P/REFERENCES OF DESIGN

THE MUSEUM AND ME: CO-DESIGNING A RESOURCE WITH FAMILIES TO ENHANCE PARENT CHILD INTERACTIONS THAT SUPPORT EARLY YEARS DEVELOPMENT GOALS.

Adira Andlay*[a]

a The Young Foundation, UK
* adiraandlay96@gmail.com, adira.andlay@youngfoundation.org

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ABSTRACT | The objective of this project is to explore ways in which playful museum interventions can enhance and increase parent-child interactions to support early years development goals, including language/communication and self-regulation. This pilot study has been based out of The Fitzwilliam Museum, University of Cambridge in the United Kingdom during August and September 2023. The approach used is a participatory design methodology with an emphasis on co-design sessions and semi-structured interviews involving users and stakeholders. The target group of this investigation focuses on children between 0-5 years and their primary family members living in Cambridge City. This investigation consists of (1) co-design of a museum resource through active engagement and creative development with children and their families (2) design and execution of a physical multi-component toolkit through rapid prototyping using the Museum's existing resources and distribution channels to achieve the social impact pilot study objective. This investigation focuses on the creation of a physical prototype as opposed to a digital one based on initial conversations with parents about use, accessibility, preferences, and interest. Thus, it serves as a blueprint for how design research methods can be applied to fields of early childhood development and museum learning, exploring new multidisciplinary domains while integrating different modes of knowledge production.

1. Introduction and Literature Review

Family Museum Visits and Spatial Ethnography

Research shows that families are crucial stakeholders by means of which museums carry out their general missions along with generating sustainable income (Louisa Hood et al., 2021). Moreover, as per the UN Convention on the Rights of the Child, museums play a central role in their ability to support and encourage children to participate in cultural life (Wallis & Noble, 2022). A museum thus becomes a place beyond historical knowledge and starts to encapsulate active sensory, aesthetic and cognitive experiences in extraordinary surroundings (Wallis & Noble, 2022). To understand the nature of participation that the parent-child stakeholder can experience, it becomes imperative to conduct research studies that actively involves participation in generating data.

Designing for a Sense of Ownership and Belonging

Participatory design can be defined as an approach to support mutual learning through equitable partnerships of communities and experts through the design of an intervention (Cumbo & Selwyn, 2022). By actively involving all stakeholders in the design process, this approach aims to generate a result that meets stakeholder needs and is usable. The process of co-design, although in the same realm, takes this approach a step forward and deepens the level of engagement, input and decision-making power that stakeholders wield in the designed outcomes (Ashley, 2022). This project uses a co-design methodology carried out in the form of various creative activities and semi-structured interviews, placing the users at the centre of the opportunity space.

Incorporating Ways of Seeing and a Child's Perspective

Duncan and Wallach 1980; Sftinteş 2012 relied on the concept of liminality which looks at the interplay between people and the built environment in museum research (Louisa Hood et al., 2021). Inspired by the use-case of liminality in family life (Louisa Hood et al., 2021) and as researched by Isabelle, Dominique, and Statia (2019), this project references the magic of *nesting, investigating and stamping* through guided playful museum interactions. *The Museum and Me* is therefore a case study of the production of socially charged, contextually relevant and culturally sensitive physical tools aimed to materialise the intangibles of early childhood development.

The Significance of a Co-Design Approach in Early Years Pedagogical Development

Design thinking in a pedagogical context is viewed as a central pillar to promoting competencies such as social creativity, collaboration, and critical thinking while enhancing student-centred solutions (Aksela, 2019). A co-design approach in educational practice is known to design *with* students, not *for* them (Corio & Mengis, 2020) by viewing them as active participants who have the right to feel empowered in decisions regarding their own way of life. In recent years, using age-appropriate co-design methods to support children's participation has become one of the main focuses of early years pedagogy, challenging traditional cultures to rethink practices as to take children's agency into account (Brinck et al., 2022). These roles are dependent on the application of co-design and offer many roles to children such as those of co-designers, co-researchers, co-authors, informants, and testers (Brinck et al., 2022). For the purpose of this research study, the participating children have played the role of *co-researchers* in the *discover and develop phases* of the methodological approach.

2. Approach and Methodology

This research investigation has been generously supported through funding provided by Nesta, UK's innovation agency for social good and Art Fund, a UK national art charity. The research questions were co-created with museum researchers and the funding partners to be as follows:

1. What archetypal personas manifest among children aged 0-5 years during their engagement with museum environments alongside their primary caregivers, taking into account their developmental milestones and linguistic competencies?
2. Which sensory modalities predominate in children's exploration of their surroundings, and what attributes of museum spaces (including scale, proportion, materiality, color, and texture) resonate most profoundly with them?
3. Who are the principal stakeholders entrusted with guiding children through the museum experience, and what foundational competencies must be cultivated to foster their agency, autonomy, and penchant for play?
4. How can a multifaceted physical toolkit be conceived to stimulate playful interactions within the museum, informed by insights garnered from the preceding inquiries?

These research inquiries were further refined and operationalized into two distinct studies denoted as Study A and Study B, as delineated in subsequent sections. In alignment with the project's ethos of participatory engagement and innovative inquiry, the funders expressed a vested interest in promoting an approach steeped in participatory methodologies and innovation-centric paradigms. Thus, the project adopted the Double Diamond Approach (Figure 1), as elucidated by the UK Design Council, which systematically guided the project through divergent and convergent phases, underpinned by pertinent theoretical frameworks encompassing museum curatorship, pedagogical strategies for early childhood development, and principles of playful design. This methodological choice was predicated on its facilitation of exploratory and innovative exploration relevance to the project's overarching objectives.

The research and physical kit have been created in close collaboration with experts from early years education and museum learning through a process of co-design sessions and semi-structured interviews with users and stakeholders. These co-design sessions, integral to the project's iterative design process, were meticulously orchestrated over the course of a month, punctuated by visits to the museum at strategic junctures, spanning the phases of discovery, definition, development, and delivery. Employing a mixed-methods approach, the research amalgamated quantitative and qualitative data gleaned from co-design sessions and semi-structured interviews. Qualitative data, elicited through observations and insights recorded via camera and written documentation, were subjected to a nuanced adaptation of Braun and Clarke's Thematic Analysis, affording a comprehensive synthesis of emergent themes. It is imperative to note that all research activities and documentation were conducted in the English language, ensuring coherence and comprehensibility across all stages of the inquiry.

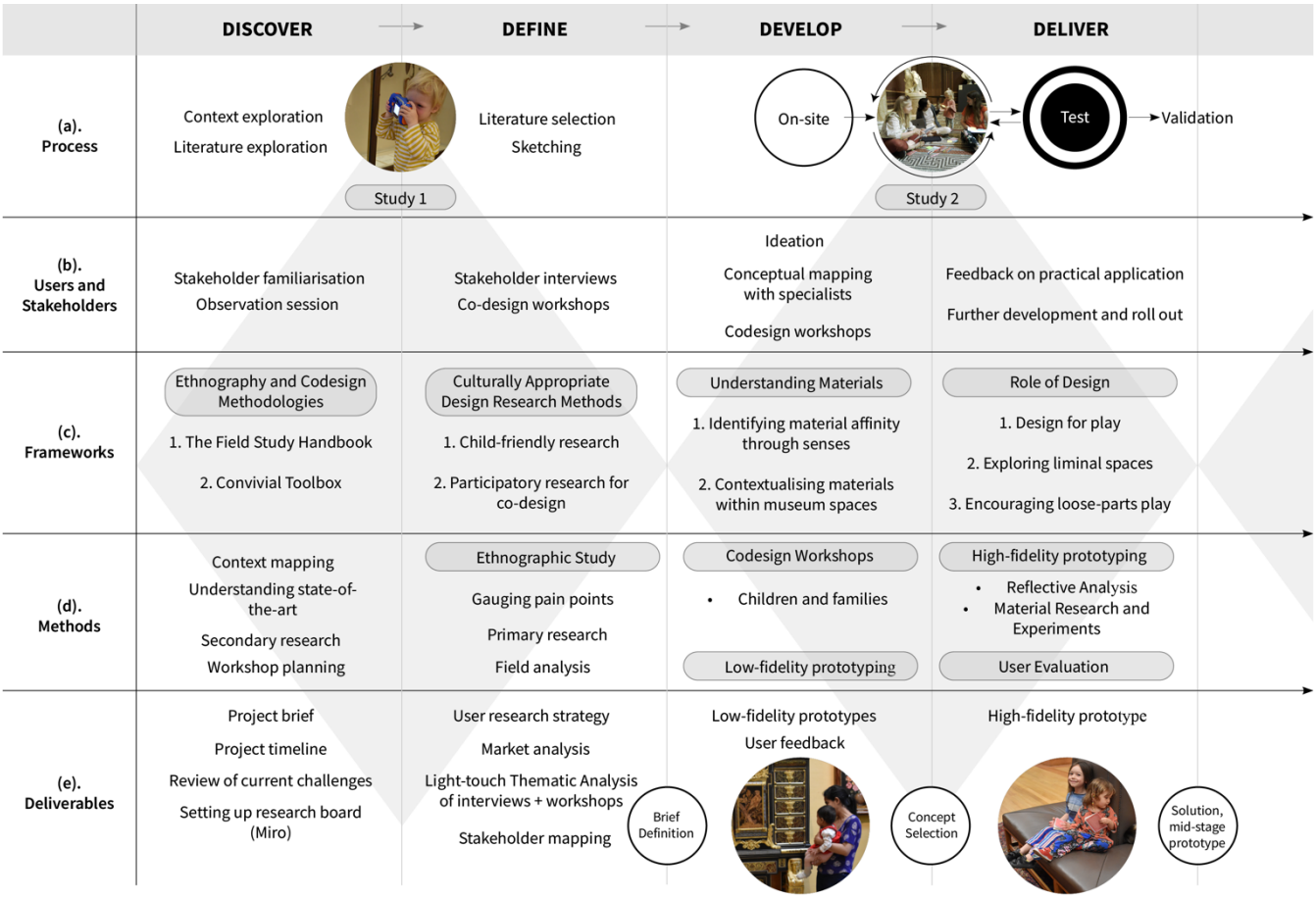

Figure 1. Methodology based on the Double Diamond Approach (full version in Appendix).

3. Study A: Co-design with Families

3.1 Aim

1. To understand the child's persona/s as identified by their parents.
2. To identify the primary sense that the child uses to explore the environment.
3. To understand the child's favourite object/area/destination in the museum to get a sense of the kind of spaces children have an affinity for.
4. To decipher a family's museum experience through parent-child interactions to identify the peak of both the most challenging and most rewarding experiences.

3.2 Study Protocol and Participants

All co-design sessions took place in the galleries of The Fitzwilliam Museum. Participants (N=10 families) were asked to choose an area/gallery they wanted to conduct the co-design activities in. Each session lasted for approximately 45 minutes, depending on the level of engagement per family. The sessions were

led by the designer along with support from a researcher at the Museum. The designer primarily engaged with the parent, while the researcher engaged with the child. However, due to the dynamic and co-dependent nature of parent-child interactions at that age, there was a fair amount of overlap in the interactions and the nature of the sessions was free-flowing.

Figure 2. Image from a Co-design Session with Remy and Leo.

3.3 Co-design Sessions

Each session was broken down into activities of material exploration (child), semi-structured interviews (parent) and storyline exercise (parent). The activities conducted are described below:

1. Gathering insights into material affinity (child)

Each child was shown a selection of different objects made from a range of materials that invoked responses from different senses. These included cloth, translucent and plastic frames, shakers, wooden blocks, etc. They were encouraged to interact with all/any of them as they preferred, and were asked to identify which their favourite object was. In situations where the child was too young to communicate using language, their actions for play and focus were keenly observed as guideposts. The researcher watched how they used/played with that object and took notes of any interesting actions and interactions.

2. Persona identification using the Blob Tree (parent)

Parents were shown the Blob Tree and asked to identify which blob/s best represented their child's exploratory nature when they came into the museum. To contextualise their blob selection, parents were additionally asked to give an example of this kind of interaction that they observed their child frequently displayed. This activity was conducted to identify core characteristics, behaviours and levels of engagement that a child showcased when in the museum space.

3. Persona identification using the Blob Tree (parent)

Using a multiple-choice question format, Parents were asked which sense (smell, taste, touch, sight, sound) or combination of senses their child was most keen to explore the environment through. They were additionally asked to give an example of this kind of interaction.

4. Storyline exercise (parent)

Adapted from the Convivial Toolbox, the storyline exercise helps design researchers understand how a particular user experiences a service, product, or environment. Parents were presented with an A4 sheet that had a line running through it. This line represented a linear timeline with the starting point on the left

being the time they entered the museum with their child, and the end point on the right being the time they exited the museum with their child.

a. On this timeline, they were asked to mark the most challenging moment they observed their child experience along with the most rewarding moment they observed their child experience.

b. Using post-it notes, they were asked to name an object/activity/toy/interaction that could make those respective moments easier or memorable respectively.

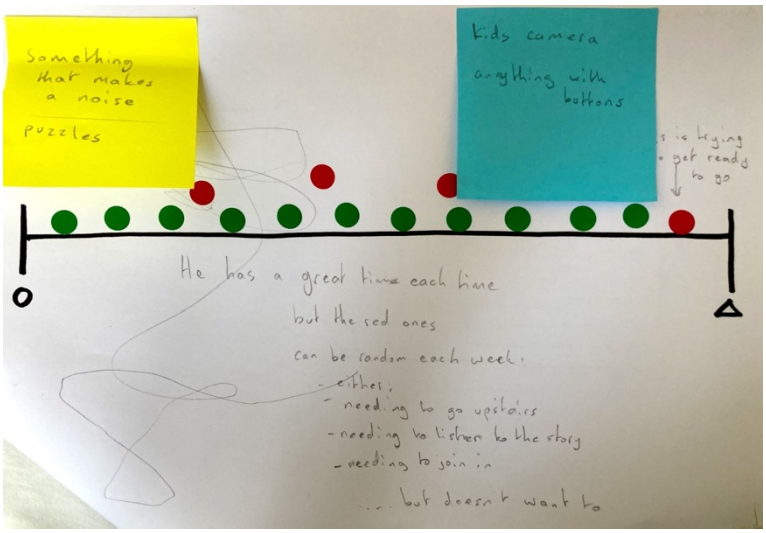

Figure 3. Image of the Storyline Exercise by Abigail.

To support these activities, parents were also asked questions like, “What would you want your child to take away from these museum visits?” and “Does your child ever talk about the museum when they are at home?” These semi-structured interviews provided details about the child’s experience of a new public environment and the types of things they remembered, were excited to share with others, were curious to come back for and were excited to experience again.

3.4 Findings

1. Children between the age group of 0-5 years are inclined to explore the museum as a physical space where the focus is not on the historical relevance (which comes at a later developmental stage), but rather the shapes, colours, sounds, scale and perspectives that they can play with. An example is shown below in Figure 4.

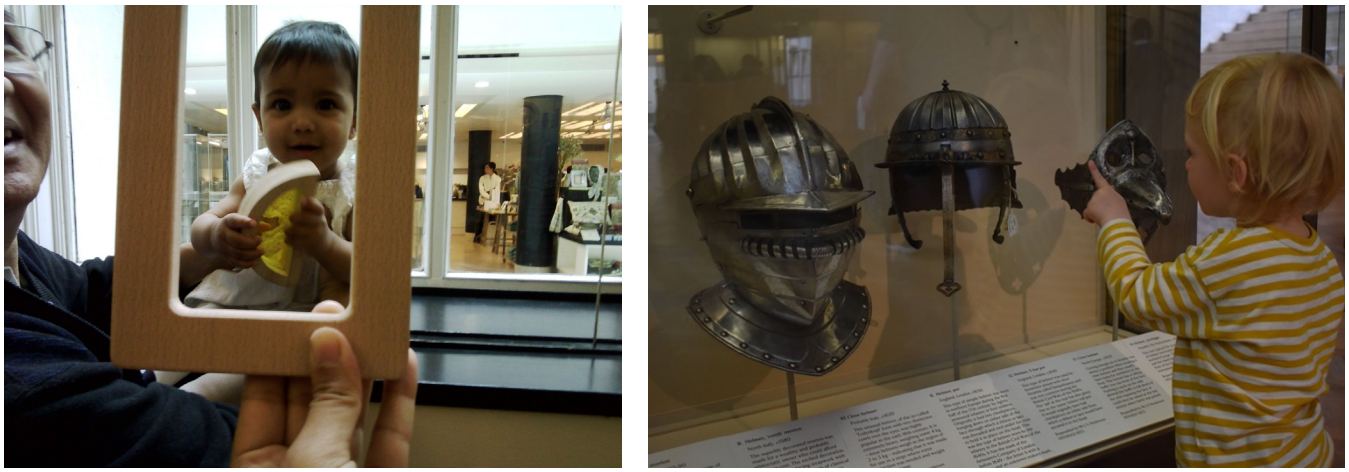

Figure 4. Image from co-design sessions with Tamana and Daniel.

2. Parents' answers to the Blob Tree helped identify the kind of child we were designing for. Descriptive words/phrases that came out of this exercise included *"loves being on the go," "making imaginary friends," "enjoys how much space there is"* and *"likes finding his favourite things"*. Looking at the trio of blobs 16, 17 and 18, Kamala exclaimed that *"these are just like us (the family), exploring the museum together!"*. An example of Lucy's answers about her child's persons as per the Blob Tree is shown below in Figure 5.

Figure 5. The Blob Tree as used by Lucy describing Lily's behaviour, interactions and energy in the Museum.

3. Most parents said that at this age their child relied on their sense of sight and touch to explore the environment as shown below in Figure 6.

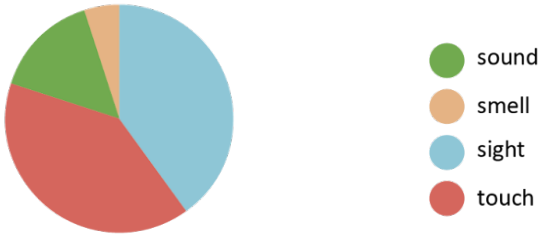

Figure 6. Graph representing parents' Answers for the question *"Which sense is your child most keen to explore their environment through?"*.

4. Majority of the parents marked a point roughly in the middle of their museum journey as the 'rewarding moment' where their child was in a complete moment of flow and absorption. While a point towards the end of their museum journey was the 'challenging moment,' where it was difficult for them to get their child to leave the museum space due to a range of personal, environmental and social factors.

Figure 7. The Average Data Gathered from Parents' Responses for the Storyline Exercise.

3.5 Results and Discussion

Table 1. Factors that emerged from co-design sessions and their thematic and design description.

Factors	Thematic and Design Description
(1). (a). Design interventions needed for the point of: Rewarding moment (experienced mid-way through)	(1). (a). Most parents indicated that their child enters a moment of flow and complete engagement at some point in the middle of their visit, where they are focused on enjoying themselves in the museum - be it by standing next to a statue, going up and down the stairs or crawling through the galleries. On further probing, parents described wanting a physical art book/magazine for their child to draw in to remember this moment.
(1). (b). Design interventions needed for the point of: Challenging moment (experienced towards the end)	(1). (b). Most parents described that their child would experience a challenging moment towards the end of their museum visit. They explained a multitude of factors for this - reluctance to leave a place that they're having fun in (environmental), exhaustion (physical) and agitation (mental). On further probing, parents described wanting a token that could be handed over to the child as a keepsake at the gate/desk as incentive to leave the museum as well as remember their time there.
(2). Parents' desire for their children to explore the museum in a safe way, without feeling like they are being judged for their child walking fast, singing, exclaiming loudly, asking questions, etc. (behaviour that typically goes against traditional expected norms of silent and watchful museum visits).	(2). All parents explained that they wanted their child to feel welcome in the museum space, and that it would benefit them in planning their visits if they discovered through the museum outreach and media channels that the museum was a child and family friendly space.
(3). Parent's desire for their children to learn about the museum as a place that's different from their home/other public spaces, to learn about the existence of an environment where things are preserved and about the ways that people lived in the past.	(3). This ties in with the need of a physical guidebook that illustrates how a museum can be explored through a child's perspective, taking into account their developmental stage and affinity for observing bright colours, exploring different heights and finding their own favourite markers that strengthen their sense of place.
(4). Parents' desire for their child to not feel scared or afraid of museum security staff.	(4). This ties in with training and capacity building that is needed to be delivered to museum staff, highlighting how charged representations of authority and uniforms can solidify fear and nervousness in a child. As at this age, it is important for a child to start being recognised as a developing individual, this can be supported by the museum staff handing out name tags for children to wear and write their names in. Subsequently, if a child is found running or touching something in the gallery, museum staff can thereby address the child directly with an ease and friendliness in their tone.

4. Study B: Design and Execution of a Physical Multi-component Kit through Rapid Prototyping

Figure 8. Work in Progress Image of the A3 Zine.

4.1 Aim

1. To develop a physical prototype that represented the participatory research insights garnered in Study A through playful interactions;
2. To identify areas of further development that go beyond the current form of the prototype.

Note: Outcomes that emerged from Study B of this project were low-fidelity prototypes documented in this paper and are currently being reviewed for further development.

4.2 Components

1. A3 Zine

To fulfil the identified need of *factor 3* from the *Results and Discussion* section in Study A, a low-cost and easily replicable A3 zine was developed. This zine title *'The Museum and Me'* is a visual guide to be used by parents and children (together or independently as preferred) to explore the physical museum space. The story of the zine is based on a child's perspective and use of their senses to explore a new environment (as represented in the empathy map in Appendix Figure 2). It makes use of a clay model developed by a family as the primary character that walks the parent-child through different spaces, objects and creative experiences.

This zine was prototyped in stages (refer Appendix Figures 3 and 4) and the low-fidelity version was tested with three families. Feedback was incorporated and elements modified, after which the high-fidelity zine was designed.

Figure 9. Digital File for the High-fidelity A3 Zine.

2. Acrylic Shapes

The co-design activities and semi-structured interviews reflected the importance of loose-parts play in supporting a child to explore the museum environment. Children between the ages of 0-5 years seemed to have an affinity for mirrors, cameras, and tinted translucent frames through which they could focus on and look through to surrounding objects, people, doorways and architecture. Based on this insight, a set of five tinted acrylic shapes were designed inspired by shapes found in the physical structure of the museum (as shown in Appendix Figure 5). They were subsequently developed by laser cutting blue and yellow acrylic sheets of 3 mm thickness.

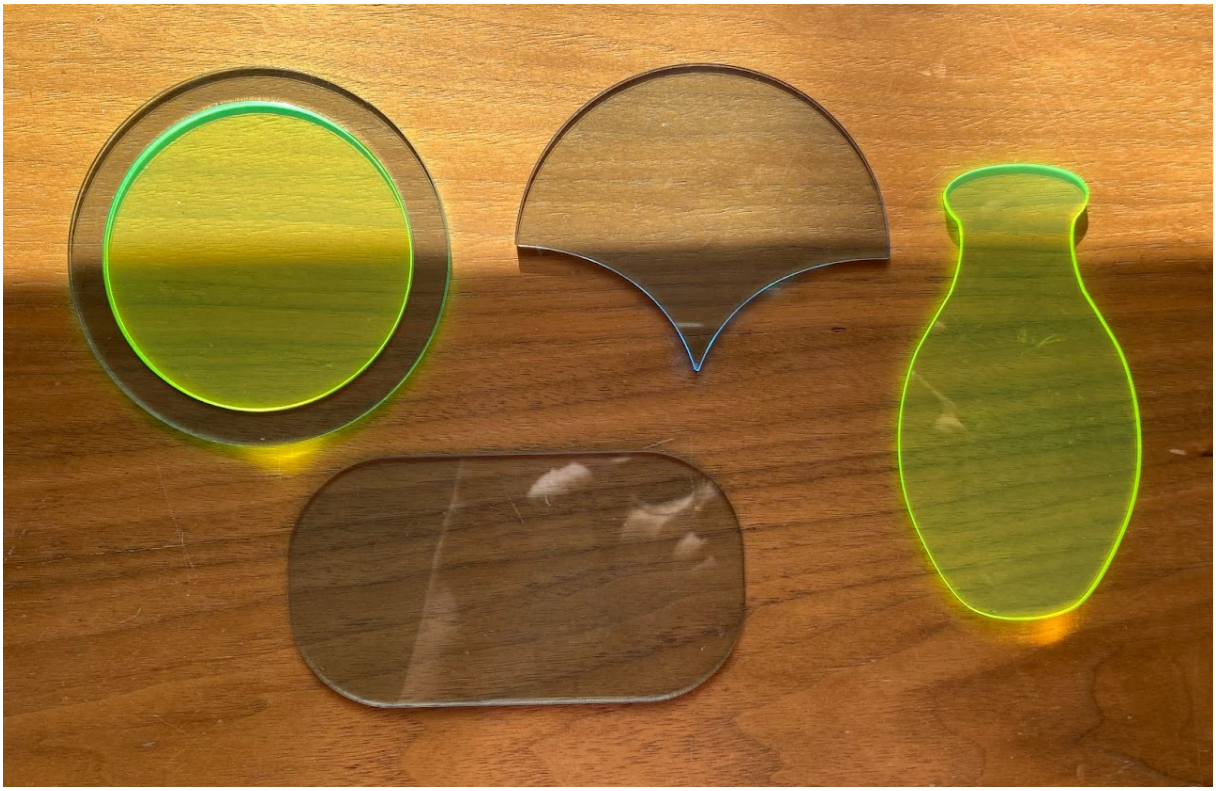

Figure 10. Image of Physical Prototypes of Acrylic Shapes.

Note: The poster in the above photographs is purely for representational purposes and not part of the display at The Fitzwilliam Museum.

3. Poster

To support the outreach and communication section of this project, two illustrations created for the A3 zine were turned into posters. Their intended use is for museum entrances, front desks and play corners which have resources and family learning material.

Figure 11. Digital Files of the Final A2 Posters.

4.3 Results and Discussion

The key contributions of this project lie in:

1. Achieving a practical, interdisciplinary collaboration between fields of participatory design, museum learning and early childhood education.
2. The use of a creative participatory design methodology - with a focus on co-design - from beginning to end, actively involving stakeholders in the design process to ensure their needs have been met.
3. The use of rapid prototyping to create a physical toolkit that is socio-culturally relevant, low-cost and easily replicable.
4. The creation of a physical multi-component prototype that can be rolled out in small groups for further user-testing and development.

5. Challenges Stemming from a Multidisciplinary Approach

This project adopted a design-led, multidisciplinary, and creative approach that allowed for the research to be crafted at the intersection of fields of early childhood education and museum learning. While such case studies are crucial to re-thinking traditional systemic modes of learning and promote inclusion, independence, and autonomy, they pose an array of challenges — ranging from maintaining a balance with stakeholders to divergent goals that are discussed below:

5.1 A Revolving Door for Stakeholders

A key challenge to a multidisciplinary approach is the frequent switching between individuals or entities involved in the flow of research. Recent literature underscores the necessity for a nuanced comprehension of 'good participation' in participatory educational contexts, emphasising socio-ethical principles such as agency and engagement (Cumbo & Selwyn, 2022). If such participatory research principles in education imply that research briefs and studies be set up in a space of earnest co-creation with students, members of educational committees and families, then the onus of maintaining the balance amongst stakeholders falls on the shoulders of the principal researcher, who in many situations may not be the expert authority on the subject matter, while remaining the expert on the nature of participatory engagement.

This provides a tricky situation for the principal researcher, as they must navigate the intricate landscape of diverse stakeholder interests, perspectives, and priorities while endeavouring to uphold the integrity and coherence of the research brief. In essence, the principal researcher assumes the role of a facilitator, orchestrating meaningful dialogue, fostering collaboration, and ensuring that the voices of all stakeholders are heard and valued. However, this task is inherently complex, particularly when stakeholders possess disparate levels of expertise, power dynamics, and vested interests.

5.2 Maintaining Educational Integrity Through a Design Lens

Participatory research is defined by socio-cultural principles that give stakeholders a say in the design of an intervention, while considering the benefits that emerge from stakeholder participation (Cumbo & Selwyn, 2022). Research indicates that participatory research in an educational context inherently aims to empower students by increasing their capacity for creative problem-solving across disciplines. While these skills are now starting to be recognised as core capabilities that support the navigation of systemic challenges, it becomes difficult to quantify and assess the nuanced impacts of participatory research initiatives within educational settings, particularly given the multifaceted nature of empowerment and the diverse array of factors that influence students' learning experiences and outcomes.

While this project emphasises learning through a design lens, the research insights acknowledge the difficulties of effectively integrating participatory methodologies into educational frameworks without compromising the integrity of the learning process. Thus, the exploration of participatory research within education requires careful consideration of how to balance innovation with fidelity to established educational standards and objectives. This endeavour necessitates ongoing dialogue, collaboration, and reflection among educators, researchers, and stakeholders to navigate the complexities of maintaining educational integrity while embracing participatory principles.

6. Future Needs and Opportunities

While the case-study has been successfully completed with key deliverables met, the majority of insights generated through this process currently remain in their early stages. This is due to a multitude of factors such as the short duration of the project, limited budget for physical prototyping and highly dynamic set-up of interactions with families. In order for the research to achieve its optimum potential in practical life, the following areas need to be considered:

6.1 Research and Development

Working with vulnerable groups requires flexibility in terms of stakeholder engagement, scheduling of sessions and the breadth of details that can be covered through interactions with the primary researcher/designer. While this project has taken these nuances into account, the depth of research could benefit with closer interactions with family groups. Areas that can be modified in the research design to achieve this include:

1. Ensuring that the structural integrity of interactions is maintained across all co-design sessions. For example, if planning for single family interactions while preparing co-design activities, it is important for all subsequent sessions to follow the same pattern. Otherwise, the risk of losing personal insights is enhanced in the face of group dynamics where people might be afraid, pressured or influenced by the other stakeholder's presence, opinions or answers.

2. To compare how families perceive museum learning and what they would want it to entail, it would be beneficial to supplement individual family sessions with focus groups for parents. This would allow stakeholders to have shared discussions about goals, ideals and value systems. It would also help in creating a network of family groups that feel connected about this topic, potentially leading to a strengthening of inter and intrapersonal relationships that could positively impact their visits to the museum. In order for parents to have such discussions with their full attention and without disruptions, it would be necessary for their children to be taken care of (if they are in a position where they lack child support) by museum/institutional staff.

6.2 User-Testing

In order to understand the effectiveness of the extent to which the current physical prototypes meet the needs identified, it is crucial for on-site user testing to be conducted. Given the contextual requirements of the project, the ideal test measures would follow a mixed-methods approach that would include the use of child-friendly likert scales, polling questions and journey maps. To gain a holistic evaluation at this stage, it would be beneficial to test the prototypes in individual families as well as in groups of families. The evaluation reached at the end would serve as a necessary blueprint for further iterations required, followed by mass development and roll-out phases.

6.3 Capacity Building for Key Museum Staff

The effectiveness of any tool, product or service depends on the openness, interest and curiosity of the stakeholders involved. In social innovation projects, this tends to involve more than the primary stakeholder as such environments flatten the curve between top-down and bottom-up structures. For children and parents to feel comfortable using the prototypes and guidelines provided, the supporting museum staff including the front desk, security team and museum curators need to be trained in the delivery of the toolkit. This would enable the use of the material in a safe, inclusive, positive and child-friendly environment.

6.4 Strengthening Foundations for Design Research in Pedagogy

Numerous research studies have consistently demonstrated the advantages of involving children in the co-design process during the initial stages of educational development. This approach not only enhances empathy but also encourages proactive problem-solving skills (Paracha et al., 2019). *The Museum and Me* delves into design research utilising creative methodologies, taking into account the specific needs of the environment, and employing readily available, cost-effective materials to facilitate inquiry. The results of this investigation highlight the significance of prioritising user input and providing the necessary tools for guiding their learning journey, thereby expanding the range of innovative outcomes.

A co-design lens diminishes the power gap between the adult researchers and children, establishing a conducive atmosphere for creative expression and affirming the belief that users are experts in their own domain. Viewing museums as learning environments unveils the multifaceted roles of museum curators, researchers, and childhood educators in shaping children's perspectives, communication skills, and overall development. Furthermore, adopting a multidisciplinary approach that integrates design research with early childhood development and museum education fosters new avenues for pedagogical advancements. This inclusive educational model, which emphasizes the active involvement of children, underscores the importance of community and peer engagement within the learning process (Brinck et al., 2022).

Co-design initiatives are able to specifically focus on children furthest from opportunity, help them explore their personal identities and engage in open-ended play within the museum environment. As we reflect on the convergence of various bodies of knowledge within educational research, the integration of co-design principles emerges as a powerful strategy for fostering collaboration and innovation. By bridging disciplines and perspectives, this approach enriches pedagogical practices and promotes a deeper understanding of child development within diverse contexts. This pilot study illuminates the transformative potential of co-design methodologies in shaping the future of education. Through similar collaborative efforts that unite theory and practice, researchers, educators, and practitioners can collectively strive towards creating more inclusive and impactful learning resources for children of all ages.

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About the Author:

Adira Andlay is a multidisciplinary designer and researcher working across fields of education, ecology, and social impact to create systems and tools that promote behavioural well-being. She currently works as a Senior Researcher at The Young Foundation, the UK's home for community research and social innovation.

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Appendix

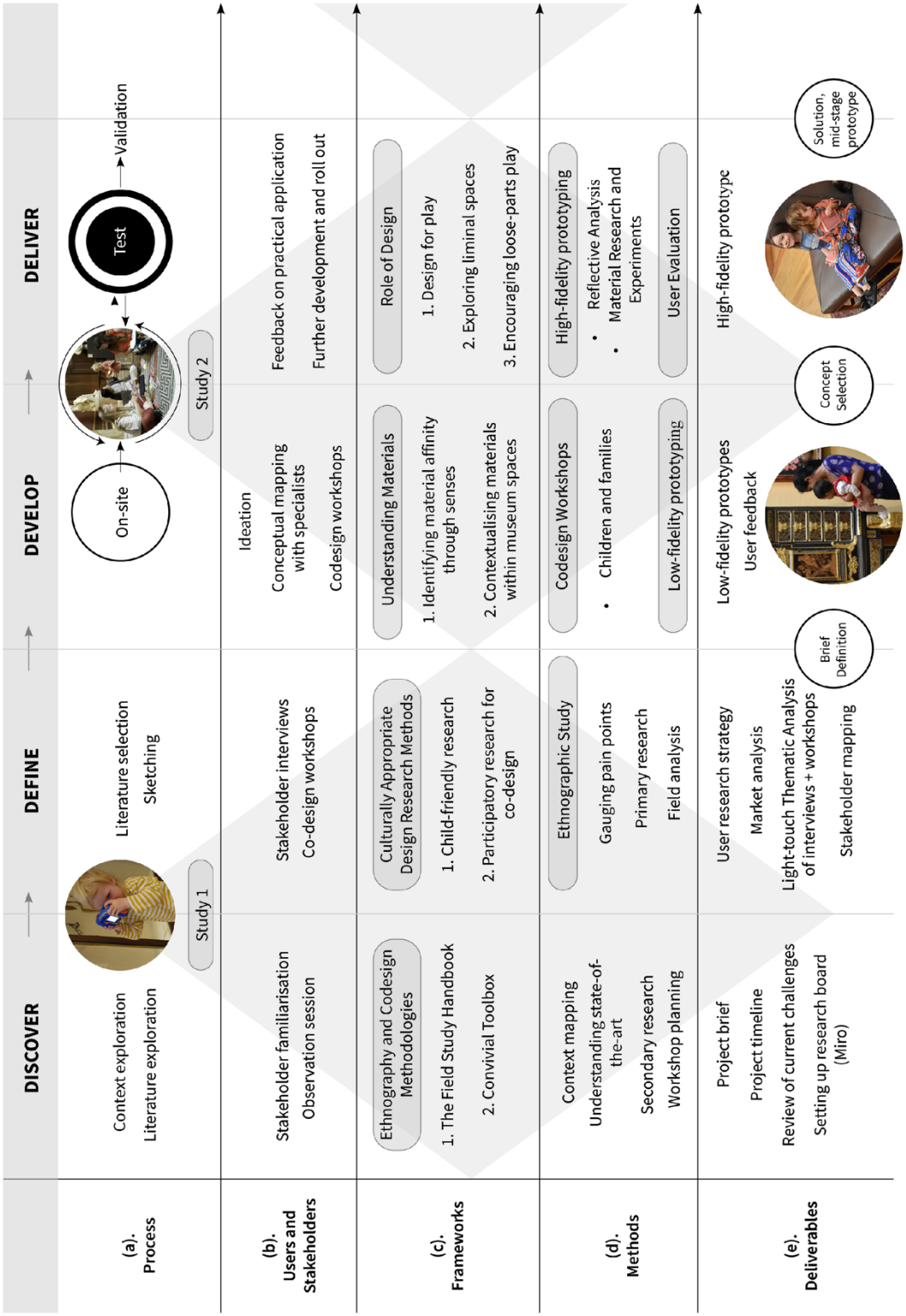

Figure 1. Methodology based on the Double Diamond Approach.

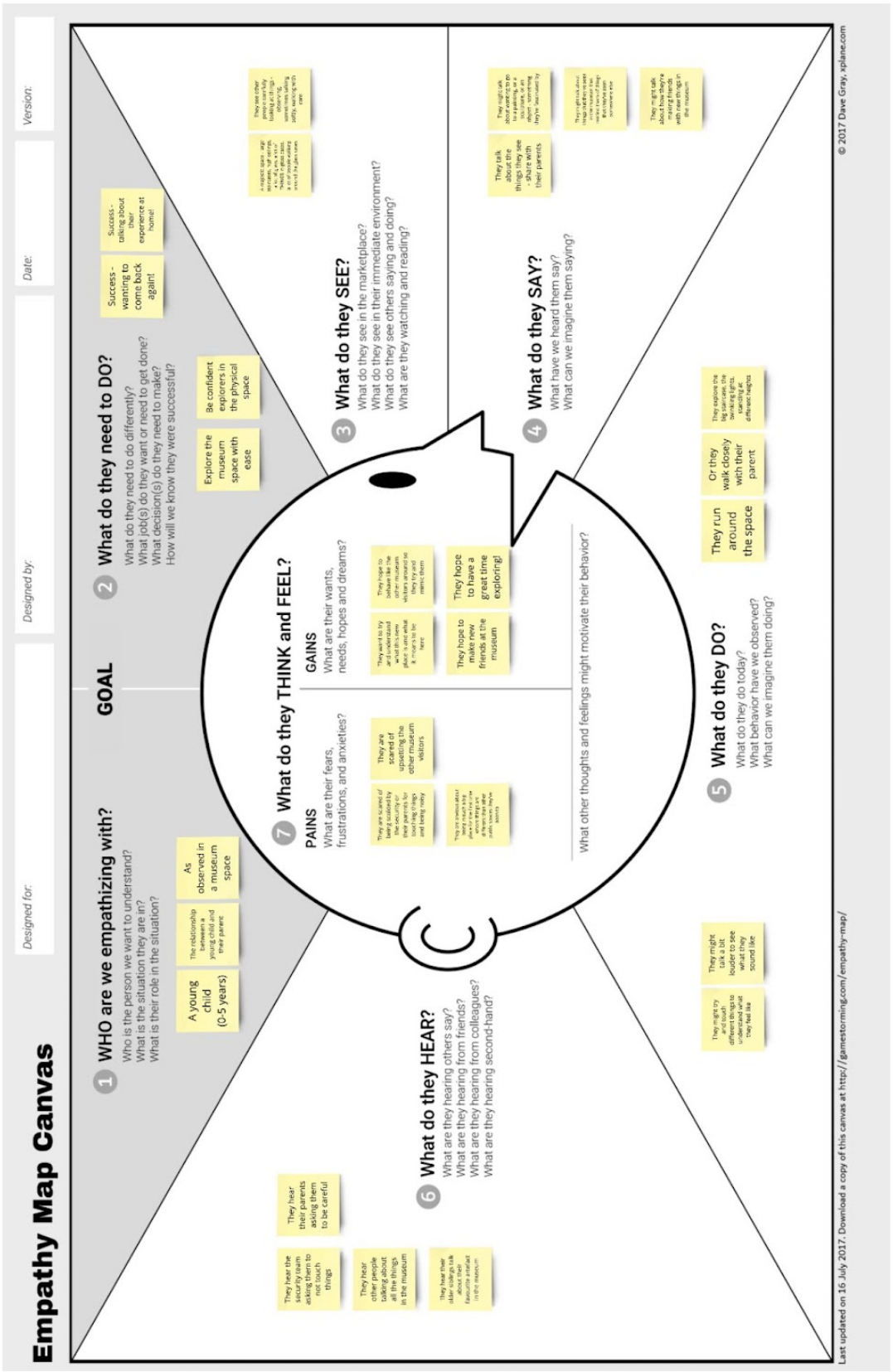

Figure 2. Empathy Map.

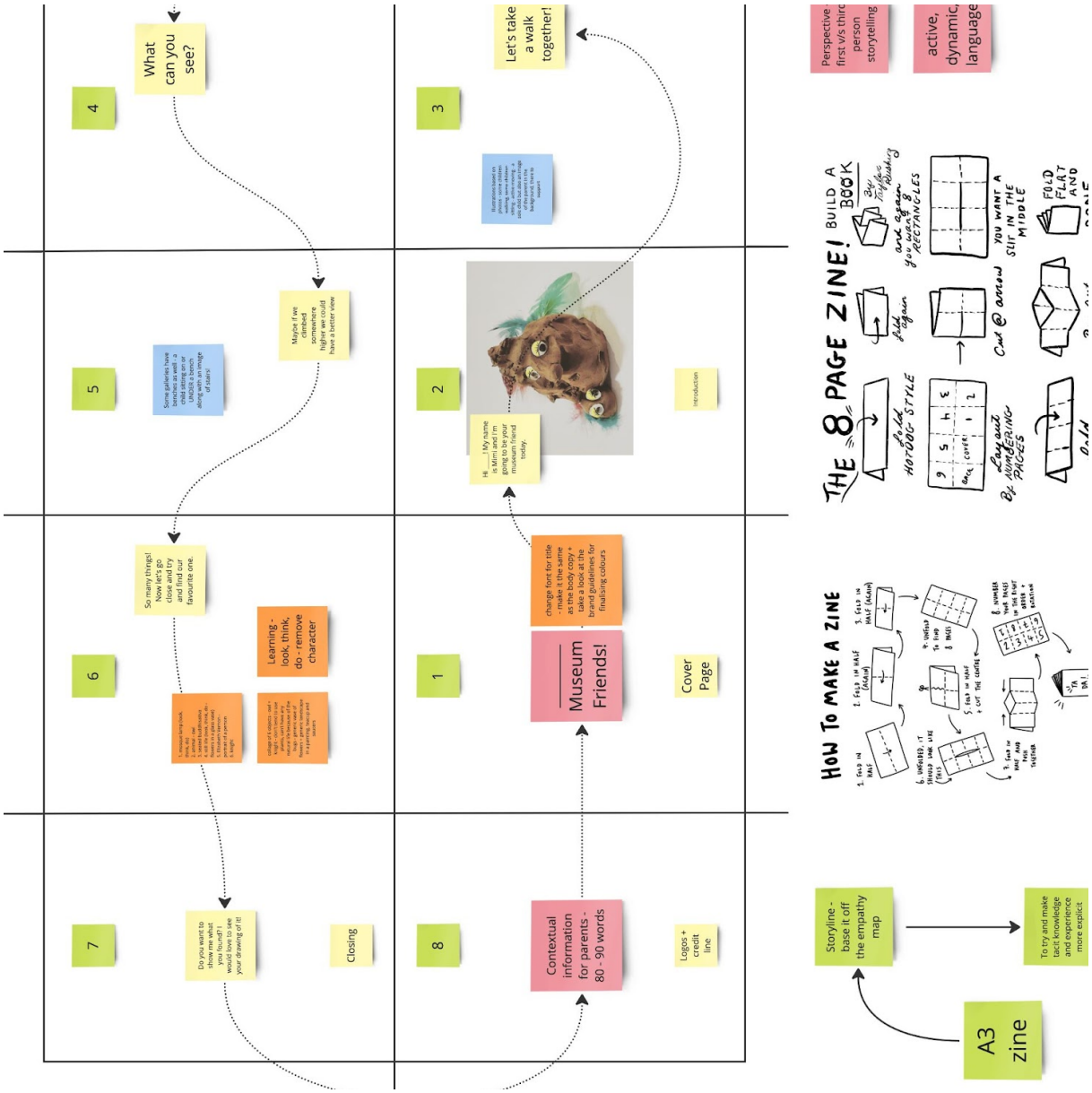

Figure 3. Zine Framework (V.1).

Figure 4. Zine Low-Fidelity Prototype (V.2).

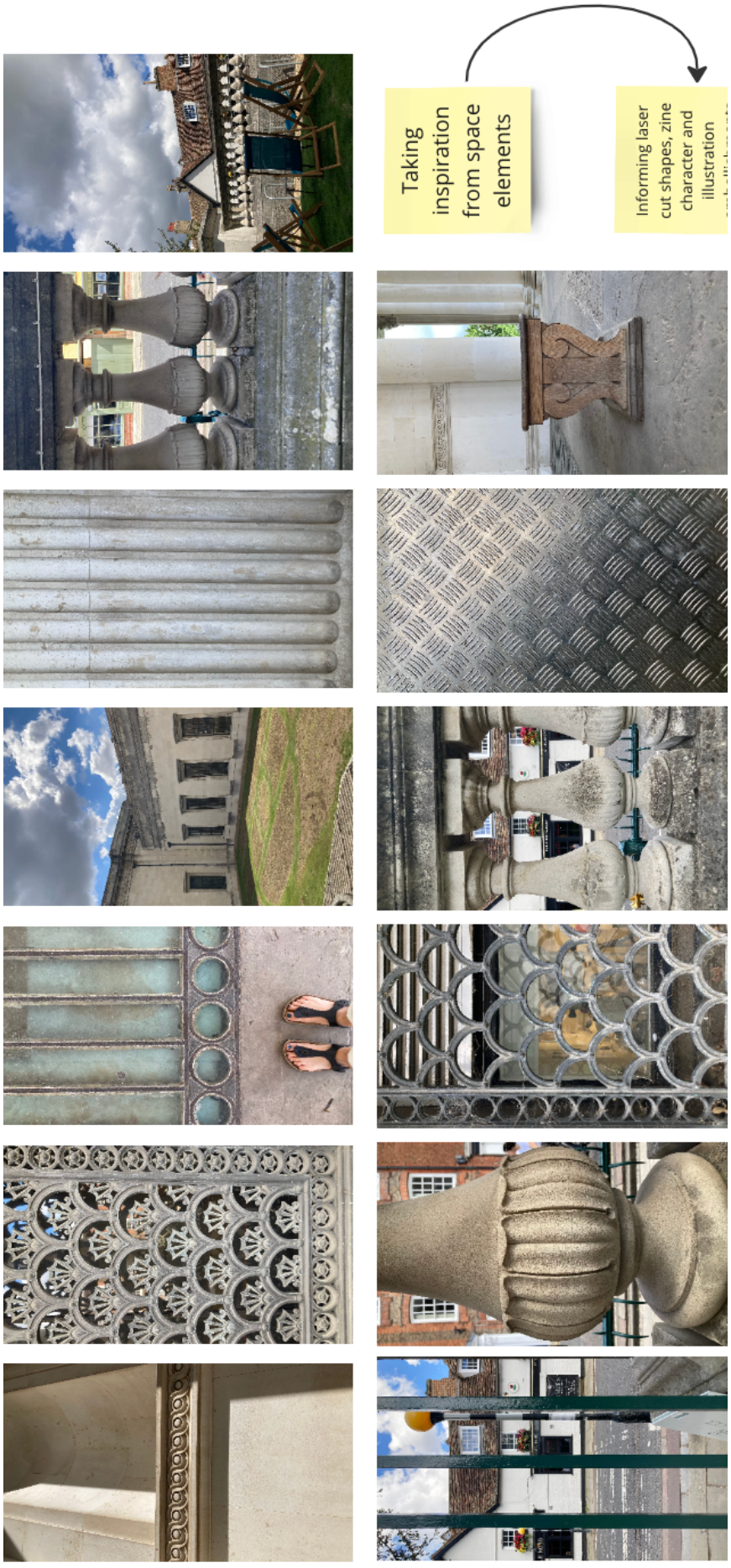

Figure 5. Physical Structure of the Museum as Inspiration for Acrylic Shapes.

P/REFERENCES OF DESIGN

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