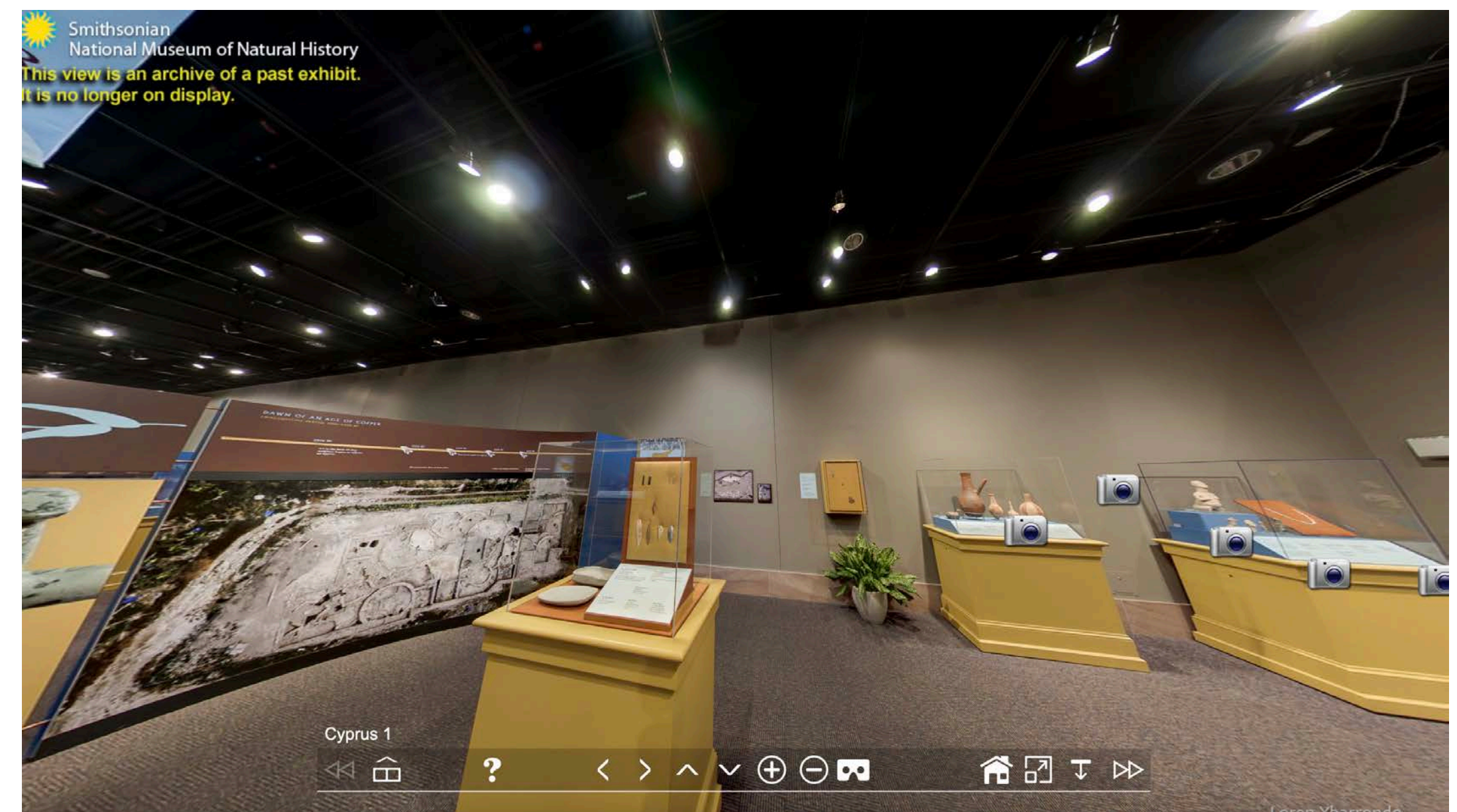
There's always more!

- Much more to XR and Cultural Heritage
- E.g., VR for Cultural Heritage
 - Enabling people to experience cultural heritage from a distance
 - Storing immersive records of past physical exhibitions
 - Immersing people with intangible culture from other cultures
- All have social, ethical, environmental and legal implications!



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Smithsonian virtual tours


<https://naturalhistory.si.edu/visit/virtual-tour/narrated-virtual-tours>

Readings for next week

- Required reading:

Tholander, J., & Jonsson, M. (2023, July). Design Ideation with AI-Sketching, Thinking and Talking with Generative Machine Learning Models. In Proceedings of the 2023 ACM Designing Interactive Systems Conference (pp. 1930-1940). <https://doi.org/10.1145/3563657.3596014>

- Optional reading (Not required but an influential paper worth knowing):

Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021, March). On the dangers of stochastic parrots: Can language models be too big? . In *Proceedings of the 2021 ACM conference on fairness, accountability, and transparency* (pp. 610-623). <https://doi.org/10.1145/3442188.3445922>

Further Reading

- Silva, R. M., Principe Cruz, E., Rosner, D. K., Kelly, D., Monroy-Hernández, A., & Liu, F. (2022, April). Understanding AR Activism: An Interview Study with Creators of Augmented Reality Experiences for Social Change. In Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (pp. 1-15).
- Cárdenas Gasca, A. M., Jacobs, J. M., Monroy-Hernández, A., & Nebeling, M. (2022, June). AR Exhibitions for Sensitive Narratives: Designing an Immersive Exhibition for the Museum of Memory in Colombia. In Designing Interactive Systems Conference (pp. 1698-1714).
- Maximilian Speicher, Brian D. Hall, and Michael Nebeling. 2019. What is Mixed Reality? In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 1–15. <https://doi.org/10.1145/3290605.3300767>
- Čopič Pucihar, K., & Kljun, M. (2018). ART for art: augmented reality taxonomy for art and cultural heritage. *Augmented Reality Art: From an Emerging Technology to a Novel Creative Medium*, 73-94.
- Liu, Z., Yan, S., Lu, Y., & Zhao, Y. (2022, April). Generating Embodied Storytelling and Interactive Experience of China Intangible Cultural Heritage “Hua'er” in Virtual Reality. In CHI Conference on Human Factors in Computing Systems Extended Abstracts (pp. 1-7).
- Sabie, D., Sheta, H., Ferdous, H. S., Kopalakrishnan, V., & Ahmed, S. I. (2023, April). Be Our Guest: Intercultural Heritage Exchange through Augmented Reality (AR). In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (pp. 1-15).