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Reifying Through Design(ing)

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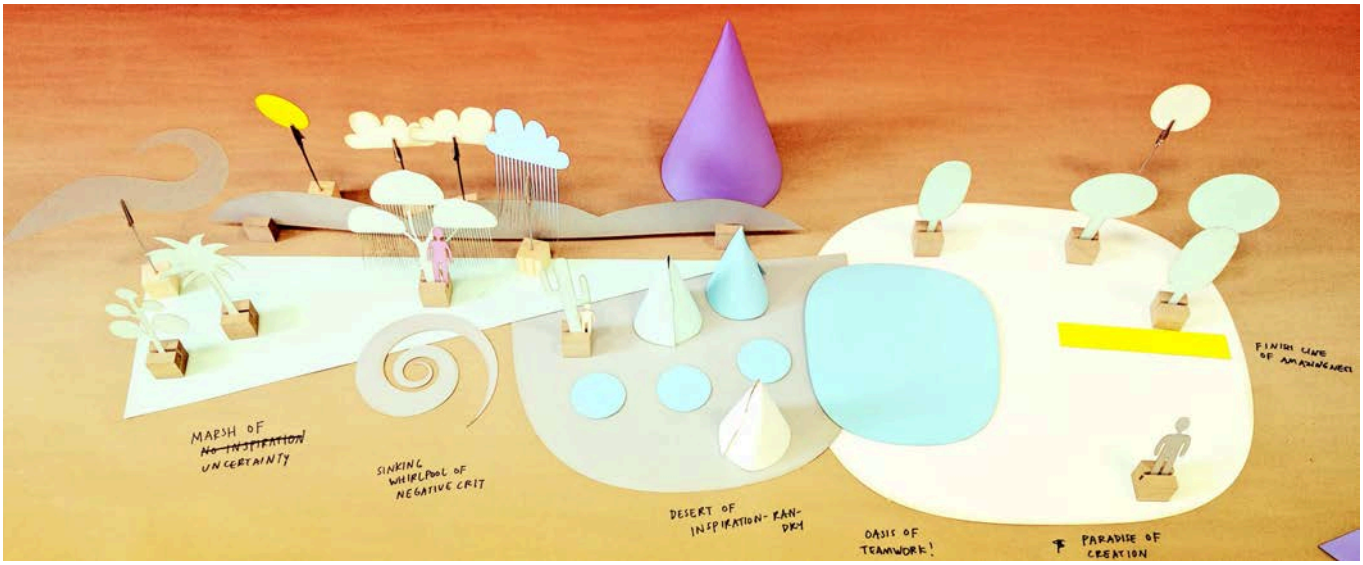

Figure 1: A 'project landscape' built and annotated by a group of undergraduate design students to represent a collective mental model of a group project they had worked on, with its ups, downs, and emotions.

ABSTRACT

What could someone else's sense of dread look like, if you could hold it in your hands? Could you build a model landscape representing your own career path? This paper illustrates projects using participant-created artefacts to materialise abstract concepts and externalise thoughts, concretising or reifying intangible phenomena, and argues that this kind of work, using design methods as a form of enquiry, could contribute to Research through Design.

USING DESIGN TO MATERIALISE ABSTRACT CONCEPTS AND EXTERNALISE THOUGHTS

Designing and creating artefacts as a way of generating knowledge is central to Research through Design (RtD); very often these artefacts are essentially materialising ideas: putting 'things' into the world that only previously existed in the mind's eye of the designers, to explore and understand their role and presence, effects and effectiveness, in the 'real' world.

But what about using similar approaches—and similar methods, drawn from design practice—to materialise not just envisioned things, but abstract or otherwise invisible ideas, concepts, and relationships? How can we use methods inspired by (often participatory) design and facilitation processes from user experience, service design, social design, and systemic design [1, 4, 13, 14]—or the attention to novel translations of abstract concepts emerging in data physicalisation [15], synaesthesia research [6], children's sandplay, constructive projective techniques in psychiatry and even art therapy—as a form of conceptual RtD, a way to communicate otherwise intangible or inaccessible ideas and private worlds? There is no 'right' way to externalise thoughts: as Jonassen and Cho [5, p.152] put it, we need "visual prostheses" to share our mental imagery with each other.

The potential for Research through Design to help people capture, express, and communicate the qualitative dimensions of their experiences, to make them reified, palpable, to enable discussion or peer support, or even to facilitate group or team sensemaking, seems worth exploring, and has plenty of precedents but does not yet seem to have been delineated as a specific field of research. The *Convivial Toolbox* of Liz Sanders and Pieter Jan Stappers [14] gets close, but does not specifically emphasise the dimension of materialising the invisible, conceptual, elements of participants' thinking.

Through a series of projects with colleagues over the last few years, I have become increasingly fascinated by how we, as designers, can apply methods from design practice as a form of enquiry into the imaginaries, mental imagery, intangible and invisible aspects of people's understanding and personal, subjective experience of concepts and ideas which are otherwise hidden or only describable through spoken or written language. What started in 2011 as an attempt to get people to draw their mental models of heating systems [7] using Post-It notes led through various drawing-based modes including asking people to create instructions for others [11] and to draw or paint their mental imagery around energy [3] or construct visual storyboards about imagined hierarchies and structures in local government. But it is a move into actual physical model-making, using card and then other materials to enable people to create their own artefacts, which seems to offer a particularly exciting and rich set of possibilities.

My intention is to present to the workshop two projects which embody the idea of the research participant-constructed physical artefact as a way for people to embody—to reify—abstract concepts, feelings, and emotions.[1] I would welcome the opportunity to explore and discuss how this kind of work fits with (or doesn't) other kinds of RtD, and the importance of aspects such as aesthetics, ease of construction, and the life of the artefact once it has been constructed, and dynamic (rather than static) versions of these kinds of artefacts.

MENTAL LANDSCAPES

Mental Landscapes, [12] developed by Delanie Ricketts, comprises a kit of laser-cut card parts embodying a particular set of metaphors based around stylised landscapes and features within landscapes, such as hills, roads, fields, and weather. We have explored the kit's use through workshops where participants assemble and arrange a variety of elements to make abstracted model landscapes which on some level represent or translate their mental models of concepts. Landscapes are a common type of metaphor in speech, particularly for talking about relations between parts of a whole, or mapping the structure of one concept onto another. Our 60 participants have built models representing their own career paths, life journeys, and group projects (Figures 1–4). Some activities were individual, while others were group-based to try to examine the collective imaginaries

[1] As I write this, I realise that it probably describes much modern sculpture.

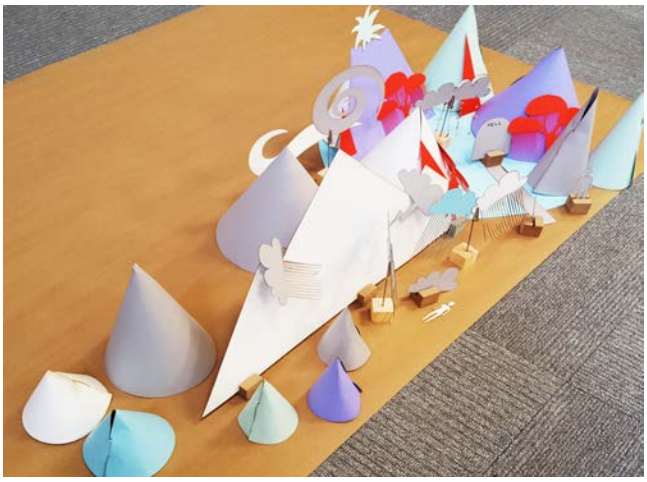

Figure 3: An undergraduate group project landscape including a stormy 'hell' phase

Figure 2: Master's students build a collective 'life landscape' representing their different career paths, their convergence, and their potential future divergence.

Figure 4: A group life landscape where students, together on a raft, approach a job market beset with whirlpools, rocky rapids, deserts and lush jungles, as well as some substantial hills to climb.

of a particular theme or idea. Aside from gaining insights around the topics being explored, the primary aim of the workshops at this stage has been to help scope possibilities for the kit's development and to explore how this kind of metaphor-based constructive projective method could be used in user research for design and HCI. (The project also fits with other work we are doing on exploring and generating novel metaphors as a creative method for visualising abstract concepts [REF]).

The kit[2], comprises elements representing:

- Hills, mountains, and raised ground, of many sizes and colours—both 3D cones and flat elevations held vertically using slotted blocks
- Lakes, ponds, and rivers, of many sizes and colours, plus 'whirlpools' or eddies
- Fields/areas of land, or 'roads', of many sizes and colours, including a 'ground' sheet, lengths of brown construction paper
- Trees and cacti of different shapes and sizes
- Silhouettes of people of different sizes
- Weather elements: sun/moon, clouds (cirrus-esque and cumulus-esque), clouds with rain, clouds with snow, clouds with lightning bolts, held vertically using crocodile clips on rods. Whirlpools could also be used as 'cyclones'
- Sticky notes for use as labels or annotations
- Generic shapes, modifiable in different ways

Our design process aimed to maximize the ability of participants to express their thinking, while not overwhelming them with sheer quantity of pre-made elements. We wanted to preserve the affordance of being able to think through how seemingly disparate experiences might relate to one another over one's life, without prescribing a particular narrative format. Laser-cut thin card enabled annotation and also rapid alteration.

EMOTIONAL MODELLING

Part of a larger project [10] developing a wide range of methods for 'materialising mental health', including an 'empathy rock garden', personalised potions, and a new lexicon of compound words to describe hard-to-describe emotions, *Emotional Modelling* (Figures 5 and 6), developed by designers Laura Rodriguez, Katie Herzog, Josh LeFevre, Nowell Kahle, and Arden Wolf, is a kit of parts which people can, individually (in private or with a researcher), assemble in different ways to represent particular self-described emotions. Initially, we gave people a wide variety of craft supplies including clay, pipe

Figure 5: The Emotional Modelling kit of parts

cleaners of various sizes and colours, fluffy balls, wooden skewers, fabric and balloons, but through discussion with participants we found that while the materials afforded a great deal of freedom, many felt overwhelmed by the variety of materials provided. We thus evolved the kit into a restricted palette of elements: a set of geometric volumes in six different colour and material combinations, including wood, felt, raw 3D-printed plastic, and weighted 3D-printed plastic which we finished to resemble stone. Within each shape we created a series of holes to accommodate two different types of connectors (wood and silicone rods) allowing participants to connect the objects together in a variety of ways.

After they had constructed their models, we asked participants to talk us through their thought process and how they had made the material and structural choices they had. Most of the 30 participants had little trouble explaining their representations; common threads emerged in the ways certain materials were most often used (echoing the general findings of some other projects around emotions and materials [e.g. 1]).

For example, many participants were drawn to faux stone volumes to describe "heavier" emotions and frequently used the silicone rods to convey emotional flexibility. We were pleasantly surprised by the breadth of potential meanings assigned to each piece; for instance, while we'd imagined that the felt volumes could prove useful in illustrating softness and perhaps even passivity, one participant piled a collection of the felt volumes together, creating what she described as "cosiness" and "warmth."

DEVELOPING THIS DIRECTION

There are people in disparate areas of design, art, and HCI research doing work which fits with this kind of approach. It would be interesting to consider how framing this as a

[2] The files are downloadable at http://imaginari.es/mental-landscapes/

Figure 6: Collection of photographs taken during participants' model-making, with handwritten participant descriptions

form of RtD, or how this kind of RtD could intersect with a growing interest in design methods and 'inventive' methods in sociology [2, 9], could bring design research into new areas of application in domains which have hitherto only had limited engagement with 'artefacts' as generators of knowledge.

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REFERENCES

[1] Manuela Aguirre Ulloa and Adrian Paulsen, 2017. Co-designing with relationships in mind: Introducing relational material mapping. Form Akademisk 10(1) 1–14.

[2] Kirsten Boehner, Bill Gaver, and Andy Boucher. 2012. Probes. In: Celia Lury and Nina Wakeford, eds. Inventive Methods: The Happening of the Social. Routledge, London

[3] Flora Bowden, Dan Lockton, Rama Gheerawo and Clare Brass, 2015. Drawing Energy: Exploring perceptions of the invisible. Royal College of Art, London..

[4] John Fass, 2016. Self Constructed Representations: Design Research in Participatory Situations. In Proceedings of Cumulus 2016, 21–24 November 2016, Hong Kong.

[5] David Jonassen, and Young Hoan Cho. 2008. Externalizing mental models with Mindtools. In Understanding Models for Learning and Instruction. D. Ifenthale, P. Pirnay-Dummer, and J.M. Spector, eds. Springer, Berlin, 2008, 145–157

[6] Chang Hee Lee, Dan Lockton, John Stevens, Stephen Jia Wang, SungHee Ahn. 2019. Synaesthetic-Translation Tool: Synaesthesia as an Interactive Material for Ideation. Proc. CHI EA '19.

[7] Dan Lockton. 2011. Mental models of HVAC systems: ethnography sessions at DECC. Report, Brunel University, London.

[8] Dan Lockton, Devika Singh, Saloni Sabnis, Michelle Chou, Sarah Foley, Alejandro Pantoja. 2019. New Metaphors: A Workshop Method for Generating Ideas and Reframing Problems in Design and Beyond. Under review.

[9] Deborah Lupton, 2018. Towards design sociology. Sociology Compass. 2018;12:e12546.

[10] Michal Luria, Jennifer Brown, Katie Herzog, Laura Rodriguez, Supawat Vitoorakaporn, Josh LeFevre, Suzannah Mills, Carlie Guilfoile, Nowell Kahle, Kailin Dong, Jessica Nip, Aisha Dev, Katie Glass, Zhiye Jin, Soonho Kwon, Arden Wolf and Dan Lockton. 2019. Potions, Rocks, Models, and Lexicons: Materializing Mental Health Using Design Methods. Under review.

[11] Robert Phillips, Dan Lockton, Sharon Baurley, and Sarah Silve. 2013. Making instructions for others: exploring mental models through a simple exercise. Interactions 20(5).

[12] Delanie Ricketts and Dan Lockton, 2019. Mental Landscapes: Externalizing Mental Models Through Metaphors. Interactions 26(2).

[13] Karianne Rygh, 2015 Value Pursuit. Design Academy Eindhoven.

[14] Liz Sanders and Pieter-Jan Stappers, 2013. Convivial Toolbox: Generative Research for the Front End of Design. BIS, Amsterdam.

[15] Alice Thudt, Uta Hinrichs, Samuel Huron, and Sheelagh Carpendale. 2018. Self-Reflection and Personal Physicalization Construction. Proc. CHI '18.