User Experience as "Human Scale:" Applications in Education and Contextual Research Using Experiential Concepts of Interaction and Motion Design

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ABSTRACT **Motion significantly changes a reading experience. Typography, rather than transparently supporting content as in the crystal goblet (Warde) falls into a representational role that has at times more connection to animation's legacy. In a greater sense, motion design, experience design, and interaction design can be thought of as experiential and performative, in that comprehension by the participant is an active process of interpretation. This paper will use a number of projects and investigations in education and also in applied projects to outline motion as indexical gesture and motion/interaction design as "embodiment" in analogy/simile and schema theory, including physical and social interactions. This is organized primarily through four areas of gesture, duration, sequence, and environment, where the last two categories are related to narrative structures based on analogy/simile, schema, and actual designed environments.**

Keywords: motion design, narrative theory, embodiment, schema theory, experience design, interaction design, cognitive metaphor

Motion and time-based experiences

Introduction

Motion significantly changes a reading experience. Typography, rather than transparently supporting content as in "the crystal goblet" falls into a representational role that has at times more connection to animation's legacy such as "12 principles for animation," codified by Disney animators (Johnston & Thomas). In the early 2000's, designers saw the potential to enlarge upon "expressive typography" and typographic experiments from the 80's and 90's in the fourth dimension. For instance, film title work for *The Island of Doctor Moreau* (Cooper, R/Greenberg Associates) used deconstructed letterforms rhythmically playing off split-second edits of cells, animals, and environments. While graphic designers quickly gained access to appropriate technology for experimentation and production, animation's large historical and contemporary reception in popular culture was in contrast to the relatively small audiences of expressive or experimental typography.

In a greater sense, motion design, experience design, and interaction design can be thought of as experiential and "performative," in that comprehension by the participant is an active process of interpretation (Peterson, et al. 5). Secondly, linear models of communication such as Shannon and Weaver (Figure 1) do not necessarily capture these contexts. As originally proposed in 1948, this communication model is primarily based on technological broadcast and reception as a set of steps such as encoding/decoding, and the potential problems arising in interference or noise source.

Shannon and Weaver's transmission model is usually presented as a foundational way of thinking through issues of communication in design, however, it does not easily accommodate the performative and experiential aspects of communication, nor account for electronic media's fungible qualities of distribution, social reception and co-production of meaning. This paper will use a number of projects and investigations in education and applied work to outline several approaches using motion as "indexical gesture" and motion/interaction design as embodiment in analogy/simile and schema theory, including physical and social interactions. It will also trace earlier connections between practice-led research informing design education, will show elaboration on continuing new course design, and connect practice-led research to ongoing work with interdisciplinary and collaborative research and work in design and social innovation.

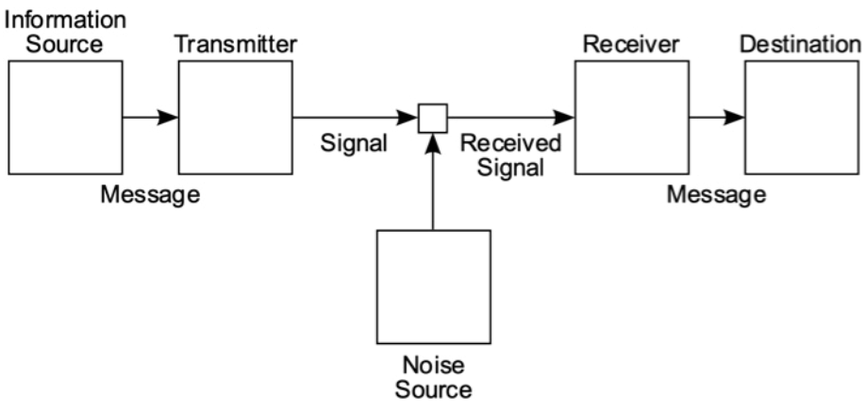

Figure 1: Shannon and Weaver "transmission" model. Source: wiki commons https://upload.wikimedia.org/wikipedia/en/5/52/Shannon_commhttps://commons.wikimedia.org/wiki/File:Shannon_communication_system.svg 2021.

Motion, experientiality and active interpretation

Simply, a syntagm is defined as the syntactical relationship between signifiers; syntagm within narrative structures can be extended to spatial relationships and film structure (Metz; Barthe). Text and image in traditional print layout invites a reader to scan a page, establish a sense of a grid-based hierarchy, and examine discrete components that they then actively construct an order from. Motion, such as in film title work and especially based on a high rate and speed, moves closer to being perceived as a whole, or gestalt, where it is experienced and reflected on rather than scrutinized and decoded. This more phenomenological framework of experiencing (Smith) changes assumptions about encoding and decoding a message, as well as "noise versus fidelity" based on sender and receiver models of communication such as Shannon and Weaver. Motion and time place the participant into an event where comprehension is also based on multiple channels of information within a dynamic gestalt. This "emerging experiential whole" is reminiscent of Dewey's interpretation of "doing and undergoing" (Dewey 54) or as Robert Innis has written:

> Integral experience, in Dewey's sense of the term, obtains form through dynamic organization in as much as the perceiver is caught up in and solicited by the emerging experiential whole. Even while experiencing the perceptual whole as an outcome over which it has no explicit control, the perceiver is creating its own experience through continuous participation … The philosophical pivot of Dewey's pragmatist aesthetic is likewise, as in his epistemology as a whole, the picture of the organism as a force rather than a transparency (Innis 62).

Motion and index

Motion elements can develop particular qualities or characteristics expressed through gesture and time. In semiotics, indexical references are those references that have a strong causal connection to something else that is absent; a footprint references the person who made the footprint, even if they are not directly in view. In common texts used in graphic design education, indexical references are often introduced as visual substitutions for other static visual representation, however the concept of index is also a time-based idea. Indexical references exist in other "performative" practices including theater and music; for instance, in *Different Trains*, musical compositions are based on voice samplings from interviews to form the basis for melodies (Reich). Each melody's tone, rhythm and pitch are indexical to the intonation of a particular phrase and voice.

"Term" or "concept" plus expressivity

Screen-based motion typography has an additional "channel" added though movement. For instance, recent motion design applied to visual branding of Google (Cook, Jarvis, & Lee) "eases in/eases out" through graphic transitions of a previously static logotype, while other elements are integrated into the interface providing feedback to a user. Specific concepts such as "listening," "thinking," "replying," "incomprehension," and "confirmation" are expressed through simplified dots that have particular motion characteristics of human gestures (Figure 2), or referential objects- each dot-plus-motion functions as a *unit of information*, or a particular concept, word or term, while the qualities of the motion carry *expressivity* (for example if the motion unit standing for

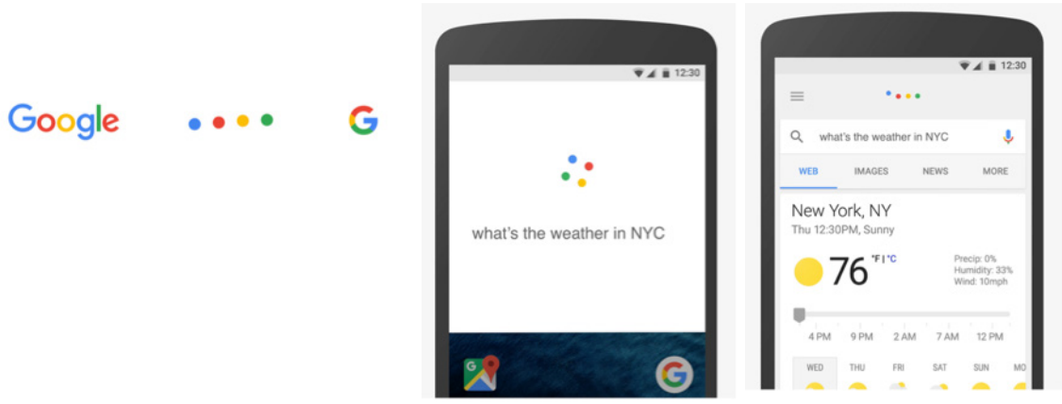

Figure 2: Images of logotype and motion dots to aid in the user interface. Source: Google Design n.d. https://design.google/library/evolving-google-identity/

incomprehension speeds up, it can express the idea of “strongly felt” incomprehension, as well as other kinds of expressivity in the path and through rhyme and pacing). The dots in this case are indexical to the things that they reference and can be likened to a form of animation-based concepts of character design (i.e., the “thing” that the motion references), thus creating an additional level of representation.

In these examples from 2008, students were asked to think of motion from source video they set up and recorded and then applied to typography to express a particular concept. Students had to consider both the *unit of meaning* as well as *expressivity* (Figures 3, 4 and 5). Expressivity is about the specificity of the motion reference; for example, the concept of train is the unit, or concept represented, a fast train is the expressivity.

The specificity of the reference is different than the more generalized ideas that are cited in some recent motion design research that ultimately trace connections back to gestalt-based design principles, such complicated/simple, soft/hard, deep/shallow, etc. (Lim, Lee & Lee; Reinhard). By creating variations on the motion reference, comparative qualities emerge based on the communication of an idea or concept and its expressivity. Evaluation is very much like watching, describing, and comparing a series of short performances or film/video sequences. More recently, this framework has been applied in motion branding and interface design in the Department of Graphic Design in a junior level three credit course on interaction and motion design (Figures 6, 7, 8).

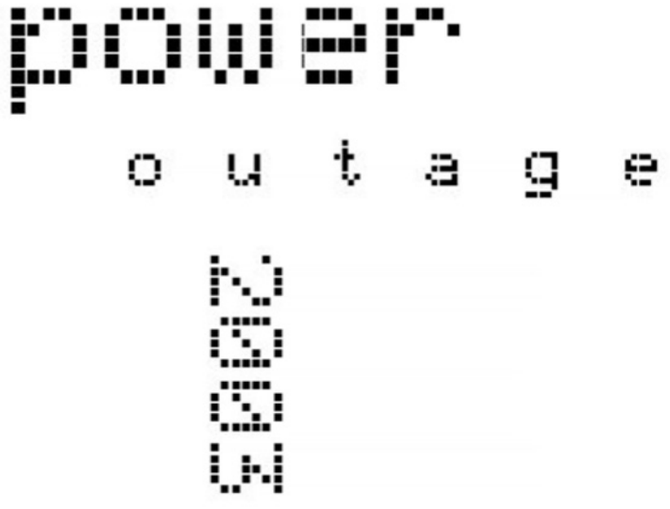

Figure 3: Reference image. Building blocks of indexical motion in short but precise studies based on exploration and eventual art directed refinement. Caroline Harris (student work) 2008.

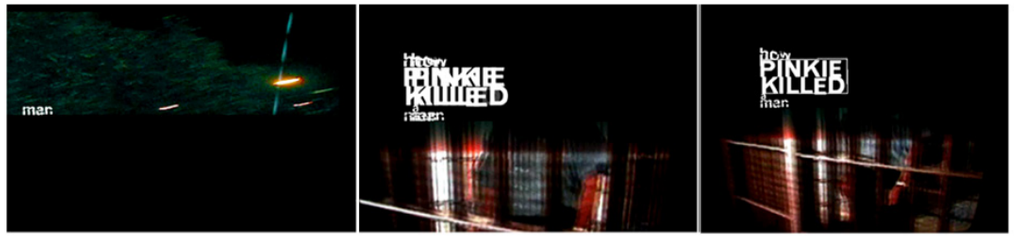

Figure 4 (top): Reference images: applying indexical gestures to film title work. Caroline Harris (student work) 2008.

Figure 5 (bottom): Reference images: applying indexical gestures to film title work. Forest Causby (student work) 2008.

Expanding on these ideas, a tentative language can be adapted from directorial practice, for example *Six Viewpoints* (Overlie, Bogart and Landau) is based on a typology of approaches that describe an actor's simple gestures and movements, and their evolving interpretation of a story.

> Gesture as sign. An identifiable visual sign (like a handshake) plus gesture, or the gesture alone applied to a completely different visual or abstract reference, as a unit, path and tempo as expressivity (for example, a quick handshake could carry connotations of a perfunctory relationship).
>
> Duration: long or short, for example, influence the attention span and overall perception of the participant: changing the duration changes the overall gestalt of a dynamic visualization—certain details emerge in a longer duration, overall pattern between different states becomes more apparent in the shorter duration.
>
> Building out into sequence, narrative, and motion that is applied to user interfaces, kinesthetic response is operates as part of a feedback loop in user interaction as the physical response to external stimuli. Immersive environments are the most notable examples in interaction (for example, a dynamic presentation of visual information in VR and AR). Sound design that reinforces feedback is also an additional channel for prompting kinesthetic response as well as other haptic issues that might be device dependent. For example, SAS Institute's interactive e-book for visually impaired grade school students Reach for the Stars uses pitch and tone to convey different wavelengths of radiation. (Lopez, Sabi & Summers)
>
> Environments that support narrative construction as a form of active interpretation include analogies / similes and by extension schemas for participants in digital and physical environments that guide larger connections or suggest ways of doing things.

These components are not isolated but are presented within a larger experience for viewers or participants. Narrative in this case is not necessarily a fully developed storyline, but a combination of Innis' perceptual whole and the focus of the participant to reach a goal or perceive a meaning within the larger designed experience. In user interaction, the narrative is actively constructed by the user in their ongoing comprehension of completing a task through the feedback that is provided through the interface. For example, the Google motion "units" communicating listening would be in response to active input by a user within a greater task, which might then move onto a next step of processing the input,

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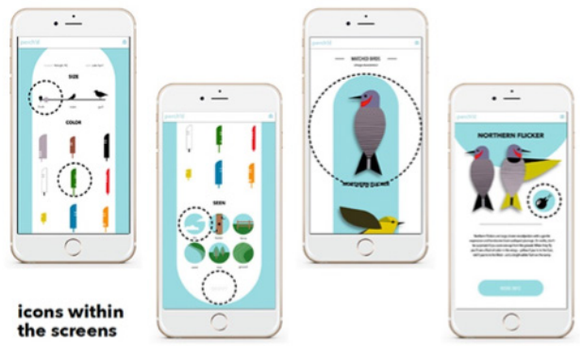

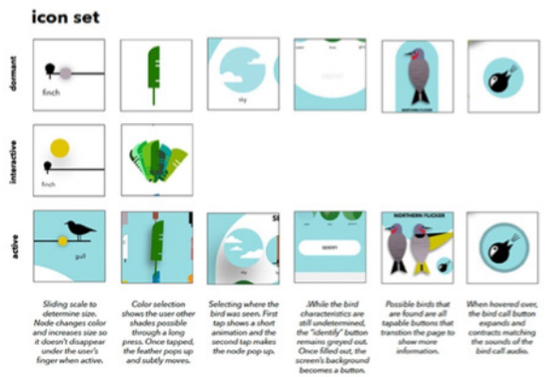

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Figure 6: Branding sequence- reference image: motion branding (student work) Anna Schecterson 2018.

Figure 7: Branding sequence- reference image: motion branding (student work) Jack Ratteree 2018.

Figure 8: Branding application to motion UI in application design: Jack Ratteree (student work) 2018.

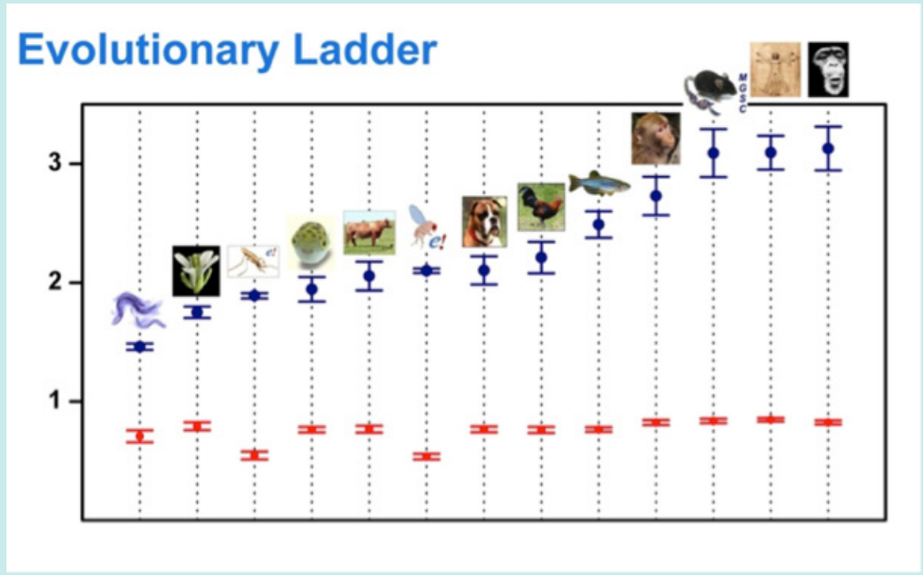
or communicating “thinking,” and then followed by a confirmation. Time based media can be seen therefore as within a greater definition of experience design and narrative construction by the participant, that traces connections back to Dewey’s original ideas of doing and undergoing.

Analogy/simile

Analogy (and simile) as a form of rhetoric is often used in science writing. Analogies are a facile way to take what is known and map attributes to an unknown concept or thing, where similarities and differences can be discussed in the details. Analogies can be figural references: the so-called ladder of evolution for example is a kind of analogy that both enables and constrains how we think about evolution as progression from lower to higher, and hence more perfected forms of life (Figure 9) as well as more recent attempts to change this interpretation to an alternative view of evolution as diversity in particular environmental contexts, represented by a bush-like structure.

Analogies encourage active participants to imagine a physical thing that provides a structure with characteristics to “contain” more complex concepts and relationships. In this way tangible examples act as embodied concepts. Embodiment can be roughly categorized here as more figurative (such as the ladder of evolution), or more quantitative. The original Department of Graphic Design motion courses in 2008 experimented with “embodied” analogies to story-tell/visualize abstract scientific concepts (Figure 12 and 13) such as the concept of geological time as so-called deep time, to parallel the Eames’s 1978 film *Powers of Ten* (Figure 10) (Eames, Eames, Boeke). *Powers of Ten* pulls back from one scene to another. Every ten seconds shows a level of scale that is ten times the size of the original scene. Based on the 1957 book *Cosmic View*, by Kees Boeke, (Figure 11) the motion version relies as much on filmic rhythm and pacing as static art direction of photographic and inset images.

Quantification and more “computational” (computational here suggests that the interpretation is actively constructed by the viewer/reader, rather than being self-evident) ideas of interpretation enlist more perceptual means for a user to comprehend information (Peterson et al. 5–6). In figure 14, the viewer assesses relative differences based on the size of a common pictograph symbolizing schools, and the measure of impact that learning technology has had on a particular discipline. Computational ideas can be perceived differently, supported through different kinds of designed artifacts.



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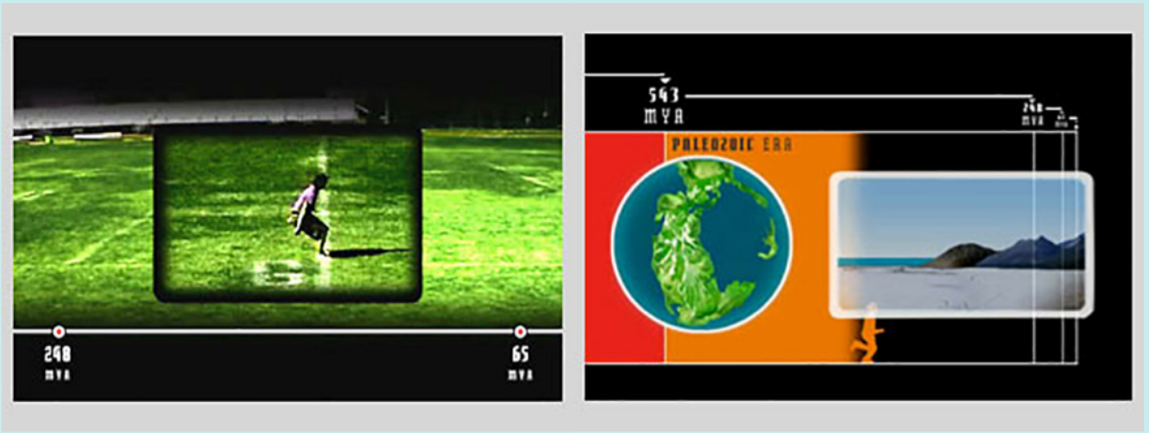

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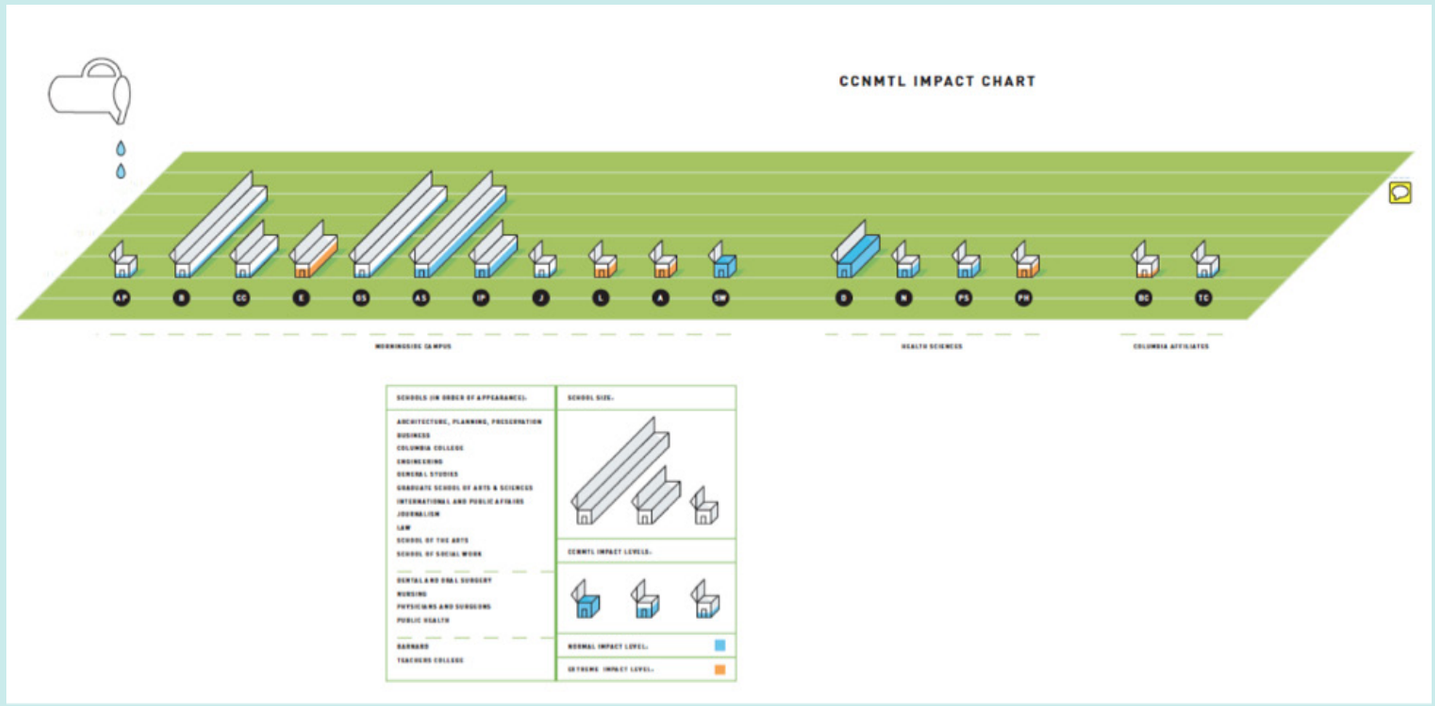

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Figure 9: A contemporary use of the ladder of evolution.
Source: http://yaroslav-ryabov.info/GenomeEvolution.html 2021.

Figure 10: Images from Powers of Ten. Source: https://www.youtube.com/watch?v=0fKBhvDjuy0 2021.

Figure 11: Cosmic View, 1957 and 1973. Source: https://www.youtube.com/watch?v=tq4ZNOtxU1c 2021.

Figure 12: Student work: time-based analogies at human scale. Football field as physical comparison.
Source: Wes Richardson 2009.

Figure 13: Student work: time-based analogies at human scale.
Quantification as size; quantification as rate; the clock. Source: Caroline Okun 2009.

Figure 14: Cited by Peterson, n.d.

Figure 15: *One Million*, Henrik Hertzberg. Source: author's collection 2021.

Interaction and embodiment

Interaction can be both physical and digital and can be characterized as experiential and performative. The book "One Million" (Hertzberg) creates a physical and perceptual experience of the abstracted idea of one million through a simple quantification of dots on a page (Figure 15). The reader is engaged in performative reading as they turn the pages, noting comparisons of real-world references (such as how many inches in a mile, the total length of a person's blood vessels, etc.). The book's weight, dimension and presence in the reader's space further emphasizes qualities of embodiment.

Quantification invites the participant to imagine an action, or a particular processual way of thinking that has or could take place. The *Voyage Scale Model Solar System* in Washington D.C. is based on human scale and a suggested itinerary that stretches from the Air and Space Museum through the length of the Mall at a scale of 1:10 billion (Figure 16). This instance acts as a combination of a more figurative idea with an actual embodied experience and is reliant on performative reading in the context of environmental design.

In the case of walking between two different displays, time, reflection, and physical exertion emphasize the concreteness of the analogy as something performed rather than imagined by the participant. This includes bodily orientation, activity, time of day, the awareness of kinds of behavior that occur in the space, the goals of the participant, and so on. Similarly, AR and VR share many of these traits of participant embodiment in a space. Physical interactions in a space invites the participant to engage in an action directly, or observe other participants doing the activity (Figure 17).

Analogy/simile leading to "schema"

It's difficult to articulate the differences between analogy and schema at face value. A schema could be seen as more open ended in how the concept functions as a "way of doing things." Schemas are concrete in their utility, and the experiences we have with them. For example, a "stair climbing" schema can be applied to new yet similar contexts as an idea of how to get something done.

Figure 16: *Voyage Scale Model Solar System.* Plan and walk as an experience. Source: https://www.jeffreybennett.com/model-solar-systems/voyage-scale-model-solar-system/ 2021.

Johnson describes schemas as "…constantly operating in our perception, bodily movement through space and physical manipulation of objects …*[as] structures that organize our mental representations at a level more general and abstract than that which we form particular mental images*" (my italics) (Johnson 23–24). Lakoff and Johnson describe schemas as having a few basic elements or components that are related by definite structures and yet have certain flexibility (Figure 19). As a result of this simple structure, they are a chief means for achieving order in our experience so that we can comprehend and reason about it. Further they can be understood as developmental over time, experiential, and influenced by the context that a subject builds a relational understanding in and with. For example, Figure 18 illustrates this as a physical interaction of sorting based on "center and periphery."

Figure 17: Examples from AR studies 2020, Katie Frohbose, Master of Graphic Design Thesis, Department of Graphic Design, North Carolina State University 2020.

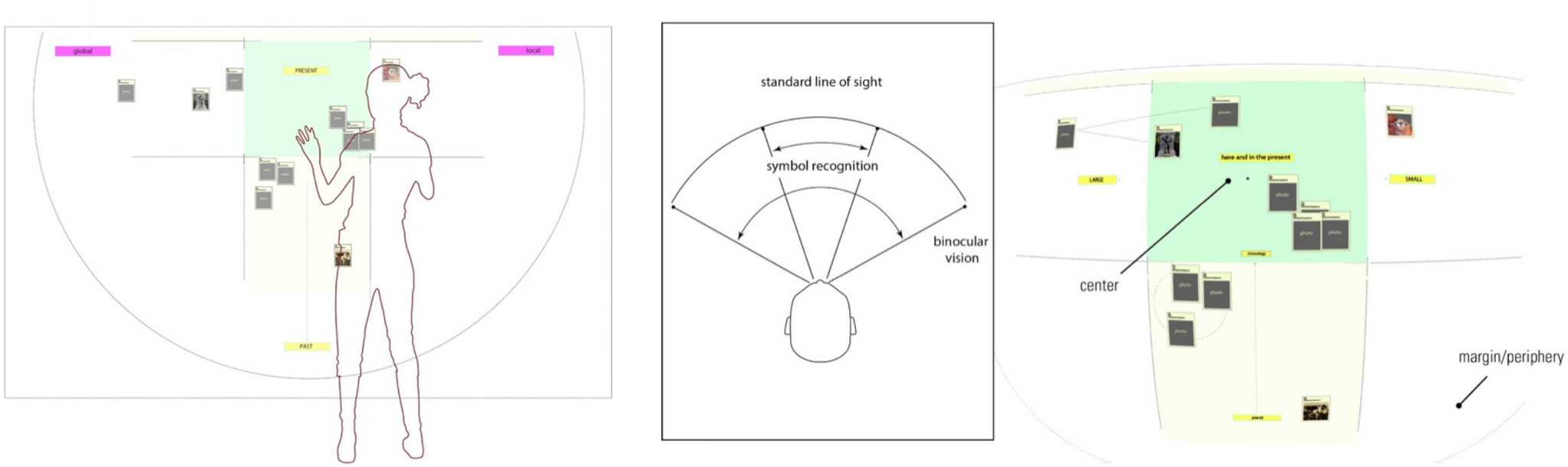


Figure 18: Experience of physical scale utilizing margin and periphery. Source: author 2021.

Schema and embodiment as components in designing for experientiality and interaction

Based on these earlier experiments, experiential and performative concepts and methods are used in final design proposals and generative research (Sanders & Stappers), working with stakeholders and interdisciplinary research colleagues in design and social innovation. An ongoing graduate course has also been created to introduce interactive tools for generative research and participatory design in various local communities (2020–2021), leading to a further synthesis between research and education. *Designing for Social and Community Experiences* is a three-credit course offered to graduate students in the Department of Graphic Design. We examine design and social innovation and apply physical and digital interactions in generative research with community members focused on problem seeking, overview recent precedents in design (Graphic Design, Urban Design, Architecture, etc.) and the social sciences, use methods such as interview and focus group, as well as issues of human geography and population demographics. Students then create design proposals and design prototypes working in small teams.

Example one: in this short project two graduate students wanted to understand some of the experiences of people who live in low-income housing communities in the Research Triangle Park (RTP). Initial community contacts were made with stakeholders in low-income housing in the Raleigh-Durham areas with an emphasis on the experiences of residents, specifically looking at categories of nutritional food sources, transportation access, and education. The initial probe provides a sketchbook with simple visual suggestions that ask participants to document their daily and weekly routine and when disruptions occur. Daily routines include working, commuting, childcare and household obligations. Two simple prompts were given for graphic representations. The first is based on proportional rendering of time through a clock face (Figure 20). Secondly, participants were asked to sketch their typical daily routine (foregrounding recent experiences from the previous week) based on mapping their route (Figure 21). In the subsequent interviews, participants were asked to describe their experiences based on these graphic visualizations. They were also asked to compare-and-contrast the two different ways of visualizing routines. In interviews, certain mapping decisions led to discussions about "pain points" encountered when a schedule broke down, and due to time constraints compromises were made regarding things like choices in nutrition and time spent with children in

Superposition	Process	Restraint removal
Enablement	Attraction	Mass-count
Path	Link	Center-periphery
Cycle	Near-far	Scale
Part-whole	Merging	Splitting
Full-empty	Matching	Container
Iteration	Contact	Blockage
Surface	Object	Balance
Counterforce	Compulsion	

Figure 19: A partial open-ended list of schemas based on references on Johnson, 1987 ("center-periphery," third column, referenced in Figure 17).

the evening based on their creation of an outlying category of fallback choices outside of the best-case route followed each day. This led (for example) to cross-referencing the map to the clock-based routine, where participant narratives shifted to how often the routine was disrupted. In a second iteration, designer researchers attempted to "amplify" (Figure 22) the ways that the participants graphically represented themselves, looking at what simple yet fundamental visual forms suggested as a kind of schema and affordance (this also exemplifies the application of a "cycle" schema from the list above). For example, the participant map suggested a particular viewpoint of a hoped-for linear experience of a daily routine that was often disrupted with variables that required contingencies to be thought through as quick solutions, even though long-term goals (such as good nutrition, adequate time for daily contact with child etc.) would be disrupted. The development of these interactions and artifacts are to help participants visualize and make explicit their points of view in dialogue with a participant researcher, or in negotiation of shared issues with colleagues, or in their general storytelling.

Example two interactive tool as a negotiated matrix: the matrix box and the "unfold" schema sorting kit guide the participant to move through decision points about characteristics of their dialogue in a group. The matrix sorting activity (fig. 23) is based on scale ("here" and "abroad") and simple valuations of positive negative or both negative and positive in an x-y matrix in interviews and small focus groups. Prior to the development of the matrix, thematic ideas emerged from initial interviews conducted in the community. They used as references in the matrix. In this example, reflexive ethnographic methods such as participant observation/in-depth interviews, etc. are broadened to include more public discussions of experiences and values, where motivated community stakeholders solicited designers in solving immediate problems. Discussions included local institutional stakeholders in education; local histories and preserving identities and practices, (35th Ephorate of Prehistoric and Classical Antiquities and the Focas–Kosmetatos Foundation), higher education institutions, and other ongoing community initiatives. From subsequent interviews, a common concern centered on preserving place-based local identity while creating a sense of cosmopolitan engagement in the EU and elsewhere. Specific needs of strengthening community engagement in museum and educational engagement were discussed. Currently many local institutions use entrepreneurial strategies working with national and international networks that are combined with local and community resources.

Example three: engaging with various communities in Greece over the last four years has led to a deeper understanding of the local/Greek culture as collectivist and dialogical, with everyday discussions typically developing intimately round a table over food or a cup of coffee. This generative tool/technique is based on a schema of "unfolding," and "nesting" as a physical interaction (Figure 24 and 25). It allows for the kind of differentiation that a default method of tree-diagramming through post-it notes creates but avoids the isolation that the more linear diagram imposes through the physical separation of word/concepts, while creating a smaller space of interaction between a group of people. Tree diagrams (Figure 26), especially in the form of Post-It Notes have a particular presentation that separates, distances, and isolates, that creates large map-like presentations. A schema of folding at a much smaller physical scale invites showing and sharing in the kinds of spaces that dialogue takes place in the context of our current work (usually a table-top) via earlier observations of "how people talk," rather than large public Post-it Note walls of divergent analysis.

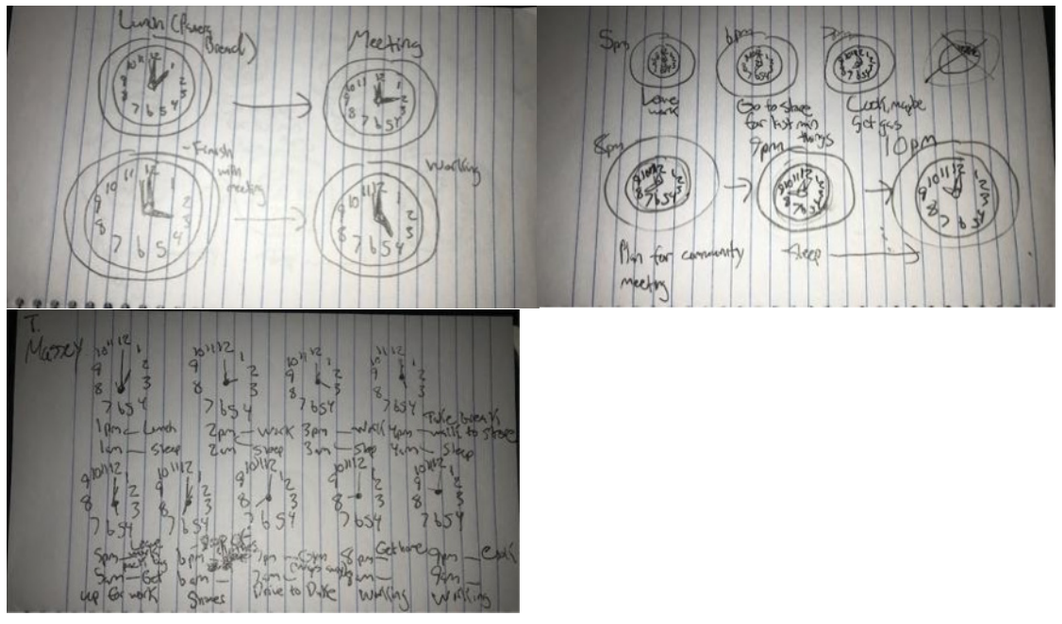
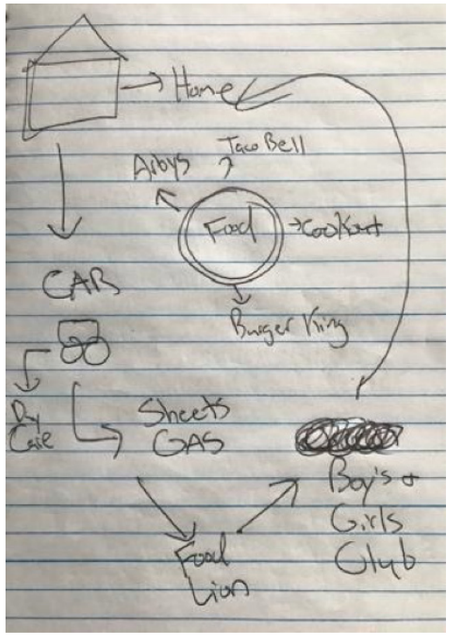
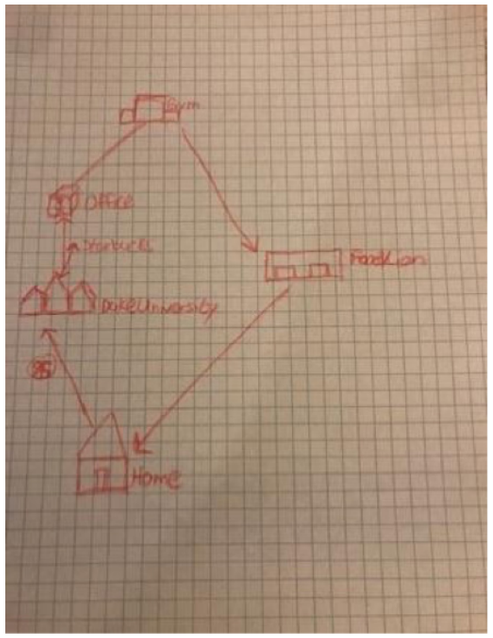


Figure 20: Initial participant sketches: schedules. Source: Nigel Jones and Madeline Kelly original research 2020.





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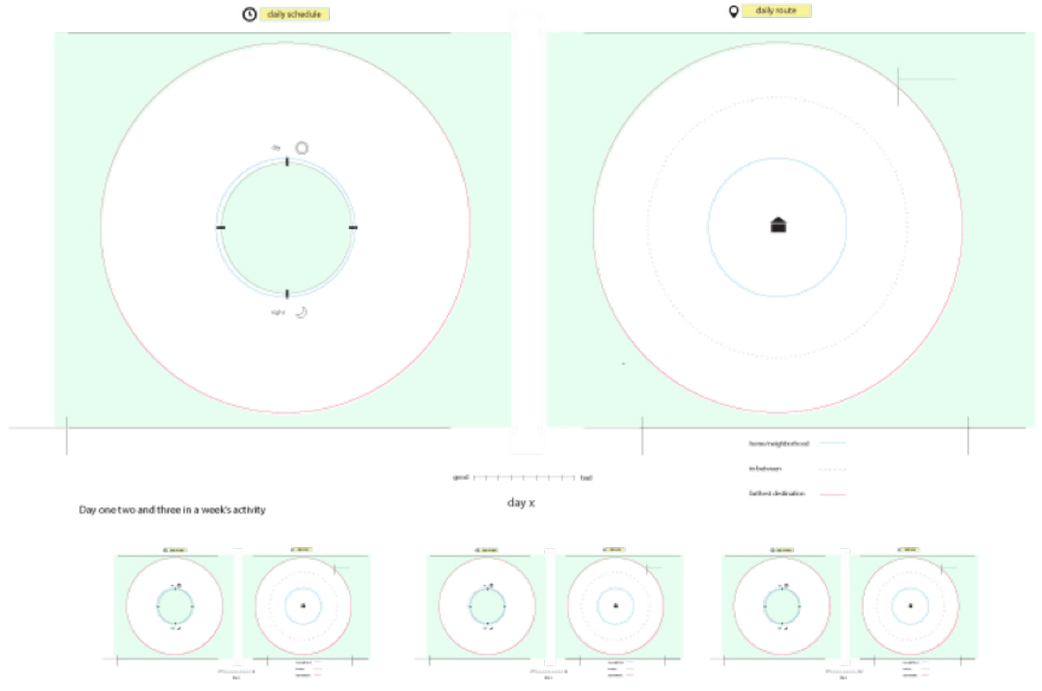

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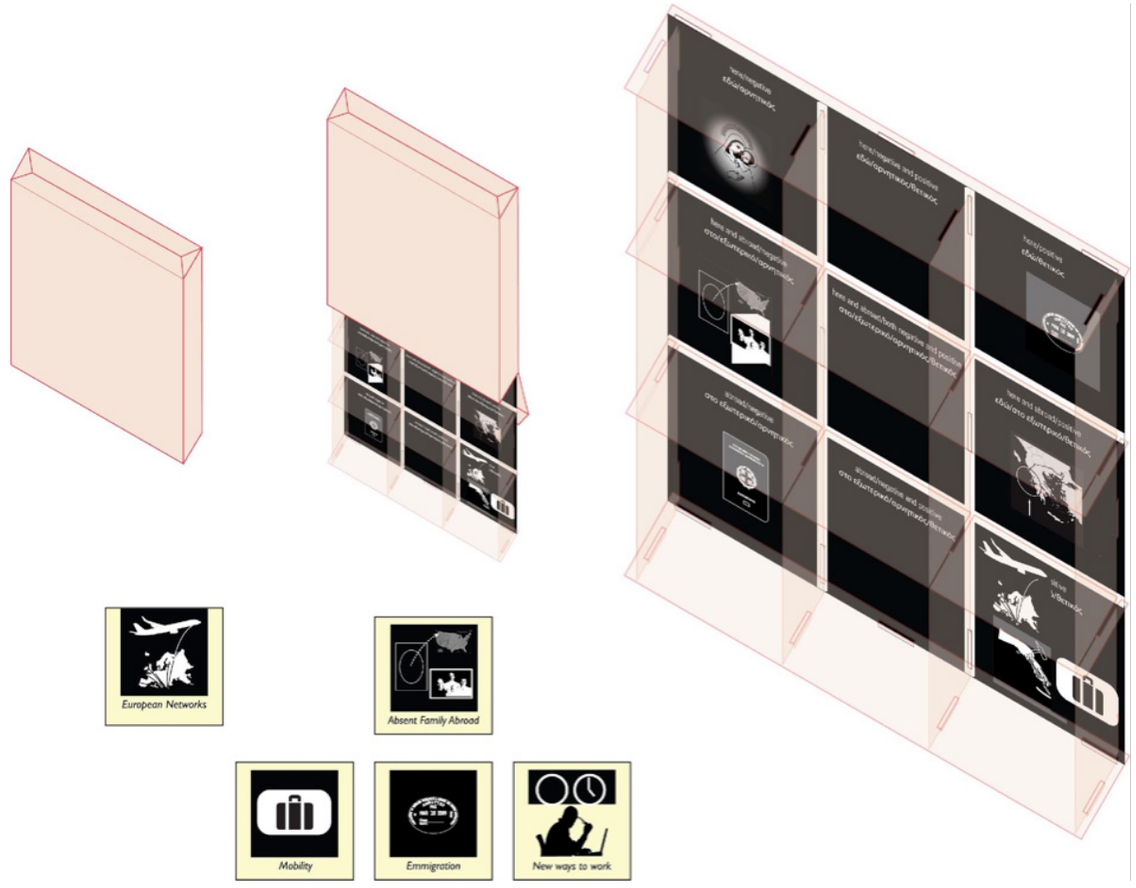
Figure 21: Initial participant sketches: maps. Source: Nigel Jones and Madeline Kelly original research 2020.

Figure 22: "Amplifying" participant concepts through design- (which is also based on a "schema" of cycle). Original ideas explored by Jones and Kelly refined by author, 2020.

Figure 23: Artifact. Source: author 2021.



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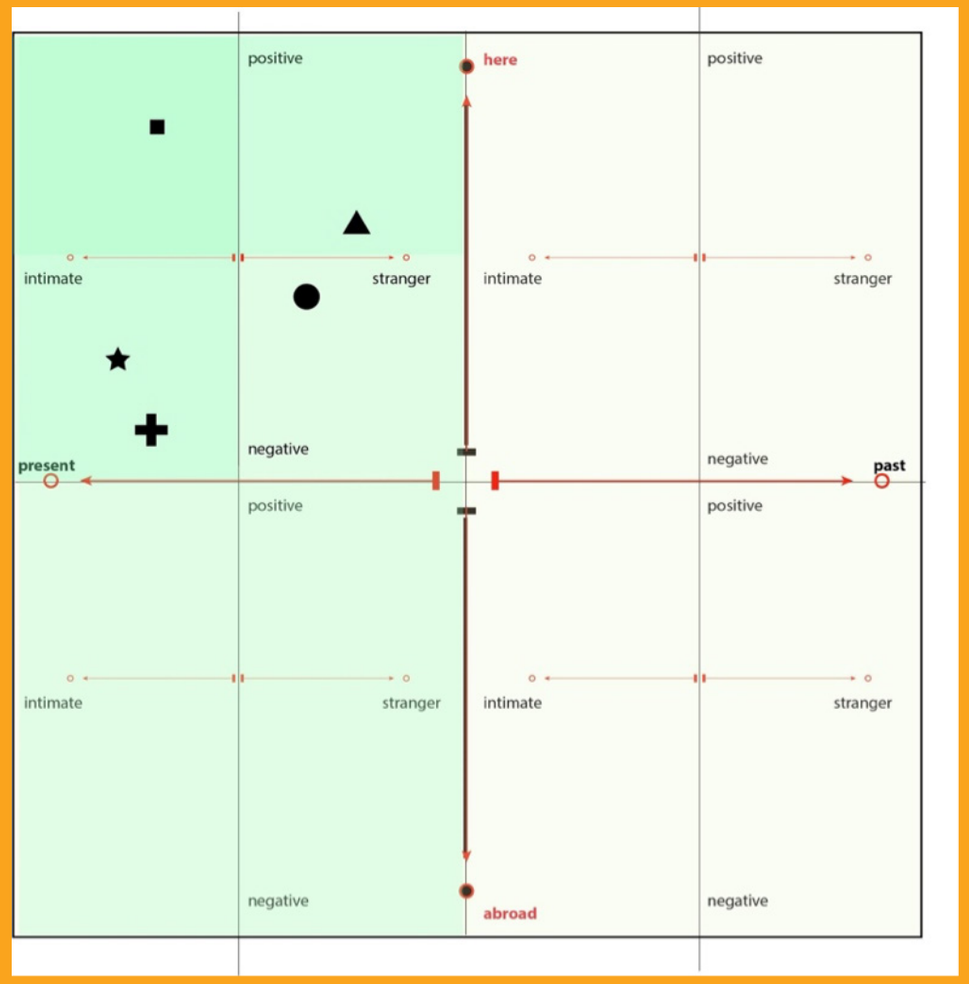

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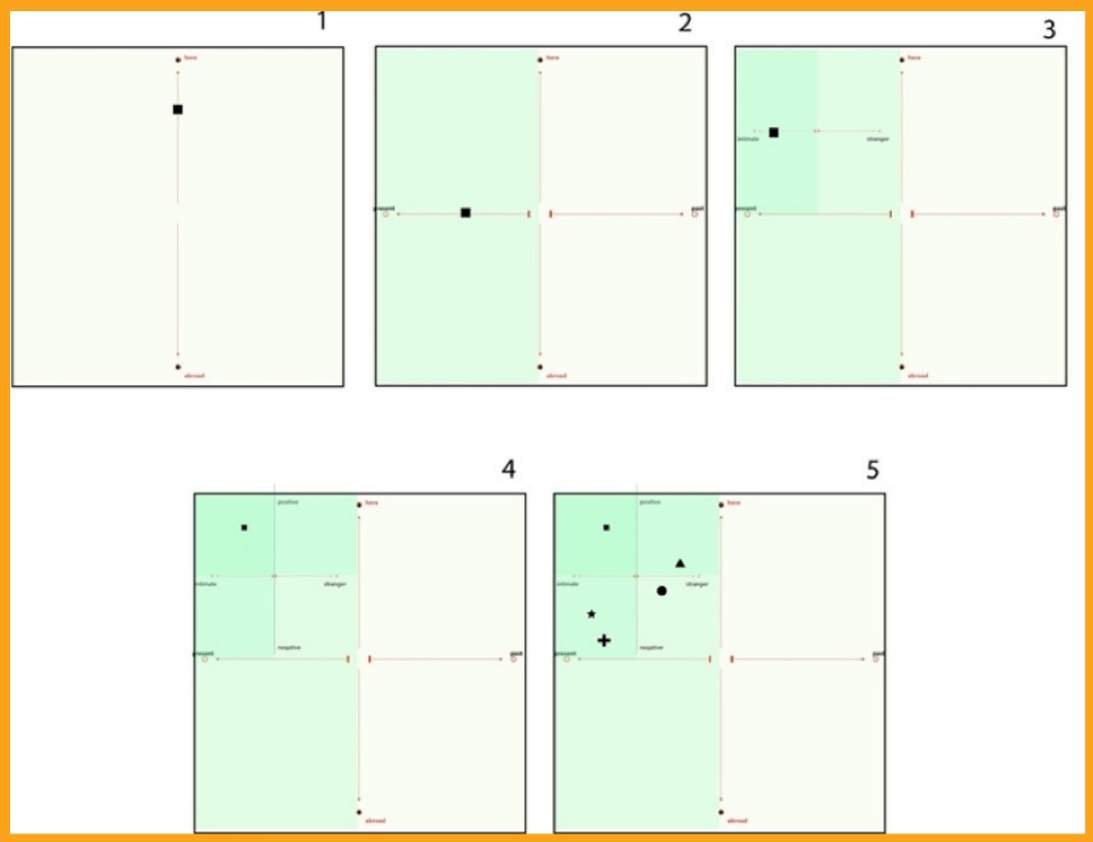

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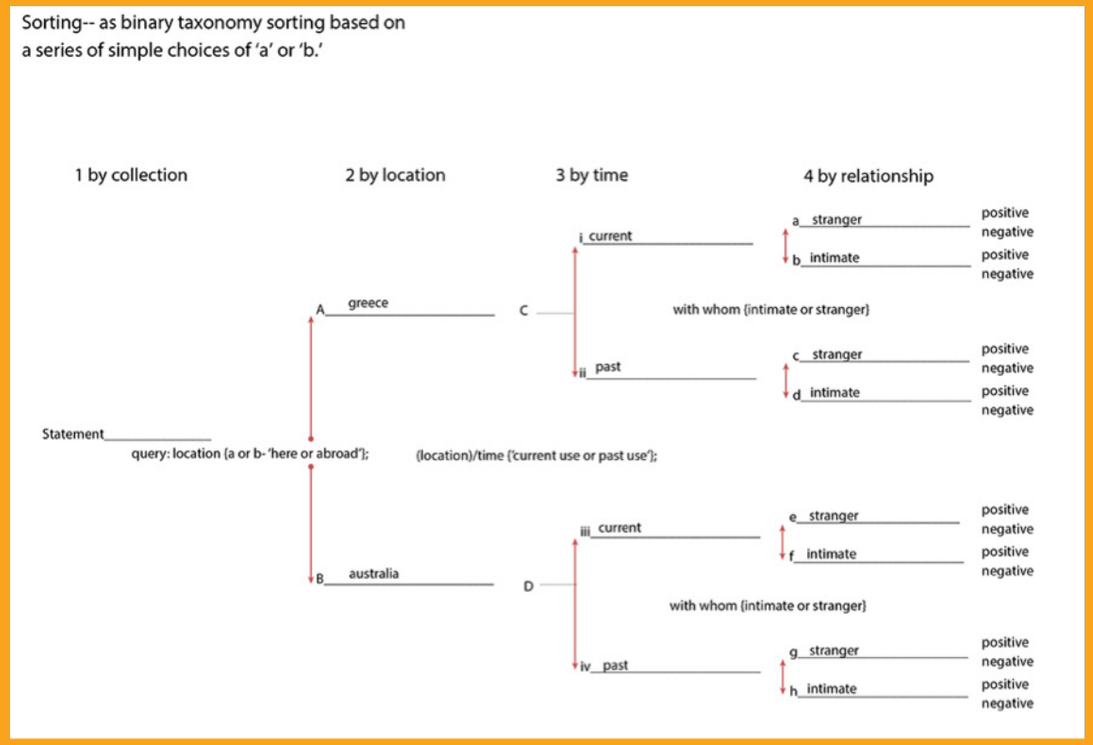

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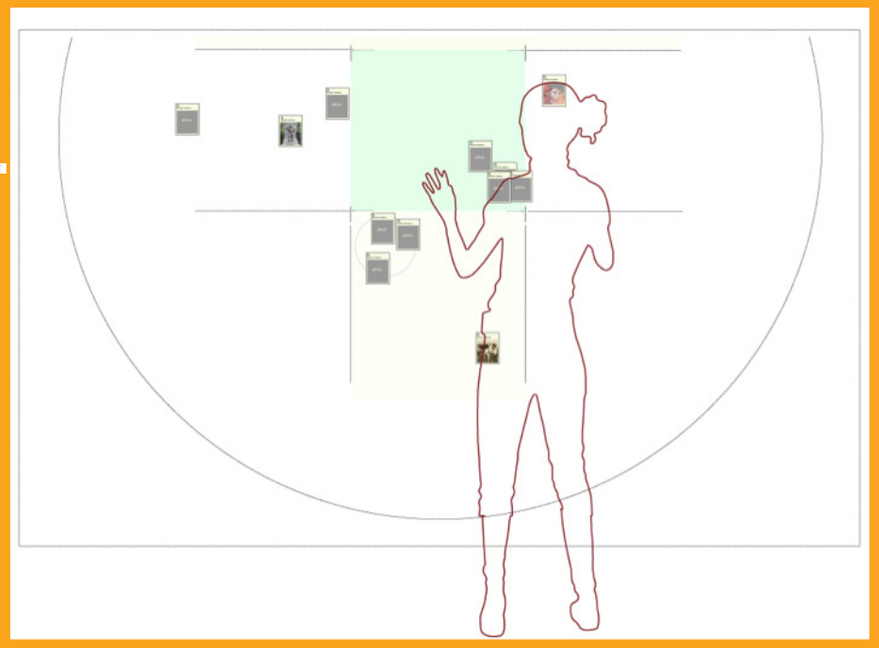
Figure 24: Unfolding structure. Source: author 2021.

Figure 25: Example of unfolding sequence of interaction. Source: author 2021.

Figure 26: The same experience expressed as a standard tree-diagram. Source: author 2021.



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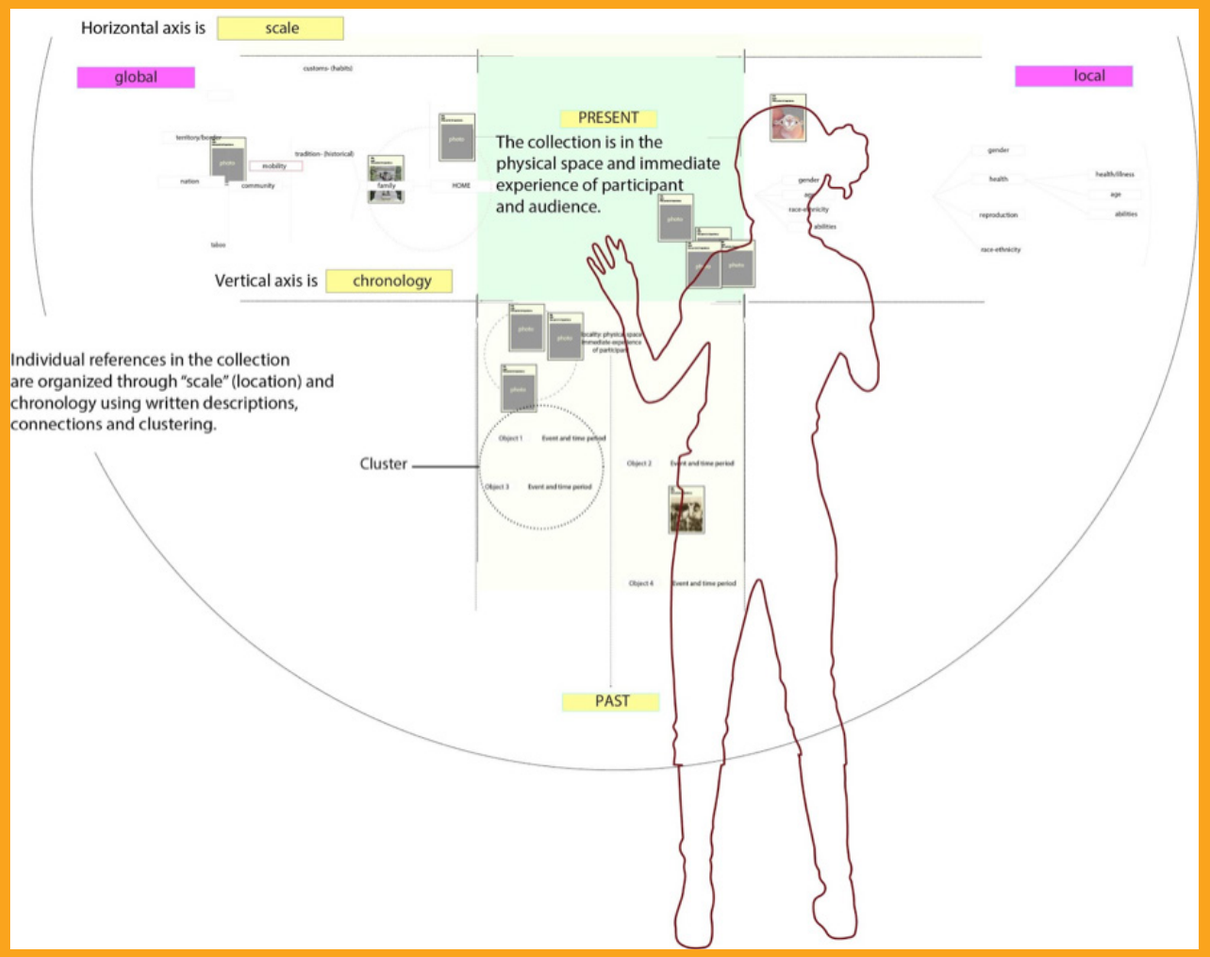
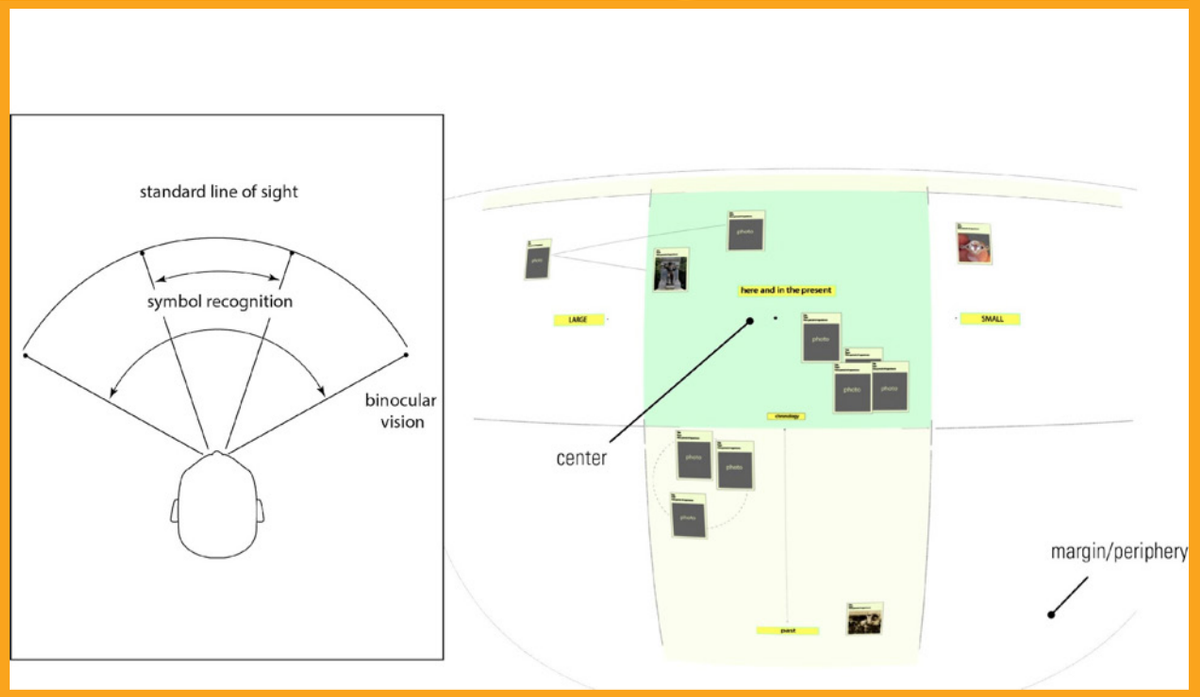


[28]



[29]

Figure 27: Basic structure. Source: author 2021.

Figure 28: Rules of organization. Source: author 2021.

Figure 29: Experience of physical scale utilizing center and periphery, based on observed collection practices (image on left based on human factors). Source: author 2021.

Example four is a designed interaction applied to an educational activity (Figure 27). This educational proposal integrates two separate practices of education plus museum and other community efforts to preserve local histories and practices. This augments museum education and the ongoing building of archives through educational institutions that have human and capital resources, while increasing intergenerational participation. Students at the 2nd Secondary School of Argostoli interview members of their family and community who have a range of historical and practice-based experiences. Personal and community assets and objects are utilized to aid in eliciting interview narratives (Figure 28). The references are photographically documented and included with the interviews. Documentation of references is used as the basis for reflexive interpretation initially between student interviewer and participant, building into a community event in the school that brings together parents, students and other community stakeholders. Narration and interpretation takes place through shared dialogue with the original participant sorting their narratives into two axes of scale and time (Figure 29).

These activities can be further documented using audio and video along with interviews and objects and archived for extended communities via the internet. The data from student initial research is archived in a digital template/online archive that the school maintains for the community in order to continue with future community research. The digital template, audio-visual data from students' interviews, and printed examples of the collected artifacts are exhibited in an event co-organized with and intended for the school and local community. Engagement in the community context helps in negotiating a common place-based history along with understanding both larger social and political etc. connections in local place-making. Secondly archiving the collections digitally and making them available through simple open-source methods can encourage further design interventions through networked stakeholders that have overlapping membership in "collectives or communities" that are outside of the physical locality.

Conclusion

This paper has introduced a number of ideas and frameworks for a segment of design that is typically understood as time-based, expressive and/or functional. This began with a discussion of motion design and the role of a participant's experience and active participation in interpretation, based on Dewey's concept of doing and undergoing. The various levels of representation in motion work can create active interpretation by a viewer and may more closely parallel activities of experiencing and reflection. Secondly, motion as indexical gesture can carry specific concepts, terms or ideas, as well as particular kinds of expressivity, which influence the overall message in addition to word and image in static design. Applied to a larger narrative structure analogy/simile can play a role in more complexly designed experiences in formats and environments, here discussed as figural and quantitative. Finally, schema and embodiment as doing and undergoing were discussed based on creating tools and techniques for generative research, and in a designed physical interaction.

In a greater sense, motion design, experience design, and interaction design can be characterized in many examples as experiential and performative, in that comprehension by the participant is an active process of interpretation. The stress of time, motion, and performativity in both new, and in also in re-examining assumptions about older media refocus us on what constitutes having an experience; it makes us rethink our framework of thinking and doing as designers.

Technology has been a main driver of the adoption of new media in Graphic Design. While technology may create the conditions for experimentation providing new affordances for users, the need for new concepts and frameworks for questioning how we know what we know can also be creatively productive for re-inventing design as an inquiry into cognitive, social, and cultural issues. Graphic design and education may yet still place these ideas and frameworks outside of a traditional graphic design curriculum as supplemental or experimental. Yet, the everyday language of Graphic Design and graphic designer's embracing terms like "users" and "participants," in place of "viewers" and "readers" signals a change in thinking. This small change indicates a recognition of Graphic Design embracing new ideas as well as where markets and opportunities lie in what was previously defined as visual communication, and requires multiple disciplines across a spectrum, such as cognitive studies, philosophy, practice-based performance, and narrative theory.

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