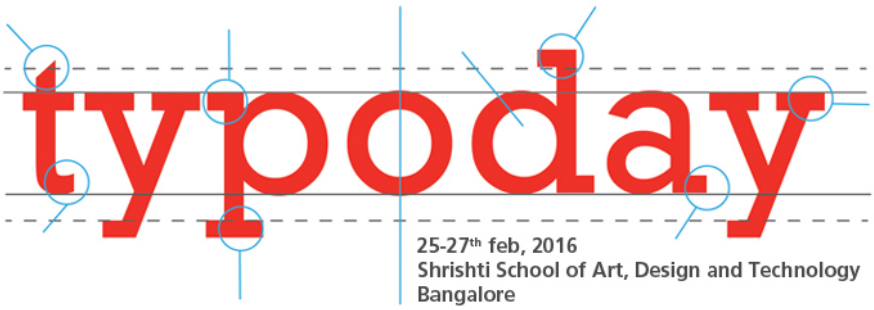

Typography and Education
http://www.typoday.in

Why Sketch?

The role of sketching in typography and design, from cognitive and educational perspectives

Tina-Marie Whitman, Malmö University, Sweden, tinamarie.whitman@mah.se

Abstract: While previous research has explored how sketching is used by designers as an initial process of conceptualization, a different approach to sketching emerged out of a conversation with Martin Farran-Lee, professor of graphic design and a practicing designer. This paper proposes that sketching can also be an intermediate strategy for constructive perception and revision based on ambiguity and indeterminacy. These properties position freehand sketching as embodied, situated, and distributed cognitive activity and remove it from the constraints of digital tools. Experienced designers may be able to elude fixation, make complex inferences about potential directions and outcomes and elicit new mental imagery from visual analogies. The paper concludes by proposing that sketching at intermediate stages of design should be integrated into design education, especially in areas like typography that often remain fixed in a digital design context.

Key words: Sketching, typography, design education, design process, embodied, situated, distributed

1. Introduction

When the American composer and music theorist John Cage was asked why he didn't give conventional lectures, he said, "I don't give these lectures to surprise people, but out of the need for poetry." He would make a list of all the stories he could think of and in his

lectures he would tell one story every minute. If it was a short story, he had to speak slowly and draw out his pauses; when he come to a long one, he had to speak as rapidly as he could.

The *poetry* of design is a difficult thing to pin down. It is just as difficult for experienced designers and educators who often end up talking around it, describing not the enigmatic destination itself, but rather a map for how to get there. This is at the heart of design education—forging a trail for our students to find their way to poetry and helping them to establish their own route.

> Where do we go then? . . . Well what we do is go straight on; that way lies, no doubt, a revelation. I had no idea this was going to happen. I did have an idea something else would happen. Ideas are one thing and what happens another (Cage, 1961, 197).

So how do artists and designers find their way and ignite some spark of poetry? Sketching—like John Cage's storytelling—is one such route.

2. Background

The following paper was inspired by a conversation with Martin Farran Lee, visiting professor of graphic design at Malmö University and a practicing designer and former art director for *Blueprint* and *Arena* magazines. Our discussion focused on the role of sketching in his own design process, in particular during the creation of his 2011 typographic project *FJK—Ten Meditations on John Keats*, a series of offset lithographs based on lines taken from ten different poems by John Keats.

While sketching has an established position within art and design, its role in typographic projects is more tentative. Design involving typography relies heavily on digital tools, and the practice and outcomes of design is steered by the particular constraints of this context. What role can sketching play?

Researchers from many disciplines have explored how sketching is used by designers, from architecture to engineering. This research has focused primarily on sketching as the initial process of thinking and visualization of ideas. We usually associate sketching with the beginning of the design process, as a way of starting a design by mapping its essential perceptual components. However, the ambiguity of form and indeterminacy in the process of sketching—be it a random splotch of ink or an irregularity in the paper—can be used by experienced designers like Martin Farran-Lee at intermediate stages of design as well, to elicit new mental imagery and give rise to previously un-thought ideas and directions in design. This can be a productive method for escaping the constraints of a digital design context like typography, and overcoming fixation and premature commitment to an outcome that may be functionally adequate, but judged to be aesthetically inadequate by the designer herself.

3. Circumventing digital constraints: freehand sketching as a embodied, situated, and distributed practice

Because design projects centering around typography are almost always actualized using digital tools, how can freehand sketching play a constructive role? In order to explore this question, sketching can be seen as *embodied*, *situated* in an environment and *distributed* among external structures, artifacts and agents. These approaches to cognition will lead to a more comprehensive understanding of the role of the body and the physical working environment for the outcome of sketching and design. In addition, research exploring sketching as an activity generating *analogy* and *innovation*, the comparison of digital and non-digital design contexts, and the role of expertise in design will be used to frame sketching at intermediate stages of design, centering on Farran-Lee's project, *FJK.*

3.1 Sketching as embodied

Embodied cognition centers on the embeddedness of the brain in the body, and locates the activity of the mind—memories, skills, knowledge, thought—within sensory processing and motor control. As Schön writes, "The design situation is a material one, apprehended, in part, through active, sensory appreciation" (Schön, 1992). Within an embodied context, sketching as a primary design activity involves gesture, motor connection between the eye and hand, and the response of the body and mind to the material conditions of the physical environment—and all the imperfections and unanticipated consequences resulting

from those interactions. The way a mark is modified by imperfections in the texture of the paper or the slight tremor of the hand, the accidental drip of ink, are unexpected consequences of sketching as an activity rooted in the body. These in turn provide new visual cues that may lead to unintended directions in the design.

3.2 Sketching as situated

Sketching can also be seen as the meeting of the mind with the materials of representation, grounded—or situated—in physical experience. The interaction of the body and the environment during sketching activity shapes the cognitive processes and the design outcomes: the lighting conditions of the working environment, the body's position at a working surface, even the visual array of notebooks, posters, sketches, and artists books within the studio. Cognitive processing is steadily affected by perceptual information streaming in from the environment (Gibson, 1979). The presence of visual cues and the richness of stimuli in the working environment thus play an important role in design processes.

Sketches extend the limitations of memory and our information-processing abilities by externalizing thought. Sketches become externalizations of thinking; they expand the limited capacity of working memory by offloading information to a place (such as paper) from which it can be readily accessed. By externalizing thinking processes, sketches can expand the limits of the imagination (e.g. (Goldshmidt, 1994), (Purcell & Gero, 1998), (Schön, 1983), (Tversky, 2001), (Tversky & Suwa, 2009)).

The forces driving cognitive activity therefore do not reside solely inside the head of the designer, but instead are distributed across the individual and the situation as they interact.

3.3 Sketching as distributed

Like the situated approach to cognition, the distributed approach extends cognitive processing from the brain of an individual to the interplay between the individual and the environment—in particular, the artifacts, objects, and tools within a particular work practice. A distributed approach to sketching also involves the various stakeholders other than the designer herself, such as the client and printer, who play a role in the thinking and design process.

Charles Wood (1993) applied theory from distributed cognition in his study comparing digital and non-digital conceptual design and representations. Considering people and their supporting artifacts and collaborators as constituting complex cognitive systems, Wood looked at Green's (1989) cognitive dimensions of computer language notations and extended his approach to ideational sketches. Wood describes the key distributed cognitive factors of sketching, including some that are especially relevant for understanding the difference between digital and non-digital sketching approaches in typography. These are transparency, premature commitment, temporariness, accessibility, and richness.

Transparency refers to the amount of effort involved in creating a representation. A transparent medium like freehand sketching on paper does not demand additional cognitive resources, while most digital design tools do and can be seen as more opaque.

The avoidance of premature commitment, or downsliding, is another key factor in freehand sketching. Working with digital tools may force the designer to make choices too early in the process, since the designer is immediately drawn into fine-tuning the details rather than operating at a more exploratory and global level, which the ambiguity of freehand sketching affords. The finished looking character of digital representations may lead to premature commitment to a still-provisional idea. In addition, sketches are usually intended for private use, put away or discarded after production. Their temporariness discourages premature commitment and may promote risk-taking in the design: "Though pen and paper are essentially viscous media the use of terse, throw-away representations which cost little effort to produce means this does not lead to premature commitment" (Wood, 1993, p. 29).

Sketches are also accessible. Many sketches can be seen at once and each sketch may represent multiple concepts and approaches, as opposed to the limited visual workspace of a digital desktop. The ability of sketches to reduce the representation to only the most essential aspects, and the quick and easy addition of perceptual cues (like scribbled notations and graphical marks) to the most relevant parts of the sketch means that sketches are generally accessible for directing attention, recall, and linking multiple pieces of information or ideas.

Finally, the term richness describes the property of a representation in which there is a substantial or even excessive amount of information: redundant encodings, typographical

and graphical marks, etc. The richness of a representation facilitates perceptual cueing, making connections and finding analogies (Wood, 1993).

The concept of richness may also be found in an expanded sense within a situated cognitive approach to sketching. The connections that a designer makes during the sketching process, using perceptual cues from sketches and the working environment, is an example of similarity-based reasoning which Goldschmidt (2001) terms *visual analogy*. Goldschmidt proposes that visual analogy helps designers to more fully understand abstract concepts and to retrieve previously acquired knowledge and visual references. According to Goldschmidt & Smolkov (2006), designers take advantage of their visual environments to trigger ideas or prompt access to their mental libraries of references and representations, both figural and conceptual. Visual stimuli in the working environment can serve to expand the problem space of design and lead to more original solutions. Innovative thinking and creative problem solving are thus prompted by rich environments, both mental and physical, which contain potential cues and sources for perceptual cuing and visual analogy (Goldschmidt, 1994).

4. Externalization and ambiguity as constructive strategies for design

Sketches are externalizations and visible traces of thinking; they expand the limited capacity of working memory by offloading information to a place (such as paper) from which it can be readily accessed. By externalizing thinking processes, sketches can expand the space and limits of the imagination (e.g. (Goldschmidt, 1994), (Purcell & Gero, 1998), (Schön, 1983), (Tversky, 2001), (Tversky & Suwa, 2009)).

Sketching is also characterized by vagueness and ambiguity, qualities that facilitate reconfiguring, reinterpretation, and revision. It is accessible, fast, relatively easy, and transparent. Sketching facilitates the deconstruction of the initial idea into parts, isolating certain ones and working on them separately. At the same time, the ambiguity of sketching encourages completeness: building things back up again in a constructive process (e.g. (Suwa & Tversky, 1997), (Suwa et al, 2001), (Suwa & Tversky, 2003), (Brew, Kantrowitz, & Fava, 2012)). Sketching can eliminate irrelevant aspects and instead visualize the essential. It can be multimodal by enriching pictorial meaning with annotation. It fixes fleeting ideas, and encourages coherence of scattered concepts (e.g. (Goldshmidt, 1994), (Schön, 1983), (Suwa & Tversky, 2003)). It also discourages fixation and premature commitment to a solution, thus facilitating change, transformation, and

innovation (Wood, 1993). Its speed, indeterminacy and ambiguity promote finding relationships and analogies. Goldschmidt refers this to as the "dialectics of sketching," the productive dialogue between reflective critique ("seeing that") and analogical reasoning and reinterpretation ("seeing as"). Schön describes this iterative process of constructing, inspecting, and reconstructing as a kind of conversation that the designer has with herself, an "evolving intention" eventually leading to a solution (Schön,1983). Tversky uses the term *constructive perception* to describe the cognitive function of sketches, allowing the designer to reconfigure and reconsider a solution, discouraging fixation and promoting new ideas (Tversky & Suwa, 2009).

The ambiguity of sketching thus promotes discovery. Designers may discover new properties and analogies from the richness of their sketches and the richness of the work environment itself, connections which emerge from sketching—as both artifact and embodied activity—but which were not there from the beginning. While the sketch starts by representing one set of constraints, elements, or relations, the experienced designer will see new features and patterns. These unanticipated discoveries suggest new directions, developing and advancing the design (e.g. (Goldschmidt, 2001), (Schön, 1983), (Suwa et al, 2001), (Tversky & Suwa, 2009), (Brew, Kantrowitz & Fava, 2012)).

5. A cognitive framework for digital and non-digital design practices in typography

An embodied and situated approach to research in design usually favors non-digital techniques. This is noted by Schön (1992, p. 7):

> A designer's knowing-in-action involves sensory, bodily knowing. The designer designs not only with the mind but with the body and senses—a fact that poses an interesting challenge to computers.

Forms that are designed using software must be precise and unambiguous. Digital design environments are resistant to conceptual design processes since they lack support for ideational activities like sketching. In addition, working within the closed and visually restrictive space of the computer monitor does not support the potential for creativity that arises from the situatedness of the designer during freehand sketching. Wood (1993) concluded that representational richness, transparency, and accessibility are more easily achieved in freehand sketching than within a digital context. In another study, Bilda and Demirkan (2003) compared the design activities of interior designers and demonstrated that traditional media had advantages over digital media in the perception of visual-

spatial features and organizational relations of the design, and supporting the generation of better design conceptions and alternative solutions.

6. Expertise

The ability to link the visual elements of a sketch to the designer's mental library of related images and past experience is enhanced and developed through the acquisition of experience and specialized knowledge that characterize expertise.

Implicit knowledge, based on prior experience, unconsciously informs our decisions and judgment, and forms the basis for expertise and intuitive action (e.g. (Brew, Kantrowitz, & Fava, 2012), (Suwa and Tversky, 2001), (Suwa and Tversky, 2003)). An important aspect of expertise in design is the ability to recognize the value of both intended and unintended consequences of changes, and the willingness to adjust the initial intention of the design (Schön, 1992). In contrast to novices, experts are able to focus on more global issues like revising problem representations and making larger-scale revisions (Fayena-Tawil, Kozbelt & Sitaras, 2011). This suggests that expertise in design may lead to metacognition and re-thinking both design intentions and solutions during intermediate stages of design.

Because sketches support many interpretations, they can be used for discovery and reinterpretation to further the design well into the design activity. Experienced designers may take advantage of the ambiguity of form to elicit new mental imagery and give rise to previously un-thought ideas and directions, even after the ideational stage of design.

7. Case study: Martin Farran-Lee's project *FJK—Ten Meditations on John Keats*

In my conversation with Martin Farran-Lee from 29 October 2015, this particular approach to sketching became apparent. Professional designers and typographers like Farran-Lee often use sketching in only a limited way—or not at all—in the initial stages of ideation and instead move directly to digital tools, citing time and cost pressures (Jonson, 2005). In Farran-Lee's case, expertise leads to delaying the use of sketching to secondary phases of design in order to rethink a solution that is functionally acceptable but judged to be aesthetically inadequate.

Martin Farran-Lee's dual professional position as both an experienced and successful designer as well as an educator lends him credibility as a representative practitioner for

understanding how sketching can be used as a productive strategy for design centering around typography. As part of his pedagogical practice, this was not the first time he has considered the role of sketching as an ideational activity within design education, nor within his own professional practice.

In our conversation, Farran-Lee and I discussed the role of sketching in his design practice, focusing in particular on his typographic project *FJK: Ten Meditations on John Keats*. Together we flipped through his sketchbooks and the printouts and sketches from the Keats project, and referred back to them as we talked about how the project evolved from an initial idea into its final state as a series of off-set lithographs based on drawings made with brush and ink. The description of his design process below is based on my notes and recordings of that conversation.

The Keats project began as a typographic project within an exclusively digital context. After selecting ten lines of poetry by John Keats, he used InDesign to set the text in Le Corbusier, a standard French stencil font. The design process continued with small adjustments and attention to the detail of the letter spacing within the format of the digital page until he felt that the design was a functional solution to his original intention (figure 1).

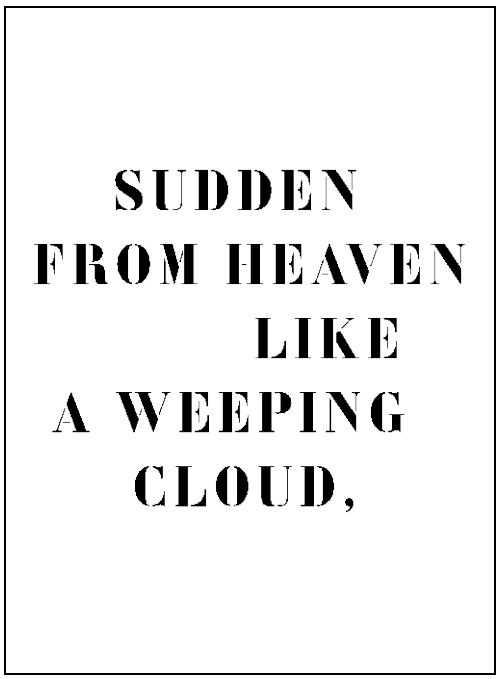

Figure 1.

However, he quickly decided that the outcome of this stage of the design was not adequate from an aesthetic perspective, describing it as too rigid and "over elaborate."

Farran-Lee then decided to begin again: “The perfect was already done—now I can push it into the unknown.” Rather than continue the design process digitally, he decided he needed a completely new approach. He left his computer behind and instead went into his studio and began to sketch the lines of text again, this time using pen, pencil, and paper. The design developed until he had established certain design constraints: shapes encircling the text on the page, a bold sans-serif lettering, each letter stretched and spaced so that together they filled the space within the shapes rather than aligning on a grid (figure 2).

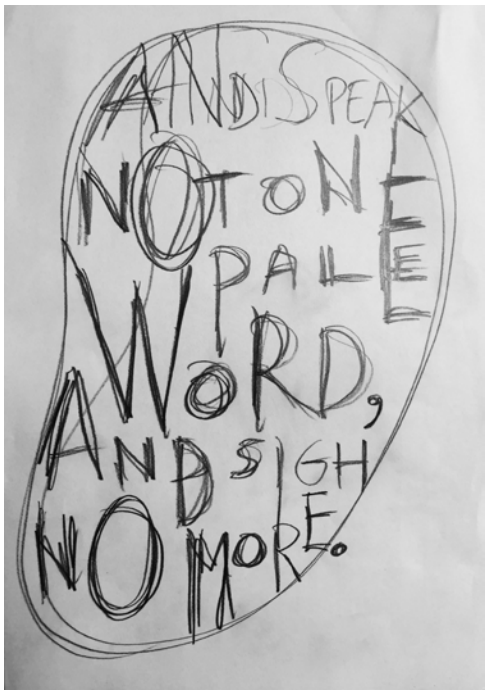

Figure 2.

He then turned to the materials in his studio, using ink and brush on heavyweight paper and experimenting with calligraphic lines—first, finding a rhythm to his gestures and calligraphic marks, and then applying that rhythm to the letters of the text (figure 3).

Figure 3.

These hand-drawn lines of text on paper were next brought into a collaborative stage of design with a printer, someone he had worked with before and trusted. Their collaboration led to the final stage of the work, which Farran-Lee judged aesthetically successful (figure 4).

Figure 4.

If seen within the cognitive perspective presented by Tversky and Suwa (2009), Farran-Lee used sketching to generate new ideas only after an adequate functional solution has been found using digital tools. Expertise replaced sketching's role in the first stages of design, so that the initial intentions and essential perceptual and functional features were generated as mental representations only, and then took form digitally. Only later in the design process, after an adequate functional solution had been found using digital tools, did Farran-Lee subject the design to a "re-sketching" process in which he reconsidered fundamental aspects of his initial solution, and experimented with alternative solutions—in particular, those concerning the material attributes of non-digital media within embodied, situated, and distributed contexts. He then created a second, revised solution in which both functional and perceptual properties of design were judged to be a better solution of his original design intentions.

8. Discussion

8.1. Implications for design practice

Sketching is usually associated with the beginning of the design process, as a way of starting a design by mapping its essential perceptual components. However, because of sketching's deconstructive and constructive functions, it can also be used at an intermediate stage of design.

In typically digital design areas like typography, the finished character of computer generated design may inhibit the designer from experimenting with alternative approaches and lead to premature commitment to provisional ideas. Design decisions originally intended to be tentative might be mistaken as intentional and definite because of the illusion of finish inherent in a digital context.

The dialectics and constructive perception that characterize sketching leads to visual analogy and may serve to change the direction of thought (Goldschmidt, 1994). In the FJK case study, sketching was used by Farran-Lee to pursue an entirely new direction for his design.

Seen within embodied, situated and distributed cognitive approaches, the material dimensions of the media, tools, and working environment of design play important roles for the design outcome and its judged innovative and creative qualities. During the act of sketching, indeterminacy in the process and unexpected visual cues elicit the designer's mental library to complete missing parts and match precepts to memory images, thus triggering new ideas.

Re-sketching, or sketching at an intermediate stage of design, thus brings the initial design intention and outcome into a new "space," from the finished-yet-provisional space of computer into a material space in which embodied, situated and distributed aspects of cognition become significant, and the non-digital elements of the design experience such as the artifacts, room, materials, and stakeholders contribute new empirical material.

Allowing himself to begin again with the confidence that expertise brings, Farran-Lee was able to break out of the closed and rigid digital space and unlock a more ambiguous and expansive cognitive space encompassing both the perceptual environment and his mental library of figural and conceptual references and past experiences, providing fodder for new associations and a better design solution.

8.2. Implications for education in typography and design

The conclusion that experienced designers are more proficient at using sketching as constructive perception (e.g.(Suwa and Tversky, 2001), (Suwa and Tversky, 2003), (Fayena-Tawil, Kozbelt & Sitaras, 2011)) suggests that this skill can be fostered in design education, even in typically digital-based design such as typography.

Sketching at intermediate stages of design may encourage this process of breaking an overly elaborate solution down and rebuilding it in new configurations, inhibiting fixation and downsliding, and expanding the space of design through the perceptual richness of the designer's working environment and practice. Establishing sketching as a central design activity in typography, analogies can be identified and used to inform both formal considerations and semantic function.

Encouraging students to find relationships through analogies triggered by their sketches, their working environment, and their mental libraries of references shows them how to break an initial design outcome down and generate new possibilities. It allows the exploration of form from fresh perspectives, and creates new trajectories to explore. This

can be a useful strategy at intermediate stages of design, and especially in areas of design like typography that are dominated by digital tools and design activities.

Introducing a functionally resolved design solution to re-sketching activities can re-inject a desirable ambiguity and materiality into a digitally-refined design, for the purpose of exploring previously unconsidered alternatives, and finding semantic potential and innovative design solutions.

References

Bilda, Z., & Demirkan, H. (2003). An insight on designers' sketching activities in traditional versus digital media. Design studies, 24(1), 27-50.

Brew, A., Kantrowitz, A., & Fava, M. (2012). Drawing connections: New directions in drawing and cognition research. In DRN Conference presentation 11.09.

Cage, J. (1961). Where are we going? And what are we doing? Edition Peters Group, Frankfurt/Main, Leipzig, London, New York.

Fayena-Tawil, F., Kozbelt, A., & Sitaras, L. (2011). Think global, act local: A protocol analysis comparison of artists' and nonartists' cognitions, metacognitions, and evaluations while drawing. Psychology of Aesthetics, Creativity, and the Arts, 5(2), 135.

Gibson, J.J. (1979). The Ecological Approach to Visual Perception. Boston: Houghton Mifflin

Goldschmidt, G. (1994). On visual design thinking: the vis kids of architecture, Design Studies, **15**(2): 158-174.

Goldschmidt, G. (2001). Visual analogy: A strategy for design reasoning and learning. Design knowing and learning: Cognition in design education, 199-220.

Goldschmidt, G., & Smolkov, M. (2006). Variances in the impact of visual stimuli on design problem solving performance. Design Studies, 27(5), 549-569.

Jonson, B. (2005). Design ideation: the conceptual sketch in the digital age. Design studies, 26(6), 613-624

Kozbelt, A. (2001). Artists as experts in visual cognition, Visual Cognition, vol. 8: 6, 705-723.

Purcell, A. T., & Gero, J. S. (1998). Drawings and the design process: A review of protocol studies in design and other disciplines and related research in cognitive psychology. Design studies, 19(4), 389-430.

Seeley, W. & Kozbelt, A., (2008). Art, Artists and Perception: A model for Premotor contributions to Perceptual analysis and Form Recognition. Philosophical Psychology, Vol. 21: 2 149-171.

Schön, D. A. (1983). The Reflective Practitioner, Harper Collins, USA.

Schön, D. A. (1992). Designing as reflective conversation with the materials of a design situation. Research in Engineering Design, 3(3), 131-147.

Schön, D. A., & Wiggins, G. (1992). Kinds of seeing and their functions in designing. Design studies, 13(2), 135-156.

Suwa, M., & Tversky, B. (1997). What do architects and students perceive in their design sketches? A protocol analysis. Design studies, 18(4), 385-403.

Suwa, M., & Tversky, B. (2001). Constructive perception in design. In J. S. Gero & M. L. Maher (Eds.) Computational and cognitive models of creative design V. Pp.227-239. Sydney: University of Sydney.

Suwa, M. and Tversky, B. (2003). Constructive perception: A skill for coordinating perception and conception. In Proceedings of the Cognitive Science Society Meetings.

Suwa, M., Tversky, B., Gero, J., & Purcell, T. (2001). Regrouping parts of an external representation as a source of insight. In Proceedings of the 3rd International Conference on Cognitive Science (pp. 692-696).

Tang, H. H., Lee, Y. Y., & Gero, J. S. (2011). Comparing collaborative co-located and distributed design processes in digital and traditional sketching environments: A protocol study using the function–behaviour–structure coding scheme. Design Studies, 32(1), 1-29.

Tversky, B. (1999). What does drawing reveal about thinking? In J. S. Gero & B. Tversky (Eds.), Visual and spatial reasoning in design. (pp. 93-101). Sydney, Australia: Key Centre of Design Computing and Cognition.

Tversky, B. (2001). Spatial schemas in depictions. In M. Gattis (Ed.), Spatial schemas and abstract thought. Pp. 79-111. Cambridge: MIT Press.

Tversky, B. (2005). Functional significance of visuospatial representations. In P. Shah & A. Miyake (Editors.), Handbook of higher-level visuospatial thinking. Pp. 1-34. Cambridge: Cambridge University Press.

Tversky, B., & Suwa, M. (2009). Thinking with sketches. In A.Markman (Ed.), Tools for innovation. Oxford, England: Oxford University Press.

Wilson, M. (2002). Six views of embodied cognition. Psychonomic bulletin & review, 9(4), 625-636.

Wood, C. C. (1993). A cognitive dimensional analysis of idea sketches. University of Sussex, School of Cognitive and Computing Sciences.

Verstijnen, I. M., van Leeuwen, C., Goldschmidt, G., Hamel, R., & Hennessey, J. M. (1998). Sketching and creative discovery. Design studies, 19(4), 519-546.