DRAWING TOGETHER. COLLABORATIVE DESIGN PRACTICES IN EXPERIMENTAL PHYSICS

ARTICULATIONS, ENGAGEMENTS

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ABSTRACT

This study investigates hand sketching as imaging practice in working environments, depicting collaborative drawing as a distinct form of knowledge. The research is based on a case study of experimental physicists' collaborative sketching practices. These questions lead the research: What specific functions do the collaborative sketching activities, and the resulting sketches have? How do different agencies get involved in collaborative imaging practices? Can the scientists' actions be described as design practices? The hypothesis is that collaborative sketching forms an integral part of science discourse. Besides being a tool for thinking and communicating together, I argue that the collaborative sketching activity functions as an epistemic design practice. These practices are often overlooked yet constitute powerful instruments in the formation of science, society, and politics.

INTRODUCTION

Experimental physicists are experts in data simulation and the use of digital media. In addition to digital imaging practices, the scientists also regularly revert to hand drawing in their daily work in the laboratories. These working practices are the catalysts for conducting an ethnographic fieldwork in an x-ray research laboratory capturing the physicists' collaborative sketching. The research is situated at the interface of Design and Drawing Research, Iconic Research, and the tradition of Laboratory Studies in History of Science, and Science and Technology Studies (STS).

Coming from media studies with a design background, my research interest is not in the drawing as a result, but in the "epistemische Verfahren" (Hoffmann, 2013), the epistemic and operative procedures of notation, communication, and visual performance. Here, sketching is understood as a process in the making, which is operative, non-linear and iterative. The sketched images are not the representation of thinking but made for thinking processes (Merz 2016, p. 364). Drawing as a joint activity has been investigated almost only in traditional design disciplines (Goldschmidt 1991, Henderson 1999, Gero 2002, Murphy 2004, Tversky 2004). The claim is, following Wolfgang Schäffners' notion of the "design turn" (Schäffner, 2010), that design practices can be found in many other disciplines other than Design where they unfold their power. The title of this submission refers to Bruno Latour's essay "Drawing Things Together" in which he refers to the practice of writing and imaging as "the most powerful explanations, that is, those that generate the most out of the least, are the ones that take writing and imaging craftmanship into account." These practices "are both material and mundane, since they are so practical, so modest, so pervasive, so close to the hands and the eyes that they escape attention" (Latour 1990, p. 22). The results of these activities do not appear in official presentations of the scientific, societal or political agendas. By reading Latour's argument critically, the informal practice of collaborative sketching can only be traced down, systematically unfolded, and analysed by a detailed micro-sociological

investigation. I am following the research object through an assemblage of methods, which develops on the way. The method framework includes participant observation, videography, and visual interviews accompanied by explorative drawings by the researcher. Three aspects of drawing activities are investigated for analysing the activities and functions of collaborative sketching. First, spaces, bodies, and data constituting infrastructures and materiality of the laboratory; Second, hybrid practices combining old and new technologies, and (non-)human agencies; Third, sharing knowledge through sketches as "enabling objects" of communication. Each section contains two perspectives, one describing the findings in the laboratory, and the other reflecting on the research procedure as well as the methodical approach.

SPACES, BODIES, DATA

The laboratory and its environment are packed with computers, digital devices, high-precision instruments, technical equipment, and tools. Evezry room is also equipped with drawing and notation devices. The experiments take place in these working spaces and are frequently accompanied by talks, meetings, and collaborative, practical work. It became visible through explorative drawing that the constant coming and going, talking and informal gathering is supported by the spatial quality of the physicists' laboratory. Especially the many open doors staying wide open during the day enable vivid social interaction and collaborative action.

Figure 1: Video still documenting collaborative work collecting data with technologies, tools, and instruments in the laboratory space. Video by the author, 2015

Figure 2: Observing the laboratory trough the lens of a Camera Lucida. Drawing by the author, 2015

DRAWING THE LAB

In the first weeks of the field study, the laboratory was seen trough the lens of a Camera Lucida. Drawing with an instrument affords concentration and time. It resembles the tacit and slow manner of a scientist engaging with the experimental system.

Additionally, the continuous presence of a person with a drawing board was irritating and provoked questions. It was the starting point for a dialogue with and among scientists as well as a growing awareness of drawing practices in the research space. Here, drawing is not only the object of research but also a method. It is a tool for communication with scientists and for visualising research insights.

HYBRID PRACTICES

Various instruments, tools, and media are used in the lab to set up and carry out experiments, as well as to transfer and analyse data. These hybrid practices combine analogue and digital procedures. How do these practices interplay in detail?
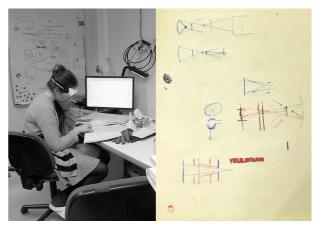

Figure 3: Left: Sketching activity in the laboratory. Right: Sketch by the scientists. Photos by the author, 2015

The sketches must serve various purposes. Besides imaging thought process they also function as objects, which are addressed as a "third" agency in the interaction. The paper sketch is a mediating object facilitating the exchange of thoughts. Thereby, the particular formation of paper, pen, supporting space, technologies and drawing bodies decides how the action takes place. The thought processes relate to the surrounding space and the interaction with the media at hand.

MEDIA MATTERS

Designing hybridity is a standard procedure in design research. Latest studies and projects in Interface Design, Interaction Design, and CSCW (Computer Supported Collaborative Work) involve manual activities with digital technologies, if nothing else because they are technically feasible (Luff 2004, Weibel 2011, Freed 2011, Vinot 2014). In contrast, the understanding of practices through a materialistic lens has often been neglected in the studies on sciences. With the "Visual STS" approach (Galison, 2014) the research object is perceived and reflected visually, including film, video, photography, and other media.
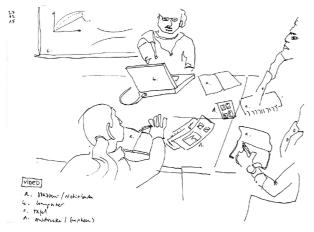

Figure 4: Page in the visual research journal: In the subgroup meeting, experimental data is collaboratively analysed using visual media tools: a. Notebooks, b. Laptop, c. Blackboard, d. Print out. The situation was also recorded with video and photo cameras. Drawing by the author, 2015.

Beyond STS, the hybrid practices performed in the laboratory are adopted and transformed as a research practice in the field. Reflectively drawing and writing is integrated with other visual tools and media for research purposes – aiming at getting hold of relations and practices involved in the sketching activities that otherwise would remain invisible.

SHARING KNOWLEDGE

The situations and interactions involving sketching are hardly ever planned and can only be caught on the fly and by consistently "following the research object" (Latour & Woolgar 1986). The informality and unpredictability of the working practices under investigation lead to the assumption that the process of drawing is either naturalised and comes without the need of preparation, and or, the sketching is not perceived as anything special or worth of announcing because of its simplistic characteristics and assumed banality (Galison 2000).

Figure 5: Video still of video sequence documenting a collaborative drawing action passing the pen. Video by the author, 2015

A typical meeting starts with the placing of one sheet of white paper and one pen for the whole group in the middle of the table, independently of the group size and other technologies involved. The pen is then passed between those who talk and sketch. The person holding the pen holds power and the right to speak. Power relations regarding people, materiality, and data become visible through the collaborative sketching.

In the observed meeting situations, the sketching also functions as a link between intrinsic experiences and the extrinsic sharing of knowledge. The experience of the collaborative sketching and the discourse embodied in the materialised sketch supports the thinking process of the scientists and connects them to the power order of the experimental system.

MAKING VISIBLE THROUGH DISCOURSE

According to philosopher Michel Foucault, the discourse of a field consists not only of spoken or written words but the collectivity of practices, including images and build environments (see Foucault 1981, p. 74). In science studies, the discourses' entity is often divided when dealing with pictures and subgrouped into terminologies, such as "viscourse" (Knorr-Cetina 2001).
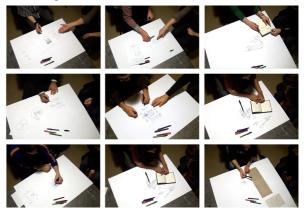

Figure 6: Visual interviews with scientists. Series of video stills by the author, 2014–2017

Here, this division is avoided by creating situations where the discourse can become visible. To find out more about the role of sketching in the scientists' discourse, semi-structured video interviews with the scientists were conducted. During these so-called

"Visual Interviews" the design researcher and experts talk and sketch together. The participant observation in a science laboratory becomes an activity in which both parties are involved through their common practice of sketching and imaging.

CONCLUSION

I have described how spaces, practices, and objects in the laboratory are connected. The working practices of experimental physicists contribute to the episteme of the experimental system through the heterogeneity and hybrid constellation of technologies, activities, and human and (non-)human agencies.

Sketching as collaborative activity and the depicted images are almost invisible – as well as in the perception of the scientists as in the participant observation. Nevertheless, both action and object of sketching are linking the internal worlds of the imaginative thinking with the external reality of scientific knowledge production. As material objects, they become operative in the experimental system.

The scientists do not only deal with known facts or natural objects. They also use scientific facts, images, and technologies for playing, imagining, constructing and projecting simulations and experiments reaching beyond existing knowledge.

The research approach is a mixture of visual and written material, as well as theoretical and practical reflections. With this procedure, the strengths of two different disciplinary approaches are synthesised, namely text in theory, and image in practice-based research. The multiplicity of methods offered by design research allows for equally working with text and image, and materiality and media making the scientists discourse visible.

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