

# Mental Landscapes: Externalizing Mental Models Through Metaphors

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We often use elements of *landscapes* as metaphors in speech, particularly to talk about relations between parts of a whole, or mapping the structure of one concept onto another. In organizational contexts, we might talk about moving into 'new territory' or the 'stakeholder landscape', having a 'vantage point', 'mainstream' and 'backwater', 'channeling our efforts', the 'lie of the land', 'descending into chaos', 'oceans of possibilities', even 'blue sky thinking'. We talk about 'food deserts' and 'career paths', 'networks' and 'decision trees', 'world-wide webs' and 'websites', sometimes directly comparing a new concept to an existing thing in a landscape, and sometimes using the idea in a more abstract way. On a more fundamental level, we might even realize the spatial metaphors inherent in 'perspective', 'field', 'area', 'stance', 'position', 'looking ahead' and, indeed, 'fundamental level' [1].

*Surfacing* (!) and *reflecting* (!) on metaphors in use has value for expanding our conceptual vocabulary [2] as we work with social and political effects of technologies, but in an HCI sense, is most commonly considered in terms of interface design—using metaphors strategically to help users understand new ways of interacting, or to generate new ideas for products or services [3]. Eliciting metaphors, tacit or explicit, can be part of a process of exploring mental models more widely, for research participants themselves or for researchers seeking to gain insights around people's understandings. But there is no 'right' way to externalize thoughts: as Jonassen and Cho [4, p.152] put it, we need "visual prostheses" to share our mental imagery.

In the Mental Landscapes project, we have taken inspiration from, or paralleled, approaches including Liz Sanders' MakeTools, Thudt et al's data physicalization for self-reflection, embodied sensemaking, work in the systemic design community, and Chueng-Nainby's collective imagery weaves [5]. Mental Landscapes comprises a kit of laser-cut card parts representing a variety of landscape elements, which can be assembled and arranged to make abstracted model landscapes. There is opportunity for this to be used individually, and in a group, along the lines of Peter Senge's call for organizations to work on "surfacing, testing, and improving our mental pictures of how the world works" [6, p.174].

**Career paths.** In a pilot study, we used 2D cut-outs. Six participants, all Master's students in Design at Carnegie Mellon, were asked individually to construct visualizations of their career paths (Fig.1) and think aloud as they did so, for up to 40 minutes, explaining the relevance of the metaphors selected and how the 'landscape' was constructed, and creating new elements (or modifying those provided) where necessary.

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*Figure 1: One participant's life journey landscape.*

For example, in Figure 1, the participant created a landscape of her life journey, from childhood through to today, with color-coded hills. Two people, both representing herself, with two suns and a variety of clouds, illustrated emotional aspects. Each hill had an annotated sign, beginning with 'Childhood' and ending with 'CMU Design' (her current position). She explained that the height of the hills represented 'achievement' and the amount of 'downhill' represented unhappiness, most significantly the sharp downhill after college, followed by a lightning cloud, grey rain cloud, and herself taking a nose dive down the hill—a (self-expressed) 'meltdown'. After the post-college downhill, she represented her series of mostly administrative, low-paid jobs with a small purple hill, followed but a wider, green hill for her Master's degree. A sun and blue clouds, with a change in color, represent her recovering and moving on from the negative emotional period following college, although it is still a part of her life.

Most participants used a side-on, time-based narrative such as this, primarily left-to-right, with a single 'path', but some produced 'aerial views' (e.g. Figure 2), and showed 'branching' structures of influences, possible choices and paths not taken. Some modified and extensively annotated the provided elements, while others kept largely them intact.



The above also include generic shapes which could be used or modified in different ways. Some opportunistically collected ‘real’ elements—rocks and fallen leaves—were included in the Life Landscapes workshop.

Overall, the design process for the kit 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. From a practical perspective, we needed to be able to manufacture the elements through laser-cutting of card, chosen as a balance between cost and variety of color availability. The resulting kit elements have some visual parallels with a variety of papercraft landscapes, but also, coincidentally, with William Kissiloff’s Pulp & Paper Pavilion at Expo 67 in Montreal.

We ran two larger group workshops with the 3D elements: *Life Landscapes*—again on life journeys; and *Project Landscapes*, in which participants modelled group projects they had recently worked on together, in their groups.

***Life Landscapes.*** In this workshop, 29 Master’s students from two design classes, in groups of 5–7, were given 30 minutes to visualize the questions ‘What does the past and future look like as a landscape? Where are we going?’ through using the kit. The focus for most groups was their own perceptions of their ‘journeys’ before, during—and imagined journey after—graduating, but the scope was left open for groups to interpret in different ways. The collaborative challenge here was to create a ‘shared’ vision from what started as a disparate set of individual experiences (Figure 3). Figure 4 shows one group explaining their landscape, centered around a set of tributaries (different backgrounds) coming together with the students on a raft together (their degrees), heading—potentially via a whirlpool—for a variety of possibilities ahead, from rocky shallows, to desert with cacti, to hills representing different kinds of careers.

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Figure 3. The modelling process.



Figure 4. A group explains their Life Landscape.

**Project Landscapes.** For this workshop, 45 undergraduate design students worked in groups of 3–5 for 30 minutes, re-forming groups they had previously worked in together on a recent project. Groups were asked to use the elements to create landscapes representing whatever aspects they found important to emphasize: topics, challenges, project stages, roles, interpersonal relationships, and so on. Groups used and modified the elements in different ways to represent different aspects of their projects. After constructing their landscapes, each group explained it briefly.

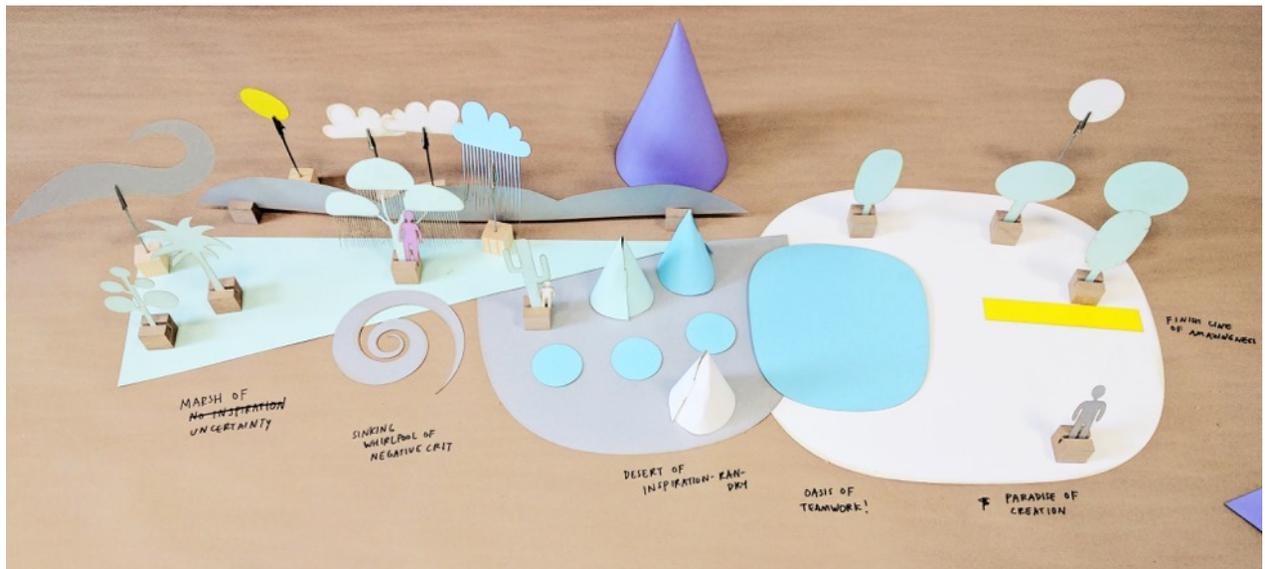


Figure 5. An annotated project landscape.

Some projects started with ‘rocky’ beginnings, represented by cones or hills. Other projects started with trees, rivers, and stars, representing periods of calm ideation, research, or general feelings of optimism. When projects encountered new difficulties later on, many groups represented these periods with lightning, rain, and hills. Several groups came up with names to represent specific parts of their project experiences, such as a ‘plateau of exhaustion’ before the project came to an end, or even in one case a ‘hell’. In Figure 5, for example, the group illustrated how at the beginning of their project, they were in a ‘marsh of uncertainty’. During their first crit, negative feedback was represented by a ‘sinking whirlpool’ and rain clouds. The grey dry ‘desert of inspiration’ represents not having a lot of ideas, but the blue circles represent the team enjoying working together. Eventually they found an ‘oasis of teamwork’, which led to ‘a paradise of creation’, and eventually completing the project.



*Figure 6. Initially extreme weather represents a communication breakdown; a rising sun represents the group starting to understand what was going on. The mountain and swirl of people represents the pressure and opportunity of a major career fair at that time in the project.*

Students' comments on trying out this iteration of landscape elements suggested that they found the process fun and creative, while also unavoidably abstract. For some, the kit helped them understand their teammates' perspectives better—after the project was over—especially in terms of stress, productivity, and emotions at points throughout a project. In this sense, the format is more useful for surfacing—and reconciling—overarching understandings than probing deeply about specifics, but in triggering discussion, it has value in enabling members of a team to interrogate each other's perspectives and mental models of a situation (echoing ideas from Senge [6]). There is value in the reflection process for the team members themselves even without any external 'analysis' of the details.

**Value for HCI and design.** Using design methods to generate knowledge—design as inquiry—is a growing approach within research through design, and various forms of modelling and metaphor-based work can make a contribution here to what might traditionally have been text- or interview-based forms of inquiry. Exploring which elements of mental models are shared between group members—and which are not—

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and the discussion around these issues once surfaced, can give useful insights for researchers seeking to understand understanding. For example, different metaphors used by participants could inspire a new form of interface design for life planning or project management tools. However, there is something more fundamentally interesting here in using these methods to shed light on the unexamined metaphors and mental models which are present in our collective (or not) societal imaginaries of abstract concepts such as life, career, family, work, and so on—and more widely, issues such as climate change, our relationship with nature, resources, artificial intelligence, mental and physical health, national identities and international migration, social equity, government, new forms of economy, and quality of life. As such, our aim in developing the kit further will be for it to be useful at multiple levels, from individual reflection to community-based participatory design workshops—giving a community the opportunity to reflect on and learn about its own thinking—and probably expanding beyond solely landscape metaphors.

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