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TANGIBLE PARTICIPATION

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Engaging designs & designerly engagements in pedagogical praxes

HENRIK SVARRER LARSEN
CERTEC | DEPARTMENT OF DESIGN SCIENCES | LTH | LUND UNIVERSITY 2015

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Henrik Svarrer Larsen

TANGIBLE PARTICIPATION

ENGAGING DESIGNS & DESIGNERLY ENGAGEMENTS IN PEDAGOGICAL PRAXES

Doctoral dissertation
CERTEC
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By its very character, an engaged design research as mine is the making of many – both inside and outside of academia. Indeed, my research has gotten its character and depth through many alliances and collaborations across project and university environments.

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be seen in the parallels between my concept of *væsen* and Mads' concept of *internal complexity*. I am truly grateful for these dialogues, and I encourage others who are interested in aesthetics of tangible interactions to read Mads' dissertation from 2014 and to take note of how similar concepts can be applied to very different contexts and framings.

For providing constructive comments on early and partially opaque versions of this dissertation, my thanks go to Peter Lau Torst Nielsen, Vanessa Carpenter, Nina Mørch Petersen and Morten Winther Larsen.

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Henrik Svarrer Larsen
Copenhagen, January 2015

Content

READER'S GUIDE XIII

VIGNETTE XVII

1 **INTRODUCTION 1**

MOTIVATIONS 4

DISSERTATION OUTLINE 7

ETHICS 9

2 **PROGRAMME 13**

PROGRAMME & PROGRAMMATICS 15

PEDAGOGICAL PRAXES 17
- Snoezelen 17
- The senses 20
- Sensory materials 21
- As praxes 25

SID, THE PROJECT 27
- Project vis-a-vis dissertation 28
- Design space delimitations 29

RESEARCH LANDSCAPE 31
- An extended materiality 32
- A sparsely populated cross-section 34

THE DESIGN PROGRAMME 36
- Desiderata as direction and volition 36
- The desiderata 38
- The foci 40

THE SENTIMENT 42

3 DESIGN IMAGINATIONS 49

ACTIVECURTAIN POKING INTO AN ILLUSIONARY YET ILLUMINATED THIRD DIMENSION 54

MALLEABLEPILLOW TOUCHING THE EPHEMERAL MATERIAL OF LIGHT 56

HUGBAG LITERALLY EMBRACING SOUNDSCAPES 58

WATERBED MUTUALLY RESONATING BODIES 60

VIBEBOARD HOW TO STROKE A VIBRATION 62

LIVELYBUTTON CRUDE INNER BEAUTY 64

LIVELYFORM MOVEMENT INVITES MOVEMENT 66

4 ENGAGEMENT 69

STARTING WITH THE CHILDREN 71
- An appreciative mind-set 73
- Going beyond voice by proxy 78
- Virtues in being actionable 79
- Videos that tickle 81
- The best should not be an enemy of the good 83
- Embracing actions 84

TWO ARENAS 88
- Designs as debateables 88
- Designs on the move 96

CO-DEVELOPING WITH PRAXES 97
- The Snoezelen triangle 97
- Capturing experiences 98

SCOPE 104

GROUNDING AND RESERVATIONS 105

5 HERITAGE 111

CO-DEVELOPING KNOWLEDGE DOMAINS 115
Design situation 116
Design imaginations 116
Design potentials 117

TO EXPLORE A DESIGN SPACE 118
By design engagements 119
Sketching 121
Inspiration 122
Debate 124

DOMAINS AND ENGAGEMENTS 126

DESIGN AGENCY 129

TANGIBLE KNOWING 130
Articulations & lenses 132
Wider implications 135

A CONTINUED QUEST 136

6 POTENTIALS 143

PROGRESSION OF THE PROGRAMME 146

ASPECTS 148
A dynamic view 156

THE TAKE 156
Designing for engagements 158

AFTER-THE-PROJECT REFLECTIONS 159

A DESIGNER'S PALETTE 161
Attributes 162
The Palette 163

UNFOLDING POTENTIALS 172
From the experiences with WaterBed 174
From the experiences with LivelyButton 178
On the other designs 180

BY SENSUOUSNESS 182
Multi-sensory 182
Bodily engagements 185

THROUGH A COMPOSITIONAL PRINCIPLE 187
Re-negotiating transparency and ambiguity 189

FOR PARTICIPATION 193
Concept of participation 194
Accessibility 194
Experience 195
Shared matters of concern 197

7 CRITERIA 201

SEEK AND EXPRESS 203

GROUNDING, SYSTEMATICS AND TRANSPARENCY 205

RELEVANCE AND REACH 208
Design qualities 208
Designerly research 209
Design processes 210
Beyond academia 211

REFERENCES 215

EXTERNAL PHOTO SOURCES 225

TERMS & CONCEPTS 226

POPULÄRVETENSKAPLIG SAMMANFATTNING 229

POPULÆRVIDENSKABELIG SAMMENFATNING 233

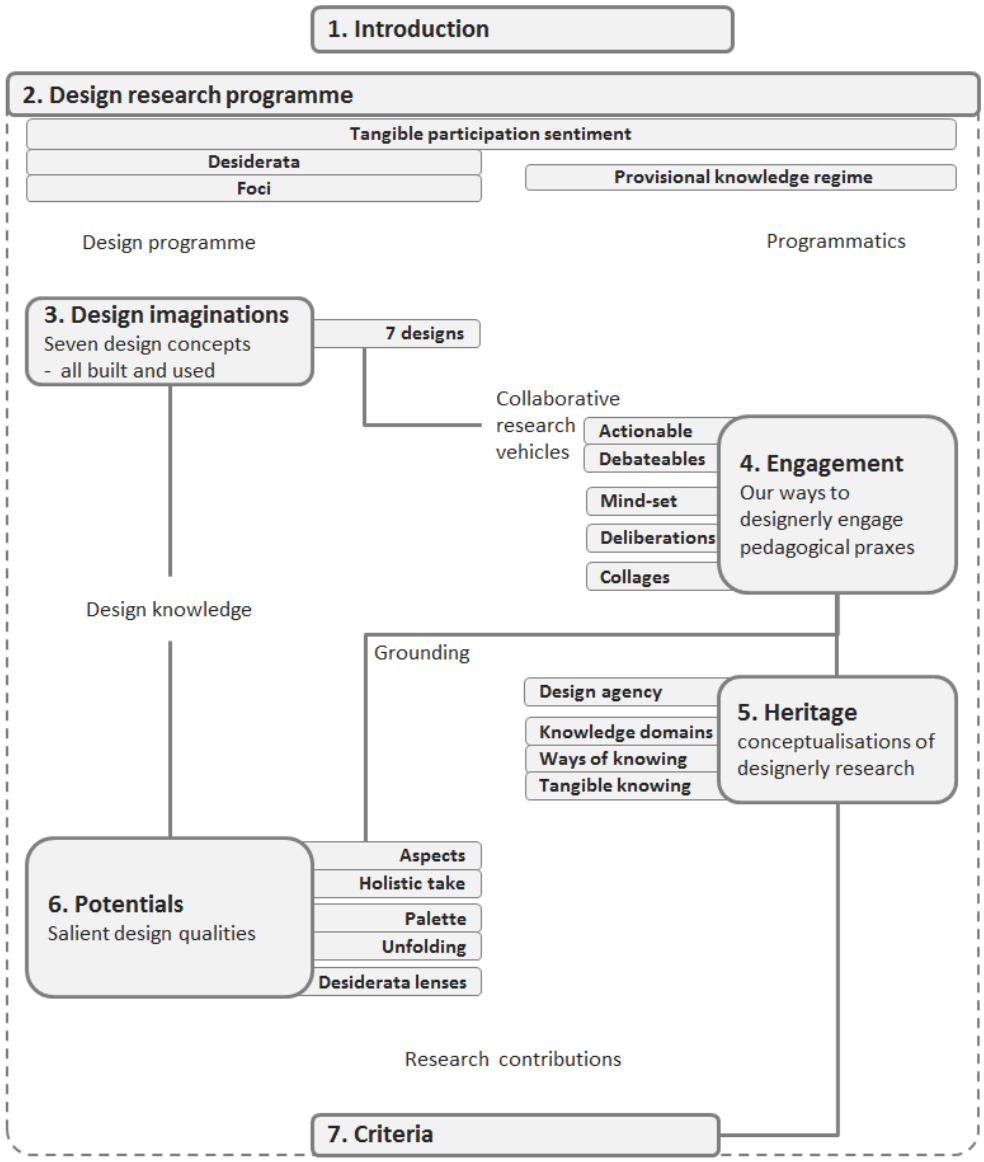


Figure I:
Roadmap to the dissertation

Reader's guide

The following is a heterogeneous mix of tips for reading:

Layout elements

As I have not staged any visuals of the participants in action, most of the photos are stills from videos shot by the staff. Due to their resolution and lighting, these photos are not suitable for large illustrations; hence, the modest layout and at times unsatisfactorily small images.

I use *italics* when emphasising or introducing new terms, as well as for the names of my designs. I use different notations for internal and external referencing: single inverted commas and brackets for [‘internal’] and double inverted commas and parentheses for (“external”).

The text in grey boxes at the end of some of the chapters (figures 2.10, 4.11, 5.7) recaptures and highlights excerpts on key points.

Entry points

For those with particular interests, who do not intend to read the text from start to end, let me suggest some entry points, but also underline that the chapters are intended to be read consecutively:

Related to pedagogy: ‘Ethics’ in chapter 1, ‘Pedagogical praxes’ and ‘The desiderata’ in chapter 2, all of chapter 4, ‘Aspects’, ‘Unfolding potentials’ and ‘For participation’ in chapter 6.

Collaborative work: ‘Motivations’ and ‘Ethics’ in chapter 1, ‘As praxes’, ‘Desiderata as direction and volition’ and ‘The desiderata’ in chapter 2, all of chapter 4, ‘Design agency’ in chapter 5.

Design qualities: ‘The design programme’ in chapter 2, all of chapters 3 and 6.

Practical design inspiration: ‘Sensory materials’ and ‘An extended materiality’ in chapter 2; all of chapter 3, at least ‘A designer’s palette’ and ‘Unfolding potentials’ in chapter 6.

'Methodologists': "Programme and programmatics' and the beginning of 'The design programme' in chapter 2, all of chapters 5 and 7.

Terms

I include Scandinavian terms, where English terms fail to catch the precise or full meaning and/or miss a range of connotations. Most of these terms are shared among several of the Germanic languages and therefore hopefully of use for many readers.

I have enclosed an appendix with a list of the terms and concepts used in this dissertation to aid the reader. For instance, I have resorted to the awkward construct *designer-researcher* to designate designers involved research in designerly ways as well as in explorative development.

It may be best to define two related key terms now: *engagement* and *participation*. *Engagement* takes on many and varied definitions in research related to Interaction Design and Game Design (e.g. Dalsgaard & Dindler, 2009; Attfield et al., 2011; Bianchi-Berthouze, 2013). I use the term *engagement* in a very generic sense of a volition and a holistic involvement; yet, this core may evolve into (pro)active and continued involvement entailing felt and holistic experiences of being absorbed as well as an aroused will and attentive commitment. The term *participation* can stretch from a colloquial meaning of just attending to heated matters of concern in the fields of disability and pedagogy. By *participation*, I mean a continuous, situated and relational engagement with special attention to the *experience* of being and taking (!) part in a significant situation.

I will also mention the distinction I make between interaction and interplay in Snoezelen: *Interaction* addresses what happens between the design and the child (and staff), while *interplay* addresses the totality of the Snoezelen experiences in which the design may indeed play a part.

For these and similar distinctions, please note that the terms and concepts used are pragmatic tools for thinking in design qualities, rather than references to concepts from other disciplines.

Videos

The videos in the chapters 3 and 6 are to be seen as integral parts of the dissertation. They are can be viewed on the attached CD (as well as through the links to vimeo.com).

Vignette

After nearly a year of barely engaging
in Snoezelen at all,
Niklas whose main activity was wringing hands
– his own or other people's –
sat and did just that, wringing his hands.

The LivelyButton design
had been placed in front of him;
without any sign of him noticing it.
As the capacitive sensor was set on high sensitivity,
the design's 'aura' reached far
and reacted to his hand,
when it happened to be near.
As the noisy motor inside the design started to turn,
and the inner lights lit up strongly,
the design caught his attention,
and he gradually started to engage with the design
including the moving spirals poking the lit surface.

Niklas lowered – for once – his gaze
and reached for the box.
He touched and turned it;
and as the design was set
to be quite hypersensitive and hyperactive,
it seemed to aid him in returning to it,
when leaving it for a few seconds.

1

INTRODUCTION

Motivations
Dissertation outline
Ethics

This dissertation contributes to three fields within design research:

- Explorations of a design space related to aesthetics of Tangible Interaction – leading to a set of design imaginations as well as perspectives on salient design qualities.
- Views on and a designerly example of knowledge construction related to Research through Design as well as to programmatic approaches to design research.
- Rich and reflected examples of how to co-develop design and pedagogy in the field of profound disabilities.

My research takes inspiration from Johan Redström (2007: 168), when he in one of the earliest publications on *design research programmes* advocates that their aim is to *seek* and *express* alternatives by critical *questioning* and *imaginations* of change. In my programme called Tangible Participation, such alternatives are articulated in a set of designs – or more precisely in what Redström (2007: 170) calls suggestive "sketches" [Swedish term used: *utkast*] making the possible present. These designs have all been part of collaborative questioning and imaginations in a long-term engagement with pedagogical praxes. Through this engagement, design and pedagogy have co-developed; and from this, the programme has matured. The matured programme presented in this dissertation entails seven designs built and used in the pedagogical praxes as well as evolved framings able to generatively address a design space.

Redström (2007: 165) also states that programmatic design research tend also to explore relations between design and research. This is indeed the case with my research, where I not only perform but also conceptualise what designerly research could (also) be. By means of these conceptualisations, I frame the knowledge construction of this dissertation, as well as the designerly engagement with pedagogical praxes. Regarding the latter, I foreground efforts to embrace pedagogical praxes and to promote influences from people like the children in the pedagogical praxes, for whom design processes cannot rely on pretend and discursive language.

Motivations

In this section, I situate my research by outlining motivations as well as guiding contexts. Please note that this dissertation only partially covers the research at large [for the scope of the dissertation, see 'Programme & programmatics'].

The prime motivation for my research comes from a tight coupling of a) my interest in the sensuous potentials of tangible interaction, and b) a will to enrich the world of people like the children in the project I base my research on. The project, called *Sensuousness, Interaction and Participation* (SID), was a 3-year development project in a pedagogical setting, in which children with profound disabilities experienced multi-sensory environments.

The secondary motivations are: c) to develop design processes suitable for designing with pedagogical practices and people like the children, and d) as part of this, to aid the progression of related pedagogical fields in relation to the use of new technology [see Figure 1.1].

To explore sensuous potentials in tangible interaction	**To enrich the world of people with profound disabilities**
To develop design processes suitable for this field (pedagogy/disability)	**To aid the progression of pedagogical fields in relation to new technology**

Figure 1.1.
The main motivations for my research. Primary motivations on top, secondary below.

The phrase *tangible participation* in the title of this dissertation points to a sentiment of mine. The sentiment permeates not only my research, but my work at large: as a designer emphasising materiality, aesthetics and the role of the body; as well as in the past, as a glassblower loving the physical engagement with matter and as a teacher intrigued by the many ways humans can learn (e.g. sensory preferences in learning styles and aesthetic learning).

As this sentiment in many ways has guided my research, I have chosen to let the name of the sentiment also stand for my research programme. I will return to the sentiment of *tangible participation* in the next chapter. For now, it may suffice to

say that the sentiment carries a deep appreciation of engagements with tangible things and especially the sensuousness therein.

The sentiment speaks into the meeting of my designerly research with a pedagogical field as I will point to in the following. After that, I will relate my research to the research field of Certec, the division of which I am part.

A crucial entry point to the dissertation is my work in the mentioned SID Project with children and staff in a pedagogical field set in multi-sensory environments. Seeing the research as growing out of this meeting has profound implications for both *what* is addressed in this dissertation and *how*. I will here provide a brief outline of the main implications, while chapter 2 will provide closer descriptions of both the pedagogical praxes and research interests.

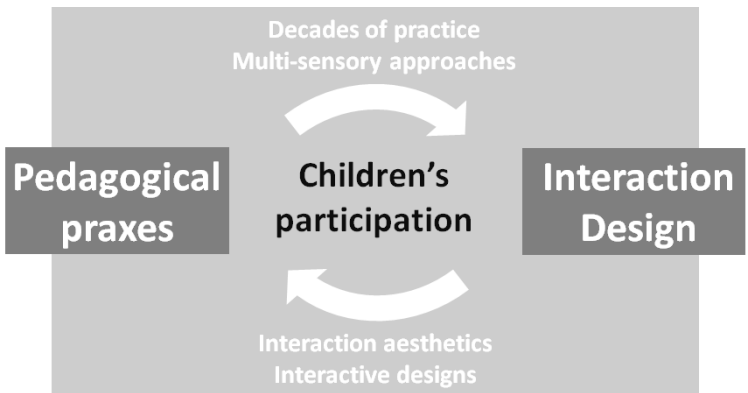


Figure 1.2.
The children's participation as the shared focal point in the cross-pollinations between pedagogical praxes and Interaction Design research.

Let me start with *what* is addressed. The pedagogical praxes that I have worked with emphasise the foundational role of the senses in engaging in the world, which connects to my research interest in *Aesthetic Interaction* (e.g. Petersen et al., 2004; Löwgren, 2009) and *Tangible Interaction* (e.g. van den Hoven et al., 2007). Reciprocally, with a deep interest in doings with tangible things that 'do', my research field carries potentials for the pedagogical praxes to revisit the significance and potentials of the multi-sensory artefacts that stand as hallmarks of their praxes. This reciprocity carries potentials for fertile cross-pollination. The introduction of truly interactive designs and related thoughts on their aesthetic potentials may enrich, perturb, question and indeed progress the pedagogical

practice, while the pedagogical staff's decades of experience around the senses may perform the same function in return and thus fuel thoughts on aesthetics of tangible interaction. These reciprocal exchanges have the children's participation as a shared focal point [see Figure 1.2] and should be seen in light of the *tangible participation* sentiment pointing to the children's sensuous engagement in the Snoezelen interplay.

How to address the meeting of pedagogical praxes and design research has been part and parcel with concerns for how to frame designerly research with regards to both overall knowledge construction and design processes. In order to embrace the knowledge creation embedded in design processes with pedagogical praxes, I have performed and elaborated on a programmatic approach to designerly research. The programme is deliberately very open in order to serve the meeting between design and pedagogy, and the core of the programme is shared between my research and the project around the terms in the acronym of the SID Project: *Sensuousness – Interaction – Participation* [Danish: *delagtighed*].

The programme frames the design work as well as the design processes with the pedagogical praxes. At the centre stand explorations of and wonderments on a design space. These explorations of a design space unfold through an interplay between evolving framings of a design space and continuous articulations in the form of the concrete design as well as experiences and actions with them. By valuating the articulations, the research not only stays with the actual designs, but also with the very actions of all participants, which marks yet another influence of the sentiment of *tangible participation*. This approach embraces designerly knowing and may intimately relate to pedagogical knowing. Furthermore, to stay with the experiences of the children and the pedagogical staff, my designs are not solely crystallised imaginations, but also collaborative research vehicles in the form of manifest communal nexus of exploration; again an influence of the sentiment pointing to the potentials of things.

The designerly stance on knowledge construction indicated above also points to the meeting between my research and the "interdisciplinary field" of my research division, Certec, and its postgraduate subject *Rehabilitation and Habilitation Engineering* as defined by the Faculty of Engineering at Lund University, Sweden (Certec, 2015/2008). My efforts to explore potentials in a designerly approach

speak to Certec's "ongoing and comprehensive effort" to take a reflective stance on and seek potentials across disciplines and paradigms, or as it is put "epistemologically separate branches" (Certec, 2015/2008). At the core of this meeting is a shared belief in Certec's credo that everyone has not only the principled right *to benefit* from, but also *to affect* the development of technology. From this follows that research should embrace diversity without requirements of uniformity of people or contexts, and start from people and their lived experiences (Hedvall, 2009) rather than require people to fit research methodologies. Accordingly, I have tried out designerly ways to make the actions of the children with disabilities take centre stage. Thereby I hope to add to the research palette of Certec; even if my designerly research may in some respects be closer to artistic research (Borgdorff, 2012) than to that of the otherwise prevailing human-computer interaction (HCI).

What I have here outlined is an *engaged design research*; a research that gets involved in a real world setting, and does so with a will to change by explorations of and by actions, artefacts and materials.

Dissertation outline

The dissertation is structured as follows:

In chapter 2, **Programme**, I introduce my design research programme, which stands for both a knowledge quest (the *design programme* per se) and ways to pursue it (the *programmatics*). I outline my research interests as well as the SID Project that forms a basis for my research – in conjunction, the two lead up to the outlining of my design programme. The design programme is framed by what I call *desiderata* and *foci.* Behind it all, lies the *sentiment* of *tangible participation* that permeates many aspects of the research throughout the dissertation. I conclude chapter 2 by portraying this sentiment and pointing to its influences.

With the sentiment comes an appreciation of the concrete and evocative. Thus, it is only natural to move on to present my designs in chapter 3, **Design Imaginations.**

I here present the designs as concepts made real, which are to be seen as what Johan Redström calls suggestive "sketches" [Swedish term used: *utkast*]. As a set, the designs make the "possible present" and thereby aid to mature the programme. (In addition, the reader will in chapter 6 become acquainted with the designs through descriptions of their qualities, and in chapter 4 see the designs function as collaborative research vehicles). The videos in this chapter are an integral part of the dissertation (CD and links are provided).

Staying with the concrete project work, Chapter 4, **Engagement**, traces design processes in relation to the pedagogical praxes. This serves to show the grounding of my knowledge contributions on design qualities as well as to provide examples of designerly ways to engage praxes. I indicate where I try new ways – especially concerning the children's role. In these efforts, the designs are seen as shared nexus of exploration.

Taking a step back, chapter 5, **Heritage**, describes how I see my research as *designerly*. Since design research – in the field generally known as Research through Design – is still searching for a foundation on knowledge construction, I have not only had to account for, but also add to the discourse on such matters. This chapter addresses the kind of knowing my programme is about; it conceptualises design processes as those mentioned in chapter 4, as well as knowledge domains including the one in chapter 6 – in sum, a tentative model of designerly research.

Chapter 6, **Potentials**, presents a number of knowledge contributions on design qualities, what I call *design potentials,* which is about making the possible present. I start with three *aspects* of interactive Snoezelen developed together with the staff. Looking back on the sum of articulations and especially the aspects, I sum up the design efforts at large into *a holistic take*: *designing for engagement*. From there, I move on to salient traits of this take and the design work at large. I conclude this chapter by providing a generative *lens* on each of the desiderata of the design programme. The video in this chapter is an integral part of the dissertation (CD and link are provided).

In Chapter 7, **Criteria**, I examine the criteria for and reach of my research contributions.

Ethics

> . . . procedures often exemplify the problematic nature
> of people being labelled as vulnerable.
> Ethical processes are often guilty
> of focusing on what people cannot do rather than what they can.
> As such, people with certain vulnerabilities may be excluded
> from experiencing experimental technologies
> that might bring great personal benefit to them.
> ...Hindering the inclusion of vulnerable people in research
> denies them access to what many excluded groups need most:
> a chance for their voices to be heard.
>
> *Vines et al. (2014: 46)*

My research is based on a project with children with profound disabilities and pedagogical staff. A crucial part of setting up any design project in situ is ethics; and this is no less so, when working with so-called *vulnerable* people and especially with people who depend on others to speak for them (Jönsson et al., 2005). For both project and research, a variety of ethical concerns may call for special attention in relation to the children and their parents/guardians as well as for the practitioners in various roles.

The research underwent a formal ethics committee approval. Yet, the concerns outlined below go beyond the scope of this approval, which is primarily concerned with informed consent and not tailored to cover ethical implications of design processes. However, I will not detail the practical safety concerns when using electricity, nor the concerns that any Snoezelen practice may have when they change equipment.

As Vines et al. (2014) point out in the above qoute, using terms like *vulnerable* are problematic if this leads to biased perceptions of individuals by emphasising what they are unable to carry out, rather than what they can. Furthermore, this view can lead to exclusion, thus denying these groups a say in the development of technology. By contrast, the SID Project takes the children and the richness of their actions as a starting point, and with agency as a key concern. This can be seen in the ambition to explore potentials for the children's participation in Snoezelen as well as in the intention to have the children affect formative design orientations rather than being mere objects of study. Thus, it is only natural that

the images of the children tend to show them as the able actors they are [see Figure 1.3]. In the SID Project we have obliged ourselves to take great care to keep the interests of the child in mind at all times when using images.

Figure 1.3.
Portraying the children as actors.

The last point is also part of a set of concerns around the parents and guardians giving consent to the children's participation in the SID Project. Parents and guardians filled in a consent form outlining the use of visuals and my research interest therein. Several options were available, so that agreeing to the publishing of videos was not a requirement for participation. The different options were used, and the project leader and Snoezelen staff took great care to ensure that the form's content were understood across languages and backgrounds, without the dialogues 'pulling' a consent. Moreover, the form states that the participants can change their mind at all times as well as withdraw without any consequences or explanation.

The same consent form was used for the pedagogical staff and the design team. Here, it crucial to note that the staff's practice and their participation in design processes are not the subject of my research per se. Thus, there are limits to my representations thereof.

Tying back to the concern for people with disability to affect research, the role of participants and interest organisations in research is an important concern. The Swedish National Association for Persons with Intellectual Disability (www.fub.se) was one of the partners applying for the project and has had close

ties to the other partners. The project stems from this long-term cooperation and shared concerns. As mentioned, the project and my research seek ways for the children to affect formative design orientations, so this topic will be thoroughly addressed in later parts of the dissertation [see chapter 4, 'Engagement'].

By the project's very nature, the pedagogical staff has taken part in articulating and discerning qualities, as I will describe in later chapters. They also had a key role in selecting the participating children. In the selection process, it was remarkable how difficult it was to obtain positively defined information about the children from other institutions. This can be seen as related to Vines et al.'s point on the risks of viewing people as vulnerable, even in the pedagogical sector.

2

PROGRAMME

Programme & programmatics
Pedagogical praxes
SID, the project
Research landscape
The design programme
The sentiment

This chapter outlines my design research programme, Tangible Participation. The design research programme *at large* stands for both a knowledge quest (the design programme per se) and ways to pursue it (the programmatics).

Design research by a programme is about making the possible present (Redström, 2007: 170) by populating and exploring a design space in the richest sense of this concept [see 'To explore a design space' in chapter 5]. In my research, this has been done in and through a long-term engagement with pedagogical praxes. After an introduction to programmatic research, I present the pedagogical praxes and outline my research interests. From this dual background, I then present the design programme, which frames the research in its exploration of potentials in interactive tangibles for promoting and enhancing the children's engagement, their participation in the interplay, and their feel of affecting the world.

Programme & programmatics

I frame my research by a programme and thereby inscribe my research into a field of design research emerging in recent years. The concept of *design research programmes* can be traced particularly through Johan Redström's and Thomas Binder's research (Binder & Redström, 2006; Brandt & Binder, 2007; Redström, 2007; Brandt et al., 2011; Koskinen et al., 2011; Redström, 2011). I would also like to point to the work by Bang & Eriksen (2014). In addition, programmes have been used by several doctoral students in Scandinavia (Hansen, 2010; Bang, 2011; Eriksen, 2012; Broms, 2014; Hobye, 2014).

Across the literature, the concept of a programme has had varying definitions as well as application fields and levels. The various conceptualisations may not all be commensurable, but by their very diversity they have served well – both as a basis for appropriating the concept of programmes to create a framing suitable for my research and as an explorative format for design research (Redström, 2007: 165). I explore possibilities in a programmatic approach specifically for designerly research rather than for bridging disciplines, and my programme concerns designs

and their qualities, not design methods per se. As already indicated, Redström's text from 2007 here stands as a main inspiration.

My research is driven by a programme and its design processes. The research is about making the programme come alive by enriching it with designs and design experiences from which salient traits of design qualities may emerge. In this way, the programme matures – yet, not by a simple linear progression or with an absolute starting or ending point. Nor are the explorations and wonderments confined to a fixed pre-set of rigid research questions/hypotheses, or to a predefined set of outcomes. Rather, my programme is set up by a number of *framings* (desiderata, foci and a sentiment), which in total continuously guide the research in exploring a design space. These initial framings co-evolved with *articulations* in and around the design artefacts (i.e. designs, videos and tales of experiences). In total, the framings and articulations evolved to mature the programme and ultimately served as a base for knowledge contributions [see 'Tangible knowing' in chapter 5].

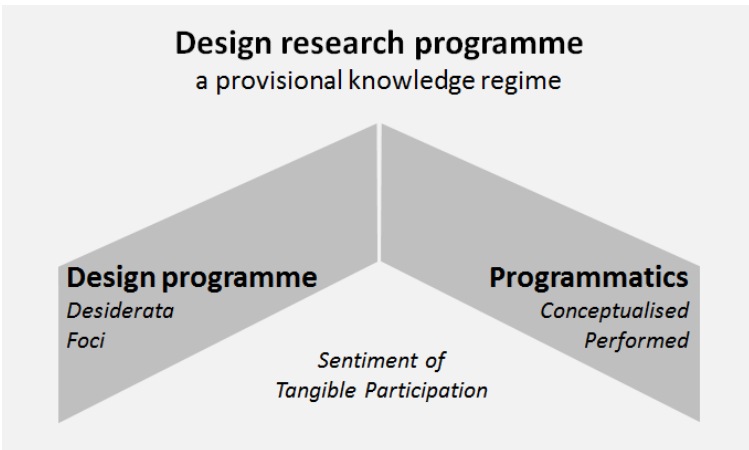


Figure 2.1.
The two sides of a programmatic design research. The knowledge quest (the design programme) and its match in knowledge construction (programmatics).The sentiment is reflected in both, and together the two form a provisional knowledge regime.

Through its openness, my programme is intended to embrace complexity by designerly processes including tacit knowledge developments and non-discursive articulations across various participants, their roles and disciplines. Here, knowledge contributions on design qualities along *the design programme* co-

develop with the *programmatic side* of the programme of how knowledge construction is performed [see chapter 4, 'Engagement'] and conceptualised [see chapter 5, 'Heritage']. I foreground this tight coupling of knowledge quest and knowledge construction to explicate that they match each other and are both guided by the sentiment. Through this tight coupling of programmatics and design programme, the programme at large *establishes a provisional knowledge regime* (Binder & Redström, 2006) [see Figure 2.1]. It is a regime that is provisional in the sense that it may not claim to be the only possible regime or to be generally applicable, but rather its virtue lies in being suitable for engaged design research by negotiating the need for situated design processes and knowledge construction. Thus, ultimately such a 'regime' may also seek new land rather than falling prey to hegemonies from established disciplines (Gaver, 2012) given that designerly research is still in its infancy (Löwgren, 2007a).

Summing up, working by a programme first and foremost marks a quest to 'populate' a design space, and thereby explore it. Yet, it also entails a view of knowledge construction. This duality is mirrored later in my approach to engage a pedagogical field. But first, I need to address the connections between my research and the development work in the SID Project.

Pedagogical praxes

To situate the programme, I will now introduce the pedagogical praxes and the project on which my research builds.

Snoezelen

> Snoezelen does generate well-being and has a relaxing effect.
> It calms people down, but also activates.
> It awakens interest, it guides and puts stimuli into order,
> it awakens memories, organises a person,
> takes fear away and offers a safe environment.
>
> *Roger Hutchinson in Gaudion (2011)*

Given my sentiment of *tangible participation*, I see a very inspiring field in the so-called multi-sensory environments (MSE) as sensory artefacts here play a key role. My interest concerns pedagogical efforts incorporating the conceptual framework of Snoezelen (NB Since 1983, *Snoezelen* is also a trademark owned by Rompa Ltd).

The international network for Snoezelen, ISNA/MSE, provides this current "definition" of Snoezelen:

> . . . a dynamic pool of Intellectual property built on an ongoing sensitive relationship between the participant, the skilled companion and a controlled environment, where a multitude of sensory stimulation possibilities are offered. Developed in the mid 1970s and practiced worldwide, the MSE/Snoezelen is guided by ethical principles of enriching quality of life. This shared approach has applications in leisure, therapy, and education, and takes place in a dedicated space suitable for all people, particularly those with special needs including dementia and autism. (Isna-mse.org, n.d.)

Multi-sensory environments are becoming increasingly popular worldwide and can be found in over 30 countries in both educational and clinical settings (Haegele & Porretta, 2014). There is a very diverse movement around Snoezelen of both pedagogical and therapeutic efforts. What is shared by most is the aim to facilitate beneficial sensory experiences to people with profound and often multiple disabilities (e.g. autism, dementia, intellectual disability, as well as sensory conditions) and to do so without having to rely on verbal communication. Given the diversity of the Snoezelen movement, I limit my descriptions in the following to elements relevant for my research. Moreover, the terminology is mine, coloured by years of engagement with the field, and thus, pedagogically inclined.

My interest in Snoezelen relates to its emphasis on the importance of sensory experiences for opening the world to the participant involved and – vice versa – for the participant, to embrace a world that may otherwise often be perceived as chaotic, incomprehensible or clouded by other concerns. Thus, Snoezelen is all about the very core of being, even if it may just be of a brief moment. Put differently, Snoezelen aims to provide experiences that matter profoundly (Vetner & Jantzen, 2006).

Rather than being guided by hardened practice (Björgvinsson, 2007) or elaborate theory, Snoezelen at its core is a very pragmatic and situated approach to finding possibilities for the person at hand, hence the plurality of practices: “We do not wish to give development and therapy a central focus within Snoezelen. It is fully open. We do not declare aims beforehand.” (Hulsegge & Verheul, 1987).

I will point out common grounds within Snoezelen through tales of its historic origin rather than dwelling on disputes. While one can trace efforts back to 1966 (Gaudion, 2011), a commonly agreed starting point for Snoezelen is the work by Jan Hulsegge and Ad Verheul in the 1970s. They set up an “experimental sensory tent filled with simple effects such as a fan blowing shards of paper, ink mixed with water and projected onto a screen, musical instruments, tactile objects, scent bottles, soaps, and flavorful foods” (Snoezeleninfo.com, n.d.). From the success of experiences similar to the tent, an international movement followed around the concept of Snoezelen. The term *Snoezelen* contracts two Dutch verbs: *snuffelen* (to sniff/seek) and *doezelen* (to doze/relax) (Hulsegge & Verheul, 1987). This duality indicates a key trait, as Snoezelen promotes a match of “stimuli” and “arousal” that enables the participant to find the calmness or the impetus needed to engage in the world.

Figure 2.2.
Snoezelen rooms, SID project. A *White room* (left) and a *Sun room* (right).

At the centre of the Snoezelen activities are the creation and adaption of an environment and the construction of dedicated Snoezelen rooms [see Figure 2.2.] in order to provide the participant with rich experiences, and to do so in a non-directive way. A key trait here is seeing the staff’s role as enabling rather than

directing: "…a sensitive, caring, non-directive approach in which an atmosphere of safety and security is created and free choice encouraged" (Haggar & Hutchinson in Flaghouse, n.d.). In a similar vein, the pedagogical staff in the SID Project described Snoezelen as interactions between themselves, the children, and the artefacts, where not goal-driven or even unforeseen possibilities emerge. This very open and emerging character is important to keep in mind.

Snoezelen has been described as "another world*"* (Hulsegge & Verheul, 1987), and indeed being with the children in the SID Project has been a uniquely generative experience illuminating the diverse ways humans engage (in) the world. Given this and the open character of Snoezelen, any assumption about a design space may be challenged. Thus, formative design orientations must be based on the children and the praxes in actu.

While many aspects of Snoezelen may resemble other pedagogic or therapeutic activities in related areas of disabilities, two key features of Snoezelen stand out and are closely related to my research interests. One is the focus on the senses and the other is the unparalleled use of sensory materials.

The senses

> The way we use our senses to engage with the world strongly influences our conception of the world.
>
> *Pagliano (2012)*

A distinctive trait of Snoezelen is its focus on the senses. Yet, this focus is addressed in very different ways in the literature on Snoezelen by authors such as Ed Verheul, Jan Hulsegge, Krista Mertens, Paul Pagliano, Jill Shapiro, Martina Dennerlein, and Lesley Collier. What is shared is an enigma of the senses as a path to richer experiences and involvement.

Especially two concerns within Snoezelen regarding the senses have been of interest to my research. Firstly, to cater for a variety of senses. This concern builds on inspiration from theories of sensory processing (e.g. Ayres, 1997; Pagliano, 2012), but may be of wider relevance, for instance, in relation to thoughts on perceptual strength in the widespread pedagogical theories of learning styles

(Dunn, 1990). For design, this points to the diversity of sensory preferences permeating our very engagement in the world.

Secondly, some strands of Snoezelen emphasise the proximate and especially the interoceptive ("bodily") senses, in opposition to the dominance of audio-visuals (e.g. Pagliano, 2012). Such interests are shared by Interaction Design around terms such as *tangibles*, *corporeality* and *embodiment*.

Sensory materials

> This specially designed sensory physical environment
> together with the input of the "enabling practitioner" . . .
> aims to maximize a person's potential to focus on his own free will and to engage . . .
>
> *Friendsofdawid.com (n.d.)*

Intimately connected to the focus on the senses is the extensive and pervasive use of sensory materials, unparalleled in the world of pedagogy as Snoezelen rooms are literally packed with sensory artefacts and electronics.

Figure 2.3.
Pedagogy and technology development. This image enigmatically captures the contrast (i.e. bottom vs top) between an engaged relation building on years of pedagogical development, and the distanced set of designs that are void of contemporary interactive technologies. (My statement is in no way a comment on the depicted Snoezelen practice.)

Figure 2.4.
A selection of existing designs used in Snoezelen. Top row: Non-interactive, tactile sensory designs. Bottom row: 'Waving in the air' interfaces.

Figure 2.5.
A selection of existing designs used in Snoezelen. Top row: Three “switches” to change colour. Bottom row: Hard surfaces as interfaces.

When first encountering Snoezelen in 2008, I was struck by the contrast between a pedagogy that had developed and diversified since the seventies, and then the technology of the designs, which did not seem to have coevolved with the practice as very few designs went beyond mere push buttons with regards to interactivity [see Figure 2.3-2.5]. However, recently some interactive designs have come about, but they tend to lack more elaborated behaviour and/or are screen-centric. A very recent best practice guide of Snoezelen in relation to dementia may capture the current state of affairs, as the guide not only segregates senses and interaction, but also exclusively shows the latter – noticeably called "high tech" – in form of "switches" with some possibility for adjustments (Jakob & Collier, 2014).

To the best of my knowledge, such lack of technology development is not engrained in the tradition of Snoezelen or indeed in the professions involved. One of the staff in the SID Project even stated that she missed the possibility to control and alter the electronic artefacts in the same ways as she, through her profession, was used to doing with for instance wooden artefacts. Furthermore in the early days, Snoezelen staff even built simple reactive floors themselves and stated for instance ". . . there is technology, enabling us to create situations for unique experiences that could not be realized otherwise" (Hulsegge & Verheul, 1987: 32,78).

One contributing factor to the limited use of electronics could very well be the questionable usability of existing products as well as a tendency to import designs from other and bigger markets. Yet, the trouble seems to even concern aesthetics as the following critique may indicate.

In recent years new technologies have begun to seep into Snoezelen rooms. In one of the few design research efforts within Snoezelen, Gaudion (2011) has made some fantastic design work, which she describes as "low-tech" to contrast these to new-coming digital technologies:

> The evolution in materials and new technologies is evident in the MSE, where the simple low-tech props of the past are being undervalued and the complicated remote control, switch-operated and single sensory screen-based activities are taking the lead. . . . Though they both hold advantages and disadvantages, it is important to consider whether simple low-tech playthings will offer similar, or even better, sensory experiences than the high-tech play

> equipment, which can be expensive and high-maintenance. . . . My observations reveal that the low-tech playthings in the MSE offer greater material variety, which often hold multisensory properties. (Gaudion, 2011: 132)

While I regard this as a relevant criticism of the import of new technology with poor usability as well as a sound call for a continuous questioning of the rationale behind the use of any sensory materials, I think this criticism risks casting a false dichotomy between the sensuousness of concrete materials and the potentials of digital behaviour. By contrast, I seek common grounds by exploring potentials of sensuousness in tangible interactivity, all with the aim to challenge and transgress the criticised state of affairs.

Given the stipulated role of the senses and the extensive use of artefacts in Snoezelen, a designer might assume that concepts of aesthetics would prevail in Snoezelen – yet, that does not seem to be the case. A recent article by Sagen et al. (2014) sees the connection, but otherwise I have only seen the word *aesthetics* in a book by practitioners, where it was mainly used to label non-directed activities (Andersen & Flendt, 1994). Thus, my research may aid by addressing the aesthetics and role of the Snoezelen artefacts; especially as Snoezelen and the pedagogical field at large seek ways to make digital artefacts an integrated and reflected part of their professional judgements.

As praxes

I have chosen to relate my research closely to Snoezelen as *praxes* [see below] rather than trying to capture it as a theory or a movement. Not just because of the lack of hardened ways and the limited theoretical base, but primarily because I – as assumingly also the founders of Snoezelen – see the deep value of situated professional judgement.

By the term *praxis* rather than *practice,* I wish to emphasise professional judgement [Danish: *professionel dømmekraft*] (Olsen, 2009; Buus et al., 2010/2011) tied to the embodied knowledge accumulated through years of practicing a profession. Such competencies go beyond what is solely tacit and implicit, because they are developed in an interplay of concrete experiences and

professional framings. Furthermore, the term *praxis* marks a situated (Rolfe, 1996), open (Hansen, 2008), creative and risky engagement, which is first and foremost expressed through actions:

> It is not simply action based on reflection. It is action which embodies certain qualities. These include a commitment to human well-being and the search for truth, and respect for others. It is the action of people who are free, who are able to act for themselves. Moreover, praxis is always risky. It requires that a person 'makes a wise and prudent practical judgement about how to act in this situation'. (Smith, 1999, 2011)
>
> . . . imagination, creativity, language, intuition and vision (to name a few) need to be considered and therefore the need for a closer look at praxis using an aesthetic focus becomes more necessary. (Penney & Warelow, 1999)

With my background of being both a schoolteacher and a designer, I see here fertile common grounds. For example, educations for both design and the caring professions (e.g. Feldsted, 2008) draw on Donald Schön to move beyond instrumental approaches. In addition, within pedagogy concerns are raised around theory-vs-practice and the role of evidence in human-centred and future-oriented practices, which echoes concerns in design research.

Moreover, seeing the Snoezelen places as arenas of praxis is a key to understanding the design processes in the SID Project with their participative and explorative nature, where the development of designs and pedagogical praxes go hand in hand. Here, the praxes evolve as part of design processes and particularly around the suggestive and manifest character of the design artefacts. Reciprocally, the praxes offer rich grounds for a designer-researcher, where design processes gain depth and richness from the actions, discernments and reflections of the staff. Chapter 4, ‘Engagement’, must be read in the light of this appreciation of praxes.

However, with such expectations, the staff in the project need to engage deeply with a will to develop views and to do so from a base of continuous engagement in Snoezelen. While I as a researcher may wish for this kind of engagement, I am also aware that this is indeed a tall order, which one should be careful to ask for. Consequently, as one of the Snoezelen places did not have a daily Snoezelen praxis, my research predominantly rests on the cooperation with the other two Snoezelen places in the project.

SID, the project

The design work presented in this dissertation took place in the SID Project (http://sid.desiign.org). The project was primarily funded by The Swedish Inheritance Fund (www.arvsfonden.se) together with contributions by the Danish municipality of Gentofte. The project was applied for Certec, the Swedish National Association for Persons with Intellectual Disability, and as project owner, the research and development unit of the non-profit organisation Furuboda Association in Sweden (http://furuboda.org).

The project comes out of the long-term connections between the involved organisations. The project background also includes my previous design projects; among them one at a Snoezelen place and another with one of the children involved in the SID Project.

The participants were school age children with profound intellectual disabilities and pedagogical staff from the following three institutions in the Øresund region: *Safiren* in Malmö (S), *Dumle* in Lund (S) and *Snoezelhuset* in Gentofte (DK). From each of these institutions, four to eight children and two staff members participated.

Over the three years of the project (July 2010 - June 2013), I was the interaction designer in and the design lead of a diverse team of students, makers, designers and engineers, which changed over time – henceforth referred to as 'the design team'. Together we covered the various tasks in relation to physical computing as well as sound, textiles and other physical materials. The project leader and the main engineer are also researchers at Certec.

The aim of the project was to explore potentials in interactive designs for the pedagogical praxes and to do so with attention to two key dimensions addressing the participation of the children: Firstly, to explore potentials for promoting and enhancing the children's engagement, their participation in the interplay, and their feeling of affecting the world. Secondly, to explore ways for these children to affect formative designerly orientations.

These ambitions of the project were carried by the words that make up its SID acronym: Sensuousness [Danish: *sanselighed*], Interaction & Participation

[Danish: *delagtighed*], which also stand as the desiderata of my design research programme.

The deep engagement indicated by the term *pedagogical praxes* is mirrored in the design processes. Also here was the project demanding for the staff, as they were not merely testers or informants in a process run by a waterfall model, but participants in exploring a design space.

The design processes embraced praxes through designerly processes of inspiration, debate and sketching. Here, designs for workshops as well as for interventions took part as crucial articulations across various types of actions and human faculties and as shared nexus of explorations. I call such design processes and the way they relate to the programme *design engagements*, and closer descriptions of how such are performed follow in chapter 4, 'Engagement', and conceptualisations thereof in chapter 5, 'Heritage'.

Project vis-a-vis dissertation

In relation to design knowledge, the SID Project primarily aims to inspire providers for and professionals in Snoezelen and related fields by evocative artefacts and rich descriptions of practices. This is not identical to my research aims [see Figure 2.6]. My research takes the project further into a programme that serves research interests around design qualities and design processes as well as knowledge construction in designerly research. At the same time my research is narrower, as the development of pedagogical practice is not an explicated part of the knowledge contributions in this dissertation given its emphasis on design matters.

In the SID Project, developing the pedagogical practice and design qualities come before providing thorough accounts of the processes involved, even though the research with regards to design processes may thereby be weakened. The reason for this prioritisation was simply that the research ultimately rests on a project in which such second order perspectives may hinder, take precious time from, and go beyond the scope of the project.

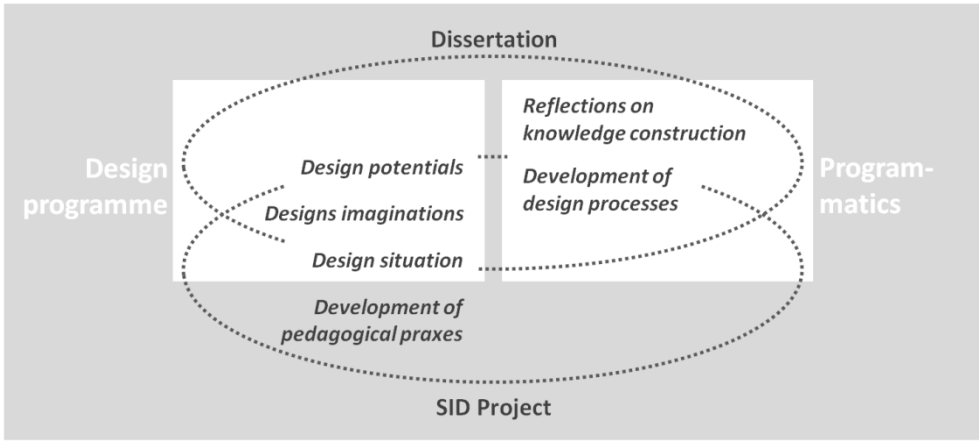


Figure 2.6.
The relation between my research at large, the dissertation and the SID Project. The research at large – as carried by programme and programmatics (white boxes) – set in relation to the SID project (lower circle) and to the scope of the dissertation (upper circle). Reflections on knowledge construction fall outside the project. The design processes and design potentials is taken further into a research programme. The development of the design situation is partially part of the dissertation, while the purely pedagogical development is not.

Nonetheless, the SID Project provides an inspiring place of action for my research. The project aligns multiple resources, competencies and experiences needed for a designerly engagement, but also inevitably draws together interests – personal and disciplinary – that may indeed vary considerably. Thus, what can be aimed at is "generative collisions" [Swedish: *fruktbara kollisioner*] (Hillgren, 2007) around shared activities through sense-making in diverse ways, rather than solely mutual understandings, let alone unison interpretations (Telier et al., 2011: 165f). Yet, with a view of design as a way to raise concerns and controversies (Telier et al., 2011), such are inherent traits of the game.

Design space delimitations

The SID Project addressed Snoezelen as played out in the praxes. Yet, not everything happening was of equal interest. Pedagogical interplays that could be carried out in any other context or without designs, might be part of overall descriptions, but not central to the SID Project's exploration. For example, a view of Snoezelen as simply being communication set in an environment that is sensorily tolerable to the user, may be tangential to this delimitation.

Similarly, the aim was to explore possibilities – not merely repeat what was more or less already there in the praxes. For example, while the SID Project raised the awareness of the children's exploration of small self-produced sounds, the agenda was not to make just another drum. Instead, with the designs I have tried to promote richer engagements than the initial effect of a hit and a curiosity on how sounds could be part of something more. Another example was the prevailing use of vibration, where some of the staff produced small boxes in which pressing the lid set off a vibrator. Our goal would not be merely to refine such coarse interaction, but possibly to make vibration a part of some richer interactivity.

To work in a project like SID requires a wide set of delimitations to focus the efforts:

We could not take interpretation of cultural codes for granted; so, for instance, learnt musical qualities were not to carry a design. Similarly, input by fingertips or output of detailed figures were not to carry a design, as we did not want to require fine motor skills and acute vision.

On an artefactual level, the focus was on the objects that the children are in direct contact with; not the room as a whole. The main reason for this is that close encounters are predominantly the realm of the children's main attention rather than faint lighting or distant objects (One might have chosen differently; for instance, to design for stretching the attention into space). This is not to say that the ambience of the room is totally without relevance, or that it does not affect other users of Snoezelen or indeed the staff.

The design concepts also had to operate with practical delimitations. In order not to complicate moving the designs between the three Snoezelen places, the design concepts do not include whole environments. Wearable computing was not addressed, as the children might have objected or required individual adaptations.

Research landscape

Having addressed the project and its pedagogical field, I now turn to research perspectives. Together, the project and research perspectives lead up to the formulation of my design research programme.

For the Snoezelen staff, the foundation for engagement is coupled to the sensuousness of the designs they have in their Snoezelen rooms. This raises a curiosity on how interactive tangibles could play a role in Snoezelen. Within the heritage of the design field at large, such a curiosity could relate to concerns labelled the richness in "form" (e.g. Redström, 2013), "gestalts" (e.g. Lim et al., 2007) or even broader as "aesthetics" (e.g. Petersen et al., 2004) – notwithstanding diverse or even contradictory definitions of these terms throughout the many avenues of design.

In relation to Snoezelen, I see aesthetic qualities as part of the richness of the everyday (e.g. Wright et al., 2008) and of broader issues such as "flourishing" (Pagliano, 2012) and *becoming* within pedagogy, which cannot be reduced to or instrumentalised as a specified function as, for instance, "the what" of aesthetic interaction (Lenz et al., 2013).

In continuation, I situate my design research within a perspective of "aesthetic experience" (Petersen et al., 2004) evoking notions of curiosity, engagement, imagination, exploration and contemplation as it moves beyond tool and media perspectives as well as beyond efficiency and superficially added fun. In exploration of such matters, I see human faculties as a whole and the artefacts being imbued with behaviour by the totality of physical and digital means. In this view, aesthetic experiences come about in engaged entanglement with artefacts that behave by the very doing and feel of one's body in relating to a rich material world, where richness also entails digital behaviours. Such engagements go beyond detached observation of art, mere channels for communication or tools for external goals.

The aesthetics of my design work lie in the sensuousness opening up for and sustaining a multitude of engagements. As Bardzell (2009b, slide 39/ time 24:42) advocates in a similar vein: "Aesthetic interactions should appeal to our senses and

our intuitions in deep and satisfying ways". Such engagements relate to thoughts on embodiment that have been embraced by Interaction Design with increasing strength and breadth over the last decade. Paradoxically, however, these efforts tend to stay shy of corporeality (Sheets-Johnstone, 1999) and are often without a deep concern for the concrete attributes of the designs. Thus, as Levisohn & Schiphorst (2011) remark: ". . . the awareness of the body from the inside, is one of the primary components of movement experience, yet its resource for technology design is not yet fully understood within the field of Human-Computer interaction". In continuation, my research interests concern how the experiences of one's body are always part of the total experiences.

Related moves can be seen within design academia (e.g. Larssen et al., 2007; Levisohn & Schiphorst, 2011; Hobye, 2014; Höök, 2014), with key inspirations from a broad field of theory across predominantly phenomenology and recent neuroscience (e.g. Johnson, 2008) as well as *Somaesthetics*. Somaesthetics' growing rapport with design is reflected in a recent video-interview with Richard Shusterman (2014. Video4: 6.00), which noticeably also contains an inclusive mind-set in designing for diversity. Here, I must stress that my research relates to design research per se and does not intend to add to or apply the above-mentioned non-design disciplines.

An extended materiality

> To understand the presence of technical objects,
> we also need to consider the materials that build them.
>
> *Redström (2005)*

From concerns of corporeality, I move to my view on the materiality of tangibles. This is a key to understanding the programme, and I will address materiality in relation to both *use* and *making/sketching* (Jung & Stolterman, 2012).

When the SID Project started, the aesthetics of tangibles was in its infancy. Here, I see my work as an answer to Robles & Wiberg (2010: 137) as they in relation to dichotomies between *physical* and *digital* point out that "a chief challenge for physical-digital designs is taking seriously a paradigm shift in which we ask not what is different but rather what is alike about materials".

My view on tangibles draws upon my background of also being an experienced glassblower and a crafts teacher cherishing temporal dimensions in *experiencing* traditional materials: Not only in terms of shapes suggestive of movement or in turning a piece of cut crystal to see the rich and intricate play of reflection and refraction, but even more so in the close engagements in performing my craft. Let me give just one example of the latter from *experiencing* interactions with the temporal and inner workings of a 'material' realm: For a proficient glassblower blowing a goblet, the habitual dance with the material is not solely based on direct observation or manipulation of the shape of the glass. Rather, it builds on a bodily sense of continuously adjusted co-movement with the glass over time resulting in the varied heat-distribution that shapes the glass as much a direct shaping and blowing.

My point here is to take a step away from separating 'digital' and 'physical' by treasuring the *experiential* qualities in the close and dynamic engagement in artisan's exchanges with their 'traditional' materials *in the making* and thereby feed imaginations of how to extend and expand such engagements into experiencing tangibles *in use*. From this experiential stance, what the digital side of tangibles can offer is to 'liberate' materials to evolve in a richer temporal dimension. Thus, I call this stance, an *extended materiality.* With this stance comes the challenge to envision a material realm come alive and become even richer.

Compared to non-computational designs, tangibles can be classified according to objective properties as having far more elaborate and flexible temporal traits such as *reversibility* and *computed causalities* (Vallgårda & Sokoler, 2010). Seen from an experiential point of view of use, however, tangibles are only meaningful as wholes. Accordingly, the starting point for my design work has not been to make separations like code-*versus*-matter or physical-*plus*-digital, but to think of all matters as potentially temporal and working by their totality of form(s). In such sketching/making, it is – again – not just objective properties that guide, but rather sensitivities to aesthetic potentials cutting across the separations. More concretely, it is not meaningful experientially to draw an impermeable division between code, sensor/actuator and other matter.

My design of *MalleablePillow* [see chapter 3] illustrates my view. In various stages of construction, elements are given separate attention, but they do not carry the design efforts separately. Rather , evoking the sense of touching light rests on the tactile form being tightly coupled to and co-developed with the temporal form by the construction of interrelated padding / microphone / code / light source / cover. It is the totality of form(s) in this design that carries both the use and the making.

In sketching/making, another inspiration can also come from craft, as Interaction Design needs to develop *sensitivities* to integrated temporal/material-based qualities through close engagement with the actual materials and their dynamics. Put differently, we need to *touch* realms of tangibles, of which we may still only have seen mere glimpses.

A sparsely populated cross-section

In chapter 6, 'Potentials', I will relate the research landscape just stipulated to my knowledge contributions on design qualities. However, two circumstances have constrained this effort. Firstly, given the engaged and bottom-up nature of my research, the descriptions do not uniformly start from existing Interaction Design theory, and thus, they may not easily fit into existing design vocabulary, concepts or frameworks.

Secondly, relating my research to existing Interaction Design research is impeded as very few researchers have addressed similar matters, or indeed the very same cross-section of research fields. For example, literature on interactive aesthetics (e.g. Petersen et al., 2004; Hansen, 2005; Schiphorst, 2009; Hobye, 2014) tends to address contexts that entail complex cultural or social codes, and thus are very different from the SID Project. Reversely, research relating to people with disabilities rarely goes beyond control and efficiency, let alone addressing aesthetic qualities as more than a mere add-on. However, there are noteworthy exceptions such as Andersson et al. (2014), where I see valuable aesthetic potentials albeit closely related to music and health issues.

Moreover, some of the aesthetically inclined Interaction Design literature unfortunately do not move far beyond simple means of, for example, meddling

with a message (e.g. Gaver et al., 2010) or a transmitted view (e.g. Gaver et al., 2004b). Reversely within HCI, interactive tangibles and elaborate behaviour are addressed; yet, such efforts tend to stay within an information processing paradigm as critiqued by i.a. Harrison et al. (2011) and Boehner et al. (2005) and/or solely "making digital information […] tangible" (Ishii & Ullmer, 1997) in what Gross et al. (2014) characterises as "physical-functionalist minimalism". Even when addressing experiential qualities, the projection of attributes well-known from the material world on to the digital – as in Löwgren's concept of *pliability* (Löwgren, 2007b) – may be relevant, but also almost obvious, when an artefact indeed (also) belongs to the material world.

In addition, prevalent paradigms seem to presuppose a generic human experience to be mapped/modelled (e.g. Bakker et al., 2009), which could potentially be at odds with both the pedagogical concerns of becoming and an appreciation of human diversity.

Given my uncommon cross-section of research fields, I may stretch referenced concepts beyond their exact field of application. Hence, some of the literature may partially be of limited relevance. The opposite may, however, not be the case as most of my knowledge contributions on design potentials relate to very foundational notions of being in the world, and thus, they may be of significance to many more.

The design programme

Having contextualised my research, I now turn to framing it as a programme. As my kind of design research sees design processes as the main source of knowledge, it is only natural to look closer at designerly knowledge construction. I will elaborate on such matters extensively in chapter 5, 'Heritage'. For now, I only address the concepts necessary to present my programme per se.

Desiderata as direction and volition

In line with Nelson & Stolterman (2003/2012: 112), I see design processes as driven by direction and volition, which I connect to my programme by addressing what Nelson & Stolterman (2003/2012: 42,105ff) call *desiderata*.

Nelson & Stolterman use the concept of desiderata in their conceptualisation of design processes, which I in turn extend to knowledge construction in designerly research; hence, in the following I include a research perspective not stated by the authors. Desiderata serve to name and aim the intentions roused out of a desire, a hope or the like. As such, desiderata go deeper than laying bare problems and needs, as the desiderata mark "the positive impulse born out of the desire to create situations […] that enhance our experiences" (Nelson & Stolterman, 2003/2012: 111). Desiderata are "the initiator of design action and designed change" (Nelson & Stolterman, 2003/2012: 117) and mark a beginning on the road to what the authors call the *expected unexpected* (Nelson & Stolterman, 2003/2012: 42), i.e. outcomes that capture salient intentions yet do so best by going beyond what could be imagined in the beginning.

As I see it, the designer-researcher is to *mature* the desiderata (Nelson & Stolterman, 2003/2012: 42) by embracing – to paraphrase Hansen (2013: 511) – a sense of something which does not exist as of yet, but nonetheless has appeal; i.e. driven by Hansen's key term, *wonderment* (Hansen, 2013: 355ff). With Hansen, I see such engagements as building on openness and on sensitivity across human faculties. It is in this light, that I use the word *exploration*.

In my research, the programme carries the engaged openness just described, and because it is research rather than commercial design work, the outcome of

maturing the desiderata is design imaginations and design potentials more than products-in-spe. Such research is not driven by rigid research questions (Redström, 2011: 2.1.; Borgdorff, 2012: 164; Löwgren et al., 2013), but by desiderata that permeate the programme.

Furthermore, my programme can only be understood in the light of the engagement with the pedagogical praxes, where the programme also has to speak to the pedagogical staff and the design crew – not as external stakeholders, but as participants in a development project. For this, the desiderata also serve a communal movement by which the programme progresses.

The programme is also set up by what I call *foci*. While the desiderata in a very open way express core intentions, the foci serve to aid the deliberations with the staff around key concepts of interactivity. In the following sections, I present the programme's desiderata and foci. All have matured during the research; yet, I will try to present them in their primordial crudeness.

Finally yet importantly, the designs also take part from the very beginning as early embodiments of the programme. As such, the designs in the first workshop [see 'We've awaken the spirits' in chapter 4] and even the first *pastiches* [see 'Pastiches' in chapter 4] took part at a point in time, where the programme was still very tentative. Seen from this vantage point, these designs in a *germinal* way make the programme more tangible and evocative. This influence of the designs in setting up a programme are similar to how Bang & Eriksen (2014) view a basic function of design experiments "as initiators or drivers framing a research program".

The desiderata

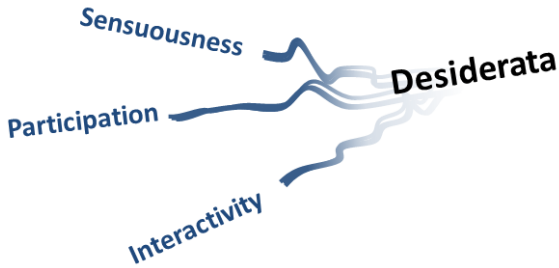


Figure 2.7.
The three desiderata of the *Tangible Participation* programme.

Nelson & Stolterman (2003/2012: 107) see desiderata as "the imperative voice of design", and that is how I see the programme's relation to my research: the programme is the imperative voice of my research. As mentioned, the acronym of the SID Project also stands for the desiderata of my research programme: Sensuousness, Interaction and Participation. These desiderata are very generic as they are stipulated directions for shared explorations, rather than concepts to be pinned down.

'Sensuousness'

Sensuousness – as the role of the senses and the significance of each of them – is a core tenet in Snoezelen; yet, it is still an underdeveloped field in Interaction Design. Sensuousness may point to potentials of using a broader spectrum of senses than the prevailing audio-visuals, but also to attunement [Danish: *stemthed*] (Fink-Jensen, 1998) as a road to engagement in the world. In other words, the senses 'colour' our experience and in various ways because we each have different sensory profiles. Thus, from the passion of Snoezelen, this desideratum advances the desire for interactive design to care for a wider spectrum of senses and promote richer experiences.

'Interactivity'

When initially pitching the project, I presented a criticism of the most popular and nowadays interactive Snoezelen design, the *Bubble Tube* [see Figure 2.8]. Building on an anecdote from one of the Snoezelen places, my critique of it

contrasted the limited workings of the design with the rich actions of a child using it. While the child explored the design in many ways, including the its vibration by touching it with his chest and teeth, all the design could do was react without nuances to binary input, screams or other machines. I questioned who had communication issues, the diagnosed child or the *Bubble Tube*. This is emblematic of the lack of rich interactivity in Snoezelen. Accordingly, from the aspirations of tangible Interaction Design, this desideratum advances the hope that interactivity can enrich Snoezelen.

'Participation' (in Snoezelen)

Where the two first desiderata can be seen as exchanges between Snoezelen and Interaction Design, the desideratum of participation is about what can come out of these exchanges in support of the children's participation in Snoezelen. The term, participation, is here to be considered as a non-trivial term concerning engagement. When the project started, this term was not as well established in the pedagogical field as today – especially in Denmark. The point with the desideratum has been the communal efforts to develop potentials for participation, not definitions. Thus from shared wishes, this desideratum advances an ambition to create and explore new possibilities for engagement.

Figure 2.8.
Explorations of a *Bubble Tube*

… in design processes

Beyond the desiderata of participation, the last term/letter in the SID acronym also carries a will to seek ways for the children to affect formative design orientations. I will address this quest in chapter 4, 'Engagement',

The foci

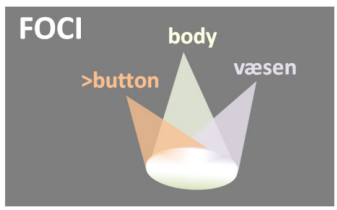


Figure 2.9.
The three foci of the programme.

The foci points to various aesthetic perspectives from which to address the desiderata. The foci are more purely related to an Interaction Design perspective than the desiderata, and as such, they can be seen as both ways to aid the praxes in coming to terms with interactivity, but also as potential perturbations of pedagogical praxes.

The three foci were introduced to the pedagogical staff without too much design jargon and carried by a variety of designs, tales and workshops.

'More-than-a-button'

Redström (2007: 169) suggests that sometimes the starting point of an exploration can best be grasped by negation. In the project, this focus point has indeed been labelled *More than a button*.

This phrase plays on the widespread use in Snoezelen of big on/off-buttons, which presuppose distance between the child's action and the feedback. In Snoezelen, where many participants have difficulties with cause and effect, such technology may represent a communication-related import from fields like the children's school and as such, the technology may be both well-known and useful in such contexts. Yet, given the very different character of Snoezelen, what if 'the opposite' of such buttons was tried out in order to enhance the children's experience of affecting the world?

This opening suggests, for instance, couplings with graduated feedback, where the amount of feedback relates to the amount of action, and couplings that co-locate input and output – such as in crumpling a piece of paper making it sound and change shape. Nonetheless, by its negated form, the focus point is very open.

‘Væsen’ ...in search of digital animism

Years back, as I was introducing the concept of interactivity to some Snoezelen staff for whom anything digital was associated with their alienating PC, I proposed that the existing artefacts could develop a *væsen* (a hard to translate Danish term for essential but possibly vaguely defined properties of an entity assumed to have some agency; being or having a spirit).

One of the staff promptly responded: “Many of the kids think so too”. This echoes Suchman (1987: 5) as she – in reflections on digital technologies – refers to children’s tendency to *attribute* life to physical objects. However, from an Interaction Design perspective, the focus point of *væsen* is not about ascribing agency, but about *actual* interactive behaviour in relation to the character and role of tangible artefacts as entities with some rudimentary agency. This interest is, however, not to be taken as a techno-centric longing for moving agency from humans to things.

The concept of *væsen* points to an interplay of transparency, autonomy and emergent order that may otherwise best be known from the realm of the living. However, the intention is not to imitate nature per se, but to explore richer ways for the children to interact. In other words, the curiosity is not on the level of resembling gestalts, but on the level of resembling qualities; thus, it does not reside in zoomorphic mimicry as known from robots and criticised by Dunne (1999) as well as Djajadiningrat et al. (2007: 23/32).

The focus point carries a sensitivity, which is both ancient and of the future: Only now can we start to see the contours of technologies, which fit the archaic belief that even a black rock can literally have rudimentary agency, a temperament or even cravings. This led me to the English phrasing of the focus point: *digital animism* – yet, without the intended reference to other uses of this term such as by Laurel (2006).

‘Body’

This focus point is about the experiential significance of engaging one’s body in using the designs. The focus point opens up for addressing the actual use of one’s body, and – especially – the sensing of one’s own body as part of the interaction

even when it is only felt as a readiness for action. As this focus point concerns a rather unarticulated aesthetic field, it may unsettle both design and pedagogy. Behind this focus point, lay profound concerns within Interaction Design of embodiment and corporeality:

> A lack of understanding of the importance of movement for cognition can only lead to an impoverished view since it ignores the way children (and all humans) create meaning through action. (Antle, 2013: 31)
>
> The awareness of the body from the inside, is one of the primary components of movement experience, yet its resource for technology design is not yet fully understood within the field of Human-Computer Interaction. (Levisohn & Schiphorst, 2011)

The sentiment

> Be-greifbarkeit [tangibility] as both palpability and comprehensibility . . . Tangibility denotes . . . manifold relations between meaning and comprehension, feeling and experiencing, thinking and perceiving, which intertwine in medial space
>
> *Robben & Schelhowe (2012) translated from German in Kaerlein (2012)*

I now describe the last component of the programme, the influences stemming from my sentiment, *tangible participation*. As the sentiment permeates my research, it has given name to the programme and in part to this dissertation. The sentiment points to a deep appreciation of engagements coupled to tangible things and especially the sensuousness therein.

By *sentiment*, I mean an underlying basic orientation or perspective. Being a sentiment, it is better seen in the effects it has than in exhaustive definitions. However, as the sentiment is an integral part of the programme, I need to introduce it now even though this inevitably involves matters not yet presented.

My research perspective is grounded in the sentiment, albeit without grand claims of evoking schools of philosophy. As the sentiment guides my work at large, it – albeit not its wording – predates the programme. Yet, the programme can been seen as one (of many conceivable) expressions of the sentiment.

The coupling of the two words in the sentiment – *participation* and *tangible* – carries its meaning. The concept of *participation* goes beyond merely taking part. This shines through in my efforts to enhance the children's participation in the Snoezelen interplay as well as for them to affect formative design orientations. Furthermore, the very construction of my research rests on a meeting of and reciprocal exchanges between design and pedagogical praxes. In these concerns for participation, various understandings of the notion of tangibility play a role in promoting the designs as being actionable and in continuation as communal nexus of explorations [see chapter 4].

The concept of *tangible* spans a wide set of relevant meanings and connotations relevant to my sentiment (Dictionary.com, n.d.-b; Merriam-Webster.com, n.d.). First of all, the term carry the meaning of significance and importance. This is reflected in that tangible things profoundly matter both in Snoezelen, in the design engagements and in my programme, but also in that design research is inevitably about what we can *do* with it (Dalsgaard, 2014) – how a world could be rather than laying bare its current state.

In Interaction Design, *tangibility/tangible* is mainly used to evoke a dual meaning of something palpable and comprehensible, which is echoed in my take on the design space [see chapter 6, 'Potentials'] and at large in the research field of tangible interaction that my research speaks into. In concordance with the introductory quote from Robben & Schelhowe, this duality also points to the involvement of various human faculties in design processes as well as generally in our engagements with things. As such, the notion also entails a view of knowledge development, where actions and engagements with matter matters, and which goes beyond dominance of the verbal and discursive. In continuation, with my concept of praxes, I do not see 'theory' as purely a field of abstract thought, nor 'practice' as solely actions, which shines through in my view on knowing [see 'Tangible knowing' in chapter 5] as well as in the appreciation of the pedagogical praxes [see 'As a praxes' in chapter 4].

Tangible can also mean *actual* as in staying with the actual designs and actions of children and pedagogical staff, and as in cherishing the rich concrete articulations as part of knowledge contributions. The notions of the actual and of addressing

various faculties extend further into the use of designs as manifest communal nexus of deliberations.

The potency of material things is also reflected in how I see my design material as I described in the section ‘An extended materiality’. Furthermore, the foci reflect the sentiment by pointing to engagements with rich materials. Examples of such rich materials can be seen in the designs presented in the next chapter.

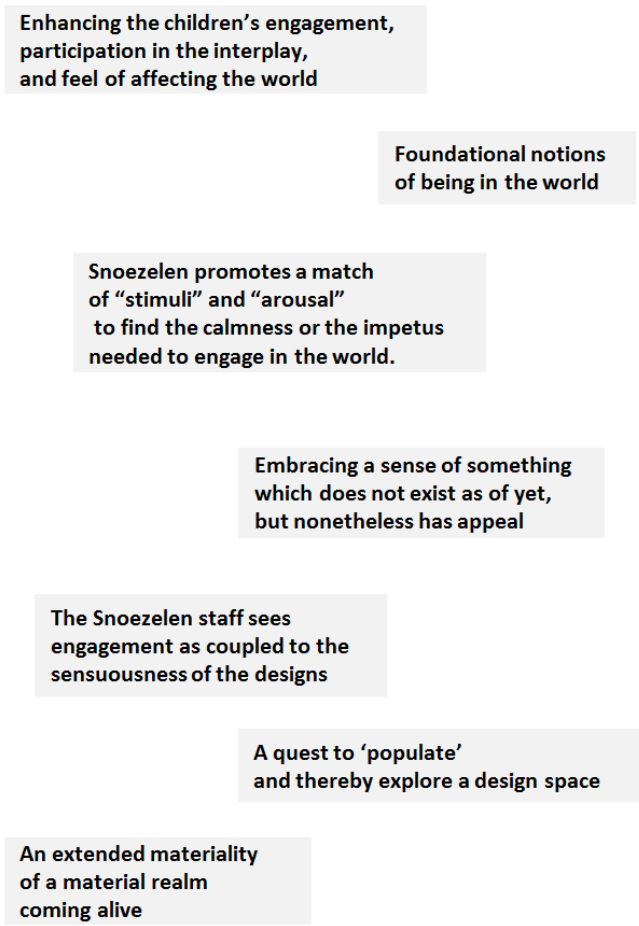


Figure 2.10.
Excerpts capturing key points

The sentiment,
an underlying basic appreciation
of engagements with things

To embrace complexity
by designerly processes

Desiderata mark the positive impulses
to create situations
that enhance our experiences

For interactivity
to enrich Snoezelen

To create and explore new
possibilities for engagement

To care for
a wider spectrum of senses
and richer experiences

The foci aid deliberations
with the staff around
key concepts of interactivity.

In a germinal way
designs make
the programme tangible

3

DESIGN IMAGINATIONS

ActiveCurtain
MalleablePillow
HugBag
WaterBed
VibeBoard
LivelyButton
LivelyForm

As mentioned, Redström (2007: 168) advocates that the aim of a design research programme is to seek and express alternatives by critical questioning and imaginations of change. Here, my designs both stand as research vehicles, as described in the next chapter, and as imaginations of change, as presented in this chapter. As imaginations, my designs should be seen as suggestive sketches making the possible present – not by being optimal solutions, but as a collective developing together to form a multitude expressing the programme's possibilities (Redström, 2007: 169-70).

I have chosen to present the designs now just after the programme in order to provide a closer and evocative feel for the design domain. I use this order even though the designs also stand as an outcomes in the sense of knowledge contributions that I in my conceptualisation of design knowledge call *design imaginations*, which is one out of three knowledge domains [see chapter 5]. The others are *design situation* and *design potentials*. As a *design imagination,* each design stands as a discrete and evocative unit, whereas *design potentials* concern salient qualities across the designs.

I also use the term *design imagination* to connect to Redström's thoughts on imaginations and to cut across terminology specifying the fidelity or degree of materialisation or having multiple meanings (as for instance with terms like *sketch* and *prototype*).

I will present seven designs. All the concepts are mine; yet, they are also outcomes of a multitude of ideation processes in the SID Project. I have had the final say in the execution of all the designs, but their actual construction and often significant parts of their sketching were outcomes of co-working with other members of the design team and for – two of the designs – also significantly with the Snoezelen staff [see 'Acknowledgements'].

There have been many more design concepts and even proper constructions – not to mention numerous variations of designs as well as designs made solely for workshop purposes. I selected these seven designs because they have been used by the children repeatedly, and thus, serve the quest for salient qualities, which I return to later in chapter 6, 'Potentials'.

My previous work in the field initially played a role, but essentially the designs all came out of the SID Project. Nevertheless, as the designs stand in the following, they are to be seen as concepts inserted into praxes that may even appear as somewhat detached and artefact-centric (yet, as next chapter will detail, they are certainly not).

Each design is not just a praxes-inspired brainchild, but an outcome of diverse engagements, including extensive sketching. My intention is not to detail the intricacies of the manifold, diverse and overlapping sketching and technical development processes among different sets of participants, but I do report on some adaptations and developments to aid the reading of later chapters.

At any given time, multiple designs concepts would be in my imagination and likewise in the making and use. Thus, I have not imposed a chronological order in their presentation, but instead I have chosen a narrative that illustrates how the designs both speak to one other and *together* explore a design space.

Figur 3.1 on next page.
The seven design imaginations

ActiveCurtain

Poking into an illusionary yet illuminated third dimension

This design is all about tying together body and projection.

ActiveCurtain is an elastic vertical screen, where any indentation will change the colour of the screen at the dent. Using a Kinect sensor, the design simply takes a coarse 3D-image of the back of the screen and projects it back through the very same semi-transparent screen; albeit, replacing the grey tones with a sequence of colours.

As one pushes the soft screen inwards, congruent coloured rings emanate from the point of indentation. It is as if one can poke into layers of colour hiding somewhere behind the screen or inside an illusionary third dimension of the screen. Together multiple points of indention can create more complex figures.

The physical feel of relating push to light varied with the way the screen was suspended: When the fixture was tight, the play of light gave a feeling of touch being very closely coupled to the amount of light, while – as the other extreme – it gave a frenzy feel, when the lower parts of the fixture broke. In the last version, the design went from wall to wall to increase its sturdiness and to allow for wider bodily and shared engagements.

We have used two versions of code: one where there is coloured light only near the indented point, and the other, where there is coloured light all over (and often in stripes, as the screen rarely stayed within the calibrated range). In early versions of the latter, there were two close layers of semi-transparent fabric giving the very first touch a feel of sharpening the image.

Figure 3.2 on next page.
ActiveCurtain. Top row: Making together. Middle rows: Bodily engagements. Bottom row: *ActiveCurtain* set-up. A projector (red circle) sends the 3D-image sensed by a *Kinect* (red rectangle) back onto the screen (right hand side) with a coloured spectrum according to the depth of the indentation.

Video on CD (link: https://vimeo.com/user1928557/activecurtain)

MalleablePillow

Touching the ephemeral material of light

This design, *MalleablePillow,* goes further than *ActiveCurtain* in exploring ways of affecting light, as here light is connected to a tactilely rich process, where one's press is felt and closely coupled to the amount of change in light, where one presses. The design carries a curiosity: Could the ephemeral material of light become something malleable?

MalleablePillow is a soft shape filled with tactilely appealing materials such as paddings and marbles in nets. As one interacts with the *MalleablePillow,* it shines where one manipulates it and with an amount of light equal to the amount of manipulation. The output follows a coded behaviour, where continuous strong and unvaried use makes *MalleablePillow* a little bit 'angrier' in the colour of the LEDs.

Leaving behind sketches of more complex constructions (like series of accelerometers), the design is indirect – and cunningly simple – in its workings, because it detects the physical manipulation from the sound the inner materials make. The construction is a layout of small microphones embedded in noisy and tactilely appealing materials, where the amount of sound detected locally determines the lights' intensity. The lights in turn partially disperse through the transparent filling with some play of light due to the padding's movement as it is manipulated.

The shaping of *MalleablePillow's* reaction is not only a matter of digital signals, but equally so a matter of the physical construction, including the material properties of the fill and its suspension inside the pillow cover.

The pillow has had several shapes: a cone to fit various hand sizes, a ring to be hung or entangled in, and finally a pillow shape with two different sides in relation to fabric texture and light permeation.

Figure 3.3.
MalleablePillow. Top row: Co-located and gradual coupling. Middle row: Different physical shapes. Bottom row: Electronics/padding and black side of cover.

Video on CD (link: https://vimeo.com/user1928557/malleablepillow)

HugBag

Literally embracing soundscapes

What if hugging big and soft shapes could be a rich source of input?

While *MalleablePillow* addresses tangibility by small movements and *ActiveCurtain* by a range of touching and poking, *HugBag* addresses gross motor hugging and leaning.

Initially, the bodily feel of hugging was to be coupled solely to light. However, try-outs from the staff and bodystorming moved our sketching towards the prime output modality being sound as it felt more coupled to the bodily feel.

As the technical construct ended up building on an inflated gym ball, we tapped into basic interactions with hugging such a form where the amount and distribution of pressure is detected by a Kinect inside the ball. For reasons of simplicity, we let the Kinect detect the distribution of pressure between top and base.

The *HugBag* ended up being a round padded half-sphere responding to hugs with soundscapes. The harder one's hug, the louder the evolving soundscape At the same time as the inevitable variation in the user's leaning generates a dynamic balance between two sound layers according to the distribution of pressure. We worked on different versions of accompanying lights – mainly as secondary amplifications of the experience.

We have explored various soundscapes, and ended up with a set of soundscape characters that the staff could move gradually and seamlessly between by a single click on a colour wheel.

Figure 3.4.
HugBag. Top row: Bodily engagements. Middle row: Technical set-up. Bottom row: Two different light constructs.

Video on CD (link: https://vimeo.com/user1928557/hugbag)

WaterBed

Mutually resonating bodies

WaterBed also responds with a soundscape, but in a more elaborate form than *HugBag*. It is an ordinary soft waterbed that responds to movement with rich soundscapes – or rather a whole 'wavescape'. For instance, simply rocking a little in the bed will evoke three layers of waves:

- infrasonic sounds (i.e. below what humans can hear) producing a 'kick' in the bed resonating in one's diaphragm
- bass sounds (from inside the bed) coupled to the infrasonics, and
- a treble layer of more flowingly evolving sounds in the room.

In shaping these interactions, much of our sketching focused on generating a strong the bodily feel. Where the other designs deal with the front side of the user, the *WaterBed* also invites one to lie on one's back and feel the feedback through it. The material feel is different compared to *HugBag* and *MalleablePillow*, because one can feel but not grab the movement of the water inside. Another important difference is that the feedback is not instantaneous, but rather like an echo.

The *WaterBed* soundscapes involved a very close co-design process between the Snoezelen staff, our sound designer and me. Because we did not have a shared frame of reference across our disciplines in relation to sound patterns, we pragmatically used a colour wheel to focus our dialogue (but without any assumption of universal qualities of colours). The colour wheel later became an interface for the staff to move seamlessly between soundscapes (as also in *HugBag*).

Just like in the *MalleablePillow,* we used indirect detection of the movements. The soundscapes were built using input from the sound of waves inside the waterbed that were generated by the user's movements. Besides using the sounds as mere indications of activity, we worked with their inherent richness as well.

We could piggyback on the existing waterbed in Snoezelen with its built-in subwoofers, and then just add four microphones to pick up the waves. While this construction was rather simple, threating the signals and avoiding acoustic feedback-loops were not.

Figure 3.5.
WaterBed. Top row: Response to any movement. Bottom row: Feeling the wavescape, including the infrasonic 'kick' (the 'kick' is indicated by the yellow graph projected onto the side of the bed).

Video on CD (link: https://vimeo.com/user1928557/waterbed)

VibeBoard

How to stroke a vibration

VibeBoard is a lap-size object, where stroking the upper wooden surface with its carved ornaments triggers patterns of vibration. The point of this design was to see vibration as a potentially rich output. Just as the *WaterBed* taps into the sonic richness of water waves, the *VibeBoard* taps into the richness in the sounds made by stroking a rifled surface. A single contact microphone stuck to the backside of the wooden top picks up the sounds, and a subwoofer beneath it generates the vibration beneath it.

While we managed to quickly solve problems of acoustic feedback loops in *WaterBed*, it was not so with the *VibeBoard*. This forced the technical development of the *VibeBoard* into becoming far too complex and unrelated to the praxis [see also ‘Designs on the move’ in chapter 4]. This design failed in many ways and did not invite any interesting use or debate, and as a result, it does not play a significant role in the contributions on design potentials. Nevertheless, the design has been part of the picture of how to engage pedagogical praxes.

Figure 3.6.
VibeBoard. Top row: Any wooden part vibrates. Bottom row: The vibration correlates with the stroking of the rifled parts.

LivelyButton
Crude inner beauty

Essentially, *LivelyButton* is a fantasy of a button coming alive – albeit, in a rather discreet and simple manner as *LivelyButton* is merely a little black box with a capacitive sensor, LED strips and a stepper motor.

One of its sides can come alive, when touched or almost touched. On that side – framed by the black edges of the rest of the box – there is a soft semi-transparent membrane. Two rotating inner spirals move the membrane and can be felt when one presses it. Two colour-changing LED-strips shine through from the inside, enabling the spirals to create a play of shadows on the membrane. The lights and the motor of the spirals react to touch ranging from hovering near the 'aura' to direct touching the membrane – depending on the sensitivity of the capacitive sensor, which is set by the staff using a slider. When the box reacts by aura, it is as if the box anticipates touch.

The *LivelyButton* has programmed behaviour according to states. If the box is not used, it returns to a phase of soft pulsating light ('breathing') to maintain presence. When used over time, its behaviour changes. Initially, these changes were very subtle over time of use as abrupt use merely offset the colour of the two lights. Later two opposite temperament modes were added that were related to a combination of touch duration and touch frequency: in one mode, longer/stronger activity makes the reactions of the box gradually stronger; and the opposite in the other mode. In other words, the design has 'temperaments' that the staff could set.

While the children's engagement with surface movement was an intended core quality, I did not anticipate the richness they would discover in the purely mechanical qualities of pressing with varied pressure against a stepper motor through the spirals – from subtle vibration to noisy pecking by the spirals.

Figure 3.7.
LivelyButton. Top left: Staff having set the aura-sensitivity and the temperament behaviour. Top right: The components. Bottom: Framed light changes, vibrations felt by chin and hands, chin poking and hand touching inner movement.

Video on CD (link: https://vimeo.com/user1928557/livelybutton)

LivelyForm

Movement invites movement

The core idea behind this design is that we react to movement with our own readiness to movement. Consequently, introducing something that moves may evoke the body to move. This is quite a different take than with the other designs on how to relate to the body.

While the *LivelyButton* has subtle internal movement, the entire *LivelyForm* moves. The elongated shape opens and closes in response to the ways it is touched (the design differentiates between touched for a while or not, positions of touches, and stroke or grab). The fabric of the design's main surface works as a capacitive sensor and in a late version by zones of this fabric. The output also includes lines of moving lights, located on the side towards which the *LivelyForm* curls up. The *LivelyForm* swiftly reacts to change in touch and according to states.

The intention was not to build something snake-like with all the learnt connotations, but along the construction process, this form became the simplest way to produce most movement. The *LivelyForm* consists of a backbone of springy plastic that a motor can pull back according to the pattern sensed by a set of capacitive sensor zones. The basic construct is rather simple but, it was not sturdy enough as the pull kept breaking the encoder of the motor. Therefore, this design plays a limited role in the dissertation.

Figure 3.8.
LivelyForm. Top row: Light and shape changing (left), reacting to 'aura' (right). Middle row: Construction; capacitive zones in the fabric (left), foam body, Arduino board, encoder (middle). Springy plastic and motor (right). Bottom row: Movement invites movement.

Video on CD (link: https://vimeo.com/user1928557/livelyform)

4

ENGAGEMENT

Starting with the children
Two arenas
Co-developing with praxes
Scope
Grounding and reservations

> . . . in its infinitive form, "to engage" asserts
> "to begin," "to attract," "to hire," "to use"
> . . . As a noun [engagement], the word indicates
> an invitation, a promise, a binding occupation.
>
> *Gerstner & Chris (2013: 14)*

Coming from my designs seen as contributions in their own right in the previous chapter, I now turn to how the designs have also served as vehicles for explorations in co-developing design and pedagogy. The polysemy in the above quote is indicative of the many sides to this engagement. Yet, as the singular of this chapter's title indicates, the design processes should be seen as embedded in my research at large and as serving the design research programme – as *an* engagement. In chapter 5, I return to some of these processes to *conceptualise* the designs processes.

In what follows, I provide rich and reflected examples of design processes in the SID Project and point to where I have sought new ways. Tracing these processes also illustrates how the project has produced the grounding of the knowledge contributions on design potentials in chapter 6.

A key starting point for the SID Project has been the children's participation, and this will also be my starting point in this chapter.

Starting with the children

Since Interaction Design as well as Participatory Design are enlarging their scope and thereby reaching new groups, it is pertinent to ask, who established design processes risk leaving out and how to act upon this challenge. The ever-increasing focus on welfare technologies (Wikipedia, n.d.) should urge researchers to consider this in non-symmetrical settings (Bertelsen & Hedvall, 2009). Doing so calls into question the ability of established Participatory Design methods to embrace diversity. One setting that especially calls for attention is where participants cannot take part in interplays that require pretending, abstract thinking and verbal dialogues – as was the case in the SID Project.

Since the children's participation was a prime ambition of the SID Project, it was natural to not only address their participation in the Snoezelen interplay, but also to explore ways for them to be part of the design processes. A key ambition of both the project and the research has been to seek ways for the children to affect formative design orientations. The aim has not been to mimic or recycle existing methods or criteria, but to explore possibilities starting from participatory values. Here, two concerns play a major role:

- To move away from the children having roles as mere objects of study.
- To mindfully embrace input from the children.

Such concerns can also be relevant for others, who cannot benefit from existing participative methods with their preferences for discursive means (e.g. children's tales and drawings) and the use of pretend (e.g. enactments with a cardboard box as a TV-prop).

Very little work has been done to include people like the children in the SID Project, even though the Participatory Design community has for a long time advocated active roles that go beyond being objectified informants and testers – and especially so for disenfranchised end-users. Even without such a political agenda (Iversen & Dindler, 2013), the focus on welfare ought to urge researchers to seek better grounding of their designs for the often costly practices.

This field was new territory when the SID Project started. Fortunately, the following years have seen some efforts (e.g. the coming special issue of the journal *CoDesign* entitled 'Codesign with People Living with Cognitive or Sensory Impairments'), but they are predominantly based on a phase model of design. By contrast, my work can be seen as trying out potentials with a more designerly approach, which integrates what other paradigms may regard as discrete processes [see chapter 5].

The following sections show how my programme has been open to the children by designerly ways of thinking in situated resources and in actions as contributions as well as by seeing designs as communal nexus of desires, sensitivities and concerns.

Another essential side to the programme is its involvement in pedagogical praxes, which invites cross-pollinations between design and pedagogics. As the design field relates to areas, where people rely on caretakers, designer-researchers may take inspiration from concerns and mind-sets in the caring professions involved (teachers, pedagogues, therapists and the like). Designer-researchers may also reciprocally suggest inspirational possibilities and offer new means of criticality to the caring professions. The processes and mind-sets presented in the following sections are contributions to such cross-pollinations – seen from a design perspective.

The inspiration from the pedagogical field can been seen in how to address two key concerns in pedagogy: working by an *appreciative mind-set*, and problematising *voice by proxy* – as I detail in the following sections. Thereafter, I unfold how an essential part of our participative efforts has been design processes around two kinds of design artefacts: a format for video-deliberations on Snoezelen interplays, and designs simultaneously partaking in two arenas: a) the Snoezelen interplay with the staff and the children, and b) deliberations amongst the staff and design crew.

An appreciative mind-set

> As a reaction to the perceived de-skilling of workers
> that the introduction of technology had brought about,
> the Utopia project took its point of departure in the skilfulness of workers.
>
> *Iversen & Dindler (2013: 25)*

In this quote, Iversen & Dindler (2013) pinpoints an essential legacy of Participatory Design: to see value in and promote the – otherwise less acknowledged – skills of people. Even if imageries of efficient tools and men of labour may recede as Participatory Design enters areas of leisure or disability, I suggest not losing sight of the legacy. However, there is a need to continue to develop the mind-set in a situated manner as well as processes suitable for such an agenda.

The SID Project took the richness of the children's actions as its pivot, and the following sections will unfold how an appreciative mind-set has permeated the design process.

Looking for potentials

> Free from the pressures to perform or achieve
> . . . liberated from control and routine . . .
> detached from medical diagnosis and known limitations,
> clients could react and respond to this new sensory world in their own special way.
>
> *Flaghouse (n.d.) on Snoezelen*

Pedagogues within the disability field are trained to meet a person with an open mind to search for opportunities (e.g. the above quote). This does not mean that impairments are ignored, but is rather a call for seeking potentials from an understanding that a disability is not static, but dynamic and played out in context (Hedvall, 2009) – and it is indeed contexts that designers (partially) design. The close engagement with the participants can open up for seeing potentials – and even new avenues – by building on what the participants can do, rather than what they cannot do.

Such thinking in terms of sense-making, situated resources and potentials in the situation at hand – rather than in deficits and diagnoses – is also a concern within disability research (Hedvall, 2009) and within participatory action research (Ghaye et al., 2008) and resembles concerns within Participatory Design of embracing practices. Recently, similar concerns in relation to "vulnerable people" have also come to the fore in HCI (Vines et al., 2014), and Katie Gaudion's (Lowe et al., 2014) design work with enhancing everyday chores for adults with autism seems to share the appreciative mind-set, even if it is not stated explicitly.

However, such a mind-set may not be taken for granted within all Interaction Design related research: Faced with a new kind of design situation, it may be an understandable initial reaction to focus on what is striking or alien, or on pre-defined characteristics – in casu given by diagnoses. It may even be so that a more or less tacitly prevailing paradigm –for instance from early wave HCI (Harrison et al., 2011) – carries a medical model view of disability rather than a deep interest in people's lived perspective (Hedvall, 2009).

Such thinking in terms of deficits – rather than by an appreciative mind-set – calls forth a number of concerns: It may lead to a narrow, poor or even belittling understanding of the people involved. This in turn may not only lead to unfortunate delimitations of design space and chain inspiration processes, but also

to colouring thoughts on participation in the design process [I will elaborate on such matter in the subsequent section 'Going beyond voice by proxy']. Not only are we all "people first" (Chappell et al., 2001) rather than carriers of labels and diagnoses, but the negatively defined rarely form a generative key to open up a design space. A designerly approach like mine – with its emphasis on inspiration, sketching and debate – is all about wonderings and dreams as well as generative disruptions of views.

While the main outcome of the appreciative mind-set lies in its more subtle influences, I will nonetheless give an illustrative example of how an appreciative mind-set matters: the story of the design *HugBag* as described in the next section.

The story of HugBag

In the recruitment phase, a boy started coming to one of the Snoezelen places. He was very strong and spent most of his time on a waterbed hugging big pillows in a very repetitious way. The staff doubted if they and Snoezelen could do anything for him, and therefore if he should be in the SID Project. Going with an appreciative – and somewhat opportunistic – mind-set, I thought that there must be something valuable in hugging pillows. Long story short, after repeatedly seeing the boy in action and much playing with pillows myself, I presented the staff with a very crude sketch of how the pillows could react and be part of evolving interactions. In other words, tapping into and enriching the boy's actions. The staff's reaction came promptly: "Then he is in!". After that, the staff continued to probe qualities by adding balls with bells inside to the waterbed and thereby adding sounds to movements. We took this further by bodystorming, which led us to have sound as the main output rather than the light streams of the original design sketch.

Notably, the boy ended up playing a very prominent role in the project and enjoyed using the big, soft and noisy *HugBag* as well as another design that he used for similar purposes, the *MalleablePillow*. He also inspired the development of the *WaterBed* design in the other Snoezelen place.

Figure 4.1.
The story of *HugBag*. Top row: From inspiration (left), sketch (middle) and staff try-outs with bell balls (right).Middle row: Shaping interactions. Bottom row: Various soundscapes and physical constructions.

Going beyond voice by proxy

> . . . how does the fact that the carers acted as a 'proxy' for the young adults differ from the manager acting as a proxy for the workers in the early days of PD.
>
> *Iversen & Leong (2012: 9)*

Snoezelen has been described as "another world" (Verheul & Hulsegge, 1987), and indeed being with the children in Snoezelen is a uniquely intriguing and inspiring experience as it points to a diversity of ways to engage in the world. Here, any assumption about a design space may be challenged, thus formative design orientations must relate closely to the children's experiences. This raises the question of how to ground design work with people like the children in the SID Project. I will start by outlining significant related efforts.

Participative work with children has been addressed for more than a decade. These often playful methods tend to rely on: a) pretending something as in the use of low-fi prototypes and role-playing, and b) discursive communication as in drawing or telling stories. While such designing with children has attracted interest (Druin, 2002), less has been done in relation to children without speech (Millen et al., 2011).

Efforts to include people without discursive language tend to stay with established methods, where proxies – for instance caretakers – speak on behalf of the end-users (e.g. Guha et al., 2008). However, a central concern in disability research is to directly embrace the participants' own perspective rather than by proxy (e.g. Allsop et al., 2010). Despite the political heritage of Participatory Design with its critical eye on power, the issue of voice-by-proxy is rarely problematised in this context. Iversen & Leong (2012) and Kramp et al. (2010) are aware of the challenge, but do not provide any measures. Despite good intentions, Kramp et al. (2010) end up merely replacing the concept of an end-user with a "relation of resident and staff members" – leaving little explanation of how such a voice differs from mere judgments of the staff. Closer to my efforts, Dawe (2007) uses technology probes with individuals with intellectual disabilities, albeit Dawe's study relied on the user's ability to pretend.

Other parts of the literature occasionally give the paradoxical impression that established participative methods come before the participative purpose of

applying the said methods; i.e. the expectation is that people should fit a set of methods rather than vice versa. To Millen et al. (2011: 94) designing with children "[…] can be difficult, particularly when the end-users have special needs that may affect their ability to communicate their views. The challenge of finding suitable methods for design input may be off-putting". On a similar note in addressing children with disabilities, Guha et al. (2008) seem to take the historical succession of roles in the design process as a hierarchy with the role of design partner as an implicit ideal, which leads to trying to compensate for the shortcomings of the children, who cannot meet the requirements of the desired role.

Thinking with an appreciative mind-set rather than starting from established methods, I have tried out ways to ground the design work with the children in the SID Project. My approach takes the situated resources as its starting point. There are three dominant sides to this:

- Appreciating the rich actions of the children.
- Acknowledging the pedagogical staff as professionals engaged in progressing their field and own praxes.
- Tapping into the legitimate and strong role of artefacts in Snoezelen.

On this basis, I have tried out design processes and related artefacts that promote the actions of the children taking centre stage in open-minded deliberations.

Virtues in being actionable

Druin (2002: 16) asserts that "Design directions may not necessarily be expressed directly by children, but may be implied by their actions". I have explored how far one can push this approach towards serving the goal of letting the children in the SID Project affect formative design orientations.

This exploration entails designs that I label as *actionable*. This means that the designs are dedicated to being both open to input and truly interactive for the children to engage with. The designs thereby open up for *actions* of all participants as significant meaningful contributions: for the children's use beyond pretend, for the staff's explorative staging and integration into their praxis, and for the continuous designing by me and others in the design crew. Chamberlain (2010) has applied a similar approach in relation to children with profound disabilities:

> Only when the designers produced working physical prototypes could the research team interact with the user and develop any meaningful sense of understanding . . . The designers found that the working prototypes acted as a bridge between themselves, the therapists and the children, revealing new knowledge about the needs of the end user, and also as a catalyst for further research and investigation. (Chamberlain, 2010: 167-8)

Seeing actions as significant contributions rather than giving primacy to discursive languages draws on a rich heritage of design experiments. Sanders et al. (2010) suggest three main categories of tools for participation. "Making things tangible" is the category that was relevant for my agenda as we could not rely on the other two: "talking/drawing" or "enacting". However, how to make things tangible to serve participation entails a dilemma of simple versus elaborate.

As Petersen et al. (2004), I see the aesthetics of interactions in the very actions and how they are felt; and thus, such interactions cannot be captured by imaginary actions around non-interactive props or mind games around post-it notes. Therefore, the designs need to be interactive to evoke the sensory and interactive side of the experiences (Löwgren, 2012; Hummels & Lévy, 2013; Hobye, 2014). Another reason for this is that with the children one cannot even have minor elements of pretend. Moreover, given that our interventions mostly have been done without the design crew attending, *Wizard-of-Oz* was only used in very early explorations; and even then, the children indeed minded "the man behind the curtain" (Buxton, 2007: 239f). In addition, the designs had to be sturdy, as we could not require gentle handling. Overall, this moves the sketches towards more elaborate constructions.

Opposing this, the designs – like sketches in Buxton's (2007) sense – should not entail a costly (in thoughts, time or funds) investment inhibiting open minds and explorations, but be easy to alter or replace. This moves the construction work in the opposite direction; towards building simple constructs.

In the design crew, we tackled this dilemma by building the most generic, yet still evocative interactive designs to carry our curiosity on emergent qualities in the interaction. The designs are generic in the sense of gestalting basic interactions, thus not very elaborated; and evocative in the sense of being sensuous and inviting to actions, explorations and curiosity, thus typically not overly simple. We have

been able to do so by use of hacks of existing soft- and hard-ware as well as the agile development platform, *Arduino*. Lim et al. (2013) has with what they call "discovery-driven prototyping" presented a similar take as they "minimize technological complexity but still enable people to utilize in-situ the core value". However, this differs from my efforts as Lim et al. work without explicit desiderata or directed critical intent: "We do not embed in the design of the prototypes any intention of what they should be used for" (Lim et al., 2013).

It is also important to note that my designs should not only be seen as each having their own individual path, but rather as a collective that develop together over time. Thus, each design may address a relatively narrow set of concerns and consequently require less elaborate construction.

Reaching out for rich input from the children is one thing, but staying with their perspective and not regressing to mere expert judgements from the staff as proxies takes more efforts. For this, design artefacts were used in two interrelated ways: I have tried out conceiving designs from a set of critical tactics. Designs seen from this angle I call *debateables* [see later section 'Designs as debateables']. In addition, the deliberations around videos of the interplay were staged in a critical manner, as I will describe in the next section.

Videos that tickle

> . . . allow polyphony of conflicting voices which, despite their opposition, respect each other and are united by passionate engagement.
>
> *Chantal Mouffe in Hillgren (2013: 76)*

The pedagogical knowledge of the staff often took anecdotal form. For a designer-researcher such tales of situated competence are very inspiring as profound pedagogical insights are nested here in professional sensitivities tied to the particulars – even when not explicated, let alone theorised. It is this kind of knowledge, the SID Project aimed to elicit through deliberations around videos of Snoezelen interplays. A key trait has been that the use of videos kept the children's action at centre stage and as a pivot of ideation, as I will elaborate in the following.

On a practical level, all interactions with the children in Snoezelen were video-recorded by the staff in the simplest of manner, and collections of video clips took centre stage in all design deliberations. This use of videos was part of a routine in monthly meetings between all staff and design crew, but it has also played a role in workshops and in the many more casual talks in the individual Snoezelen places.

Inspired by an interactionist's perspective (Alvesson & Kärreman, 2005), the video clips were used to share mysteries and openings in the practice, thus inviting peers and designers to ponder and wonder rather than trying to terminate interpretation. The staff called it working with "*videos that tickle*".

Concretely, every month the staff of each Snoezelen place presented a set of video snips with some kind of framing – even sometimes as open-ended as "what can we do for him here?" or "this is somehow cool, or …?", and often starting with statements like "Look there! He's taking ...", wonderment, ideation and debate emanated from the children's action and the way we used the videos.

In these deliberations, the staff exposed their practice to others and even the full interplay as I have had access to the film stock – all done with the intent to see potentials and openings rather than stale criticism or error correction. Nonetheless, such willingness to show one's praxis demonstrates an open and inquisitive mind-set and thereby indicates a dedication to progress as professionals needed in a development project like SID. To develop such deliberations together has in no way been easy, and the process has taken detours of presentations so open-ended that it was hard for peers to comment, as well as presentations so close to product testing that it left little space for wonderment or ideation.

In accordance with the stipulated *appreciative mind-set*, the video deliberations aimed to keep the attention on potentials and the lived experience, thereby promoting what the children can and their wishes rather than what they cannot because of their disability. Insisting on starting and staying with the actions of the children carries critical intent, and our approach has been crucial for the deliberations to stay with the children – even when there seemed to be consensus around the appreciative mind-set.

Summing up previous sections, I would like to point to four key elements:

- Focusing on actual doings rather than preconceptions or pre-conditions (Hedvall, 2009).
- Evoke tacit understandings that may steer the staff.
- Inviting wonderment (Hansen, 2013: 477) and a plurality of interpretations (Ghaye et al., 2008).
- Looking for potentials rather than 'deficits'.

One could see the videos as staged *design artefacts* (Telier et al., 2011) – yet, of another kind than the actionable designs. However, all the design artefacts go hand in hand, as the designs for try-outs are also built also to serve the deliberations.

The best should not be an enemy of the good

I have presented steps towards developing design processes that stay with the participants without requiring them to use pretend or discursive language, and that – just as important and intimately linked – in a generative manner open up deliberations and thereby potentially challenge monolithic expert/caretaker views. These steps suggest that by designerly means (including the measures presented in following sections) these children can affect formative design orientations rather than being mere objects of study in laying bare a context or in subsequent tests. Such moves – just like the pedagogical efforts – must be highly situated. Consequently, my contribution may not serve as textbook guidelines, but rather as mind-sets and rich exemplars of designerly ways, which in total may serve other designer-researchers in working out sensitive ways suitable for their particular contexts.

The aim has not been to mimic outcomes or levels of participation in the tradition of Participatory Design, but to seek meaningful situated ways even if they are not ideal in the abstract. Put in terms of a Swedish proverb: The best should not be an enemy of the good. The approach may indeed be viewed in various ways in relation to the children's continued agency: In one sense, the children are simply observed and interpreted, and – although the children may *feel* empowered by the designs in the Snoezelen interplay – such feel of empowerment are not present in the design processes as may otherwise be desired within Participatory Design.

Seen from another perspective, a tangible dialogue is promoted by the actionable designs, and the children make generative contributions to deliberations open to such.

Even if the children cannot be claimed as *design partners* (Druin, 2002), and the approach does not (dis)solve the power issues around *voice by proxy* and asymmetries (Bertelsen & Hedvall, 2009), our efforts still make a significant difference – not solely by the use of video and actionable designs, but together with the stipulated mind-set. This is not an easy way, since issues around *voice by proxy* represent a standing challenge that requires a reflective stance.

As indicated, our efforts in relation to the children go hand in hand with ways to relate to the professionals involved. The following sections must be viewed in light of this – even when not explicated.

Embracing actions

> Working with peoples' values as the engine of PD is challenging
> ... as values are not something that people articulate explicitly in their everyday lives.
> However, values are implicit in all (social) activities and thus,
> enmeshed in peoples' variously motivated and diffused practices…
>
> *Iversen & Leong (2012: 470)*

The designs can be seen as wonderings as well as materialised hunches or understandings – all relating to the design programme. By evocative qualities (Buxton, 2007) – of being sensuous, tangible, manifest; yet tentative or even ambiguous – the designs promote explorative try-outs as well as imagination and criticality. Thus, making the designs actionable and very tangible in their responsiveness is not merely a separate accommodation for the children, but also for the Snoezelen staff as they perform, ponder and try-out pedagogical thoughts around and with designs.

With the aim to work for generative collisions (Hillgren, 2007) between participants, the design processes in the SID Project promote starting from the concrete Snoezelen interplays – seeing the values, sensitivities, concerns and judgements that drive the praxes in actions rather than solely in words. Behind this lies a firm belief that the praxes are meaningful and carry valuable insights that the staff can contribute to design processes –especially so if designer-researchers can

develop sensitive ways to perturb the praxes and elicit knowledge in suitable forms and formats.

Making the designs actionable and thus felt has played a key role in engaging not only the children, but also the staff in their try-outs. Even the settings of parameters in the designs more and more became part of a materiality, the staff could engage in – just as they have added physical objects to the designs to explore.

To illustrate some of the above-mentioned qualities, I will now describe a workshop that played a key role in the project start-up.

"We've awakened the spirits"

> . . . to eschew a priori categories of interest
> in favor of discovering what emerges from interaction.
>
> *Harrison et al. (2011: 389)*

Various workshops were held in the SID Project. They primarily aimed to develop ways of working in the project and for the staff to come to grips with interactivity – from practicing video editing to developing an appreciative mind-set, and from playing with light effects to making imaginary narratives of use.

While these workshops have been important for moving the project forward, most of them do not call for reflections on design processes. Yet, I will describe one workshop, as it can be seen as both an example combining the purposes of design engagements [see next chapter] and as part of an initial framing of the project and programme by germinal designs [see chapter 2].

This workshop was one of the very first things that happened in the SID Project, and it took place in two adjacent Snoezelen rooms. The main intent was to anchor basic concepts of interactivity with the staff in a generative manner.

Figure 4.2.
Workshop in the SID Project. Hands-on inspirations from existing toys (top left). Trying-out designs with 'infestations' of well-known Snoezelen things: A set of fans reacting to tilting (top right), bubble tube reacting to touch (bottom left), and a ball pool where balls radiated rings of coloured light when moved (bottom right).

Prior to the workshop, we in the design crew had rebuilt designs well-known in the Snoezelen places – yet, also enhanced them with behaviour by use of simple physical computing [see Figure 4.2]:

- A set of fans blew stronger as one leant towards them.
- A bubble tube changed lights and bubbling when touched.
- A vibration-box reacted as if it was a gas pedal with associated noise.
- Coloured light waves would emit from balls that were moved in the ball pool.

These playful rebuilds were (re)inserted into Snoezelen for the staff to sketch imaginary practice around them. The event went as follows:

The Snoezelen staff was told that the designs had been awoken; as if each design had or was a "spirit" with reference to the focus point of *væsen*. They were asked to explore the designs together in two groups and make up small narratives of imagined Snoezeling (i.e. what is deemed Snoezelen experiences) around the artefacts by a user they knew or imagined (what I called *future anecdotes*).

The staff explored and played around with the designs and discussed, used their bodies and imagined anecdotes. The evocative nature of the designs was evident, likewise the knowledge of the staff in the situated dialogues. The workshop illustrates a way designs can support a shared negotiation of difficult key questions such as *What's the behaviour of a thing?*

Along the way, various desires, views and concerns were touched upon, and anecdotes were summed up. However, at the end, when the two groups should present in plenum, the anecdotes receded and generalised statements took over. Furthermore, it was obvious that thinking of things as responsive was not second nature to all of the staff. There may have been many reasons for this, as the initial workshop also served social purposes and everyone in the overheated rooms was exhausted once we got to the presentations. Nevertheless, trusting the worth of one's own anecdotes and thinking in terms of artefact behaviour continued to be issues, we needed to address.

With the very concrete and truly interactive nature of the designs – suggestive of what to come – the workshop served well as an emblematic start and as a shared point of reference. I doubt if the same impact could have been achieved without the designs.

The artefacts can be seen as *boundary objects* (e.g. Telier et al., 2011) as they belonged to both design and pedagogical practices and were well-known and at the same time suggestive of the unknown – yet, boundary objects of an especially rich and evocative kind. This way of estranging the familiar (Bell et al., 2005) by infestations promoted a change-perspective at the same time as it met the staff on their own turf in the sense of place, artefacts and anecdotes. Thereby also implied the balance of care and perturbation, which is crucial to keep in mind for such processes to be fruitful.

The workshop took existing designs from Snoezelen as starting points; yet, not to do use(r) studies, but as a means of inspiration, debate and sketching [see next chapter]. My concept of design engagements had not emerged at the time of the workshop. Nevertheless, the urge to cut across divisions between for instance probes, sketches and provotypes was an impetus, and this early workshop aided my thoughts around design engagements as being intertwined and guided by several simultaneous purposes [see next chapter].

Two arenas

> …one can distinguish between
> commonsense notions of the artifact as given, as "just there,"
> and more critical understandings of the artifact as a series of constructions
> among designers and different users and even uses.
>
> *J. Bardzell (2009a: 2363-4)*

My designs partake in two arenas: In the Snoezelen interplay with the staff and the children as well as in deliberations amongst staff and design crew. This duality of arenas is mirrored in my designs so that the same design can be viewed from two different angles:

- Design concepts made into *actionable* imaginations of how Snoezelen could also be [as already presented in 'Virtues in being actionable'].
- Designs carrying tactics for how to speak into the Snoezelen praxes; by being what I call *debateables* [see next section].

A key point here is that each angle is just as much a matter of designing as the other – and in my design work, the two angles are joined in each of the designs and have cross-pollinated in the initial ideation phase. Although such a duality of designing for actual use and for perturbing the praxes might sound as if it could muddle or obscure ideation, I have found it aided divergent thinking. Given the character the SID Project, the duality felt natural for me as a designer, but it may initially have invited unwarranted thoughts of *product testing* amongst the pedagogical staff.

In the following, I describe how I have worked with this second angle.

Designs as debateables

> Beyond serving as suggestions for development,
> then, design proposals can also be seen
> as complex hypothetical statements for debate.
>
> *Gaver & Martin (2000: 215)*

Any artefact for design engagements will connect to the situation at hand – to some extent or at least potentially, intended or not, and for better or for worse. Addressing such matters is inherent in any design task. An example of this is

Buxton's (2007) recommendation that sketches should not look more finished than the embedded thoughts are. Otherwise they could risk giving an impression of later and less explorative processes. However, *in the wild* it runs deeper than such process indication.

There is an inbuilt duality of seeing the design artefacts as not solely evocative design concepts for actual use, but also as artefacts designed with *tactical intent* in relation to the collaborative design processes. Accordingly, my designs also carry tactics of how the designs can connect to the praxes, when the designs – not only by their staging, but also by their very gestalt – speak into the situation, pick up on prevailing traits of the praxes, or on what is not addressed, or …well, endless numbers of ways could be imagined. Designs seen from this angle of connecting to praxes, I call *debateables*.

It is important to stress that such tactics not only provide alternatives, but also – by the very same design – engage views, sensitivities, concerns and judgements that drive the praxes. Put differently, such efforts concern not only opening up a design space to a (in casu pedagogical) praxis, but also – vice versa – opening up a praxis to a design space. Relating to praxes may thereby transgress the dichotomy between detached provocation and subservient facilitation.

Some of these tactics emerged more or less tacitly during the continuous design processes. This also implies that such tactics are not to be seen as recipes, but rather as expressions of an awareness that permeates a design engagement. Moreover, the tactics that such debateables carry will have to be very context sensitive. Thus, even though the tactics used in the SID Project may serve as concrete inspiration for others, I mainly present them to illustrate how to be aware of the duality of arenas in designing design engagements.

On the following pages, I briefly illustrate four tactics from the SID Project.

Overtly enriching the incremental

This tactic builds on direct wishes from the pedagogical staff – yet, makes them into so much more.

Subserviently following incremental design wishes from users may risk leading to design traps, a halt of exploration in the programme or away from questioning values. This tactic seeks to circumvent such risks by exaggeration.

Two designs illustrate this: Rather than merely replacing the existing switch with an accelerometer as input for the light inside an existing product of malleable bags with rubber balls, we took the malleability of light to extremes in *MalleablePillow*. *VibeBoard* was another design that tried to escape incrementality, as it tried to unfold the richness of active touch, rather than just adding a more refined version of the buzzer-in-a-box designs that the staff at one of the Snoezelen places makes themselves.

Figure 4.3.
The tactic of overtly enriching the incremental. Top row: *VibeBoard* (left) and a buzzer-in-a-box from one of the Snoezelen places (right). Bottom row: *MalleablePillow* (left) and an existing product, a bag of rubber balls with lights (right).

Transgressing the existing design ecology

This tactic works by adding something not present in the current practice.

In Snoezelen, there are lots of moving lights and many passive things, but hardly any moving objects. To address this, we built *LivelyForm*, a bending form reacting to various ways of touching. Unfortunately, this design was broken most of the time. Yet, by its very initial presence it opened a design space, and some of the staff shared my assumption that moving objects may have the potential to elicit an inner readiness for movement.

The moving parts of the *LivelyButton* design could also be seen as adhering to this tactic.

Figure 4.4.
The tactic of transgressing the existing design ecology. Moving parts inside *LivelyButton* (left) and the moving *LivelyForm* (right).

Minding the gap between rhetoric and actions

The point with this tactic is to populate rather than expose gaps between rhetoric and action.

The staff emphasised the role of the bodily, inner or basic senses. At times, though, it was as if presuppositions of immobile users only able to receive unintendedly took precedence. This may have been part of the background for some the staff's dominant focus on vibration and pressure, i.e. more passive forms (being touched rather than touching).

The design of *HugBag* is the most clear case in point, as it takes the actual movements of a child as its starting point [see 'The story of HugBag'], and when designing *WaterBed,* the staff and I took a child's movements as our starting point. Along the way, the children fuelled this process by the bodily ways they used the designs.

Figure 4.5.
The tactic of minding the gap between rhetoric and actions. Bodily engagements with *HugBag* (left) and *WaterBed* (right).

Pastiches

The fourth tactic of *pastiches* aims to evoke curiosity, reflection and debate by gestalting rather than by analytic critiques and questioning. It does so by cherishing yet transgressing the existing, as the pastiches combine elements of iconic designs within Snoezelen but also evocatively twist their properties and enhance them by interactivity. In this manner, the designs aid in perturbing rationales and values, as the following two examples will illustrate. Both designs took part early and served as germinal designs in setting up the programme. I will describe the two examples of pastiches more closely than the previous tactics, as this tactic more clearly brought the three foci of the programme to the fore.

LivelyButton as pastiche

The most dominant interface for interaction in Snoezelen is still today simple on/off-buttons, often in primary colours. While the buttons may be relevant in other contexts, their relevance in a Snoezelen experience could be questioned – even to the degree of suspecting an unreflected technology import from non-leisure domains. For example, the external buttons used to control the widely used *Bubble Tubes* separate cause and effect, where all the fun of affecting the lights happens somewhere else than where the user can give input. This kind of designs called for alternatives.

LivelyButton as a pastiche embodies such an alternative in an almost demonstrative manner. In *LivelyButton,* all the fun happens inside what is otherwise a dull black box, instead of at a distance from the buttons as in the existing designs. Through a soft semi-transparent surface, one not only sees light and movements on the inside, but also feels the moving parts pushing against the surface. These movements even create a play of shadows as a hint to the hippified light patterns mentioned previously. On top of this, as an alternative to the dullness of pressing a simple button, the box starts to react just before one touches it; as if it had an aura enabling it to anticipate the touch [see closer description of the design in chapter 3].

In total, *LivelyButton* not only addressed the focus point of *more-than-a-button*, but also opened up for the focus point of *Væsen* by its aura, inner movements and

temperaments. In addition, as the purely mechanical play with the motor entailed both vibration, passive and active touch as well as motions, it sustained a continuous debate or even controversy around the interactive potentials in vibration – and thereby the focus point of *the body*. This was something the design dedicated to vibration, *VibeBoard*, failed to do.

At first, the dullness of the box made the staff both doubtful as to its potential; even to the degree that they in summing up their experiences included a sentence of "Just a black box, yet so much more". This design indeed had a great impact.

ActiveCurtain as a pastiche

Most Snoezelen places have numerous moving wall projections; often with either rotating pictorials or somewhat hippified evolving patterns. While I do appreciate that this – just as the colour-setting of the rooms (Andersen & Flendt, 1994) – can give the staff a feel for the ambience of the particular room, it escapes me, how the projections can be relevant to the many users, who focus on things close to them. The users cannot affect these projections, yet for most people, Snoezelen also emphasises the importance of touch in grasping the world – both literally and metaphorically. Hence, in Snoezelen a plethora of appealing textiles can be found. These are typically tactilely rich and in some sense even interactive by purely materials means; but as the progression of smart textiles has not yet reached Snoezelen, they are not responsive by digital means.

ActiveCurtain as a pastiche combines textiles and projected light by making it possible for the user to affect light patterns by indenting a soft textile screen [see the design description in chapter 3]. In this way, the design addresses the focus point of *the body* and point beyond technologies recently seeping into Snoezelen such as flat hard screens of tablets and waving in the air in front of a Kinect.

The simplicity of the design is a virtue in pointing to salient issues; albeit here at the cost of not including more rich tactile and malleable qualities also present in my own sketching. All in all, I think *ActiveCurtain* as an early design served to introduce basic concepts around interactivity – as in the focus point *more-than-a-button* – as well as it paved a way for the much more tactilely rich design of *MalleablePillow*.

Figure 4.6.
LivelyButton as a pastiche. The inner action of *LivelyButton* (left and right) versus the separation of cause and effect by switches for a bubble tube (centre).

Figure 4.7.
ActiveCurtain as a pastiche. Left side: Existing tactile materials and moving projections. Right side: Engaging *ActiveCurtain*.

Designs on the move

In the previous sections, I have described different ways by which the designs served as vehicles in collaborative processes: in 'The story of *HugBag*' where a sketch opened a design space and thereby the project for a boy; as boundary objects in a workshop initiating the SID Project; as debateables with a set of critical tactics, and as sketches that are actionable for the children so they can affect the design processes. I will return to these ways in the next chapter, where I describe three purposes by which to understand the role of the designs in the design processes.

Purposes aside, engaging praxes with actual designs also entails numerous challenges of construction and organisation. I provide examples to give a broader impression of the processes in the SID Project.

Some designs thrived, some did not make it, and one got a rough deal – let me illustrate.

For the dull little black box of *LivelyButton* to perturb praxes, it needed time, but it has had a lot of impact. *ActiveCurtain* came at a time of frustration, so it took time for it to play a role. More trivially, three designs are not detailed in this dissertation as they respectively were not finished, came too late in the project, or repeatedly broke down.

A single design, *VibeBoard*, suffered a lot of hardship. It had a lethal set of 'infant illnesses': it was designed solely for hands, built by technicians outside the SID Project and quickly grew overtly complex, had too little sensuous sketching, assumed the staff at this stage could/should work with parameter settings, and naïvely subservient to staff's wishes. Additionally, the design came at an early stage of the project when some of the participants were still lingering on to thinking in terms of product testing.

VibeBoard served as a wake-up call to reflect on minds-sets and roles – including getting the technical development inside the project again. By contrast, the final design, *WaterBed*, showed that by then the design crew and the pedagogical staff together had learnt to work with complex development across disciplines.

Co-developing with praxes

> As different kinds of digital artefacts
> become more and more influential in pedagogical practice,
> it is important to discuss the intersection
> of the design of digital artefacts and pedagogical practice . . .
> Pedagogical practice […] needs to develop
> a way of critically examining digital artefacts/media,
> to be able to not just use digital media
> but also, and more importantly, to develop its practice.
>
> *Hernwall & Arvola (2008: 67)*

Moving on from the designs as research vehicles, I will now look closer at the collaboration with the pedagogical staff. The SID Project entailed the development of pedagogical praxes. The next section illustrates this in relation to pedagogical thoughts, while subsequent sections describe a process of working with co-annotated portfolios (so-called collages).

The Snoezelen triangle

I have not in this dissertation taken upon me to pursue the enigma of Snoezelen per se. Nevertheless, to give the reader an impression, I will briefly sketch a recurrent discussion around a model of Snoezelen.

In one of the initial shared meetings, a pedagogue presented a model for Snoezelen in the form of triangle [se Figure 4.8]. In the model, Snoezelen is seen as what *emerges* from dynamic interplays between participant (in casu child), caretaker and artefacts. I foreground this model as it also fuelled generative questions on the role of the artefacts of interest to both design and Snoezelen pedagogy:

- Is the artefact not more than solely a costly communication tool – all though it could be interpreted as such from the outside?
- Is Snoezelen not more than a merely playful toy session catered for by staff – at least in dedicated institutions?
- Does the role of the artefact not go beyond simply being a tool to make the child cope with being present – even though the term ‘sensory diet’ used by other Snoezelen practitioners could invite such thinking?

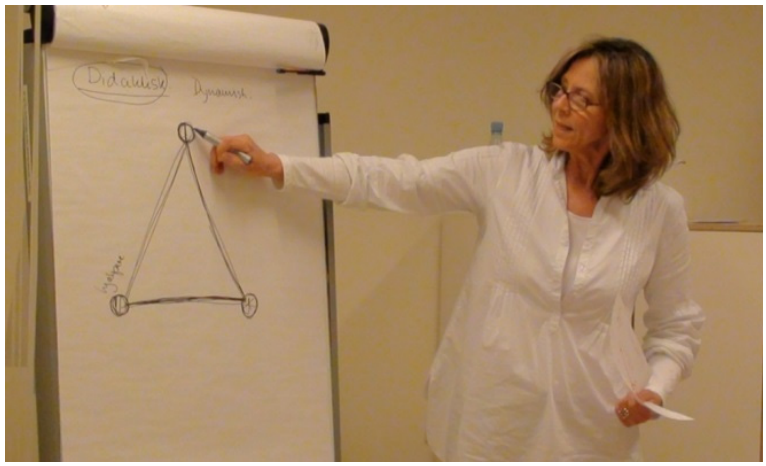


Figure 4.8.
A pedagogue presenting the triangle model of Snoezelen.

I refrain from any general statement on the essence of Snoezelen, but to the best of my understanding, Snoezelen transgresses the three types of relations just stipulated. Yet, Snoezelen can *also* be these relations and in the Snoezelen places many other relevant activities takes place. As one of the staff said: "Not all that happens in Snoezelen *is* Snoezelen". What indeed constitutes the core of Snoezelen was an on-going debate, to which I (also) contributed through design artefacts.

Capturing experiences

> How do users such as teachers and nurses become better at seeing themselves as both users and critical further-developers of technology . . . ?
>
> *Hasse (2012: 12. My translation from Danish)*

Another way design and pedagogy co-developed was in how to capture salient traits in the Snoezelen experiences – mostly seen from the staff's perspectives and through their judgement – yet, still predominantly orientated towards the foci and desiderata.

In the following, I will describe the way the staff used *collages* to crystalise their thoughts. These collages were crucial to the research in two significant ways. Firstly, they served as grounding for my work on *design potentials.* Secondly, in

our work with the collages I could see seeds for a contribution to design research processes related to *annotated portfolios* (Bowers, 2012; Gaver & Bowers, 2012; Löwgren, 2013).

Towards the end of the project, the staff and I discussed how best to capture and reflect on the often complex and multifaceted insights related to the children's actions and assumed experiences. Building on the previous work around video deliberations, we wanted to continue to work with the crucial virtues in our use of video:

- As an aid in keeping the children centre stage in their absence.
- Able to capture temporal aspects of interaction.
- Being richer and less reductive than terms, drawings and stills.

This was only possible as we by then had practiced an appreciative mind-set for long – and on a more practical note, video editing. In addressing qualities in the use of the designs, the staff had tried out various ways to give accompanying comments in relation to the videos. This had developed from open questions and vague themes accompanying the edited videos, to more focussed discussions supported by written text as pointers superimposed in the videos. The staff and I took this further as we tried ways to put together a collection of videos around a single design and connect these to various types of statements.

As the staff and I were seeking new ways, the processes varied from place to place and over time, but here I mainly portray traits salient in the process.

Annotation elements

The collages captured reflections crystalised through serendipic interplays of selecting, re(-)viewing, editing and annotating videos of the children and Snoezelen staff using the interactive designs.

Concretely, the work took the following form. For each design, the staff would edit a number of videos that they thought captured important traits in the interplays – even if they (initially) could not always fully explain why. The selected videos would then be placed – by a token of a still image and some title – in the middle of a template I had preparred (A3-paper / PowerPoint-slide, see Figure 4.9). Here, the stills would be annotated in various ways.

The video stills were literally surrounded by annotation possibilities [My translations from Scandinavian]:

- Above the video stills, the staff would place titles of take-away points, such as “transgressing stereotypical movements” or “bodily exploring and affecting”.
- As a more open and possibly evocative option just below the name of the design, the staff put their own self-quotations like “From passive recipient to active user” or “Things trigger emotion ...brings forwards something that matters”.
- Below the video stills was a space for annotations in layers. The layers were called “The artefact does…”, “It affects by…”, “The users experience. . .”; and below these, a separate and more open category “Second order perspectives”, where the staff wrote, for instance, “The children did other things and explored in different ways than we had expected”. This category also became a place to write about design openings and miscellaneous thoughts.
- Later some of the staff would add to the possibilities by superimposing a couple of sentences on each video token, or by keywords edited into the video.
- A last and crucial element was the possibility to connect the various elements with lines. The core idea here was to dynamically connect sets of annotations, so that one video could relate to one subset of annotations, and another video to another – possibly overlapping – subset. In this way, commonalities and variances are displayed rather than discursively explained.

To initiate the process, I had collected all the statements given by one of the Snoezelen places during previous deliberations around one of the early designs. I plotted several of the statements – each condensed to one sentence – into the layers, and added a few of the staff’s favourite videos, some suggestive take-away titles, a somewhat peculiar self-quotation and a few connector-lines. There was still plenty of vacant space –yet in the background, I added some simple graphic elements to promote thinking in terms of connections and similarities.

Figure 4.9. on next page.
Making co-annotated video-portfolios.

Both the layers and the connector-lines nudged the staff to some kind of prioritisation. This was much needed, but not easy. I had emphasised to the staff that it was more important to state their points provisionally than settle their placement in the collage from start. The subsequent shuffling around of statements in the layers also triggered reflection and debate in a generative manner. Many of the statements from one of the Snoezelen place were written as a mix of the layers, indicating a holistic take that seemed to resist being reduced to connectors and layers. Nevertheless, even this Snoezelen place insisted that the layers had been very beneficial to the process, as this tied the statements to the very concrete actions of the children – a kind of reflection they needed to strengthen their dialogue. Furthermore, they had appropriated the format of the collages by giving holistic comments to each of the videos, which served well as it framed the viewing of the video.

The connector lines acted as a way to deal with complexity across the various experiences with a design – yet, in various ways: A part of one collage initially had only a single line between the take-away title and video plus a couple of lines to the layer below, but it soon grew by new lines as statements related to other videos begged consideration. Reversely, one collage quickly got lines all over. While the many lines may indicate the relevance of the statements, it also called for a closer consideration of the statements. For example, too many vague or too general statements – such as "The artefact creates ambience" – seemed to block – rather than aid fruitful reflections.

To sum up, all the elements kept speaking to each other and lead us to see videos with new eyes as well as to adding new elements or producing new videos.

For project reasons, the collages were also shown as on the project's web site – aimed towards other Snoezelen practitioners and the like. The connector lines were intended to guide navigation through exploration and association, where hovering over one element would dynamically bring forth related elements. As time ran out the connectors were left out; thus, the interactive mesh on a webpage never came through, but the videos and annotations can be seen on the SID Project's website (http://sid.desiign.org, click on *Erfaringer*).

Towards co-annotated portfolios

The collages have served well in eliciting, explicating and probing insights from the praxes – and do so in a generative manner by being concrete and evocative. The emerging collages became very tangible indications of thought structures and served well for shared deliberations between the two staff members in each Snoezelen place as well as with me. As such, the collages have served as a main foundation for discerning design potentials.

We called these design artefacts *collages,* a term familiar to the staff. From a research perspective, these collages can be seen as tentative explorations of potentials in making *annotated portfolios* as presented by Gaver & Bowers (Bowers, 2012; Gaver & Bowers, 2012) – albeit going beyond their framework with regards to both purpose and form. Gaver & Bowers have shown how qualities of designs can be presented in a generative manner by sets of brief annotations on a careful selection of designs. The strength of the portfolios lay in in the "indexical, mutually informing relationship" (Gaver & Bowers, 2012: 48).

The collages can be seen as annotated portfolios, in the sense that they do not do away with the complexity of the particular, but rather savour the evocative concreteness and let words serve as pointing sticks. However, these collages also go beyond Gaver & Bower's concept in several ways:

- The collages were part of collaborative efforts – hence, the term *co-annotated*.
- The work with the collages explored qualities rather than solely presenting them.
- To capture interactive qualities, we used videos rather than stills.
- The connectors were intended to work dynamically and thereby promote explorative readings.

Another crucial difference between our co-annotated portfolios and Gaver & Bower's annotated portfolios is that theirs point to traits across designs, while ours focus on various qualities of a single design at a time – yet, as part of a set of collages (In chapter 6, I will draw parallels between the designs). However, this difference does not exclude the relevance of the four points made above for the continued development of portfolios.

The original thought behind Gaver & Bowers' portfolios was for designers to present design qualities. The indexical virtues of the portfolio seem to also serve our collaborative use of the collages to elicit qualities and still stay close to actual designs and concrete action. I thus suggest that such ways of discerning qualities could be of interest to a wider set of engaged design research.

However, making co-annotated portfolios – in close and continuous dialogues in the later parts of the SID Project and building on video deliberation throughout the project – is very different from making presentations to outsiders. Hence, the process of making co-annotated portfolios can embrace complexity in ways that I hesitate to assume for a portfolio on its own in a research or design publication.

Scope

In this chapter so far, I have described the design processes in the SID Project and tied together key traits of mind-set, ways of deliberations and design work [see Figure 4.10] – as partially summed up in the previous sections: 'The best should not be an enemy of the good', 'Designs on the move' and 'Towards co-annotated portfolios'. I will now briefly speculate on possible appropriations of these knowledge contributions.

As presented, the appreciative mind-set informs and is informed by a field tied to profound disabilities. Yet, its *principle* – of situated resources, looking for potentials, actual doings and rich actions – may well be appropriated for other contexts. The co-annotated portfolios as a design research tool may point to richer ways to communicate in design portfolios (i.e. by videos and dynamic linkage) as well as beyond purely disseminative purposes (i.e. for exploration and collaboration). Both video-deliberations and portfolio-making may offer practical inspiration for the caring professions in relation to dilemmas of connecting theory and praxes. The criticality of the debateables is very generic; thus, it could be of interest for other collaborations. The debateables also carry Critical Design into situated engagements, which may be of interest to the public as well as to research. Yet, the debateables as connected to the video-deliberations and the design as

actionables speak specifically into asymmetrical participative contexts. The virtue of being actionable is closely related to the potentials released by the agile development platforms and hacks within physical computing – here noticeably it is also used to serve debate and inspiration.

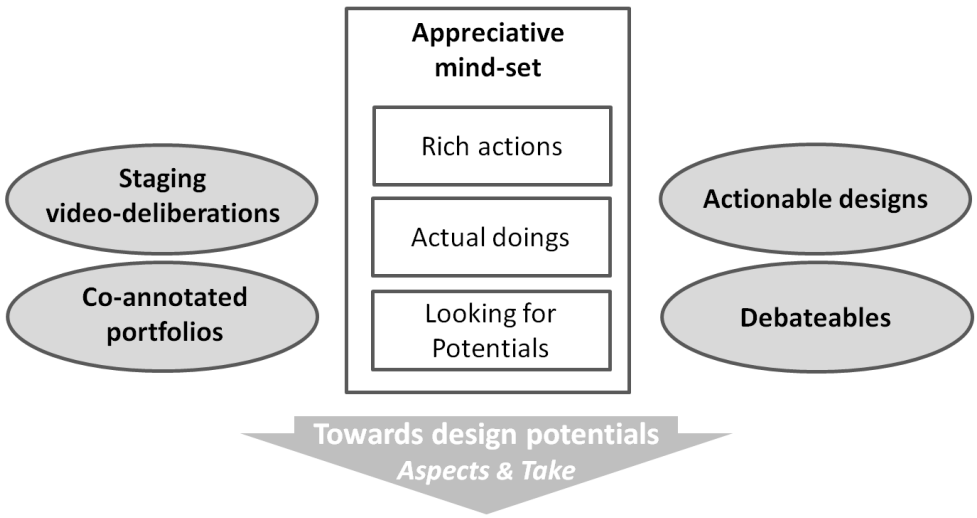


Figure 4.10.
Elements of engagement. The design engagements as a tight coupling of mind-set (box), design works (right hand side) and ways to deliberate (left hand side), which serve later contributions on design potentials.

Grounding and reservations

Building on this chapter's descriptions of the design processes in the SID Project, I will now address the nature and limitations of the staff's contributions seen as grounding of contributions on design potentials to be presented later in chapter 6.

Through the long-term designerly processes, the situated and often tacit knowledge of the pedagogical staff together with the children's actions have led to formative design orientations. The staff's collages serve as a major basis for my effort to elicit design qualities. Yet, the previous deliberations and more informal talks, my direct experiences of Snoezelen interplays as well as all the video stock have also aided my work on design qualities.

It is the final outcomes of the SID Project, rather than meticulous process accounts, that I will point to when addressing design qualities in chapter 6. The reasons for this are that the serendipic, collaborative, multi-voiced and partly tacit nature of the processes resist taming into sequential accounts, and that developing the pedagogical practice and design qualities has come before creating thorough accounts of examples [see 'Project vis-a-vis dissertation' in chapter 2].

There are also some delimitations to what is addressed. The descriptions by the staff point to concrete situations within a short timeframe, even though they go beyond initial use and have long-term pedagogical developments in mind. There are two reasons for this. Firstly, for most of the children, recollection may not stretch over many months. Secondly, the focus is on those interactions and interplays, where the designs play a role, not on the development of the child per se, although it is all seen in the perspective of what the staff members deem as 'good' Snoezelen.

The second delimitation follows from the very construction of the project. In it, the children were seen as evaluators rather than objects of study. This is not to say that the children's interplays with the staff were uninformed by pedagogical insights, on-going judgements and background information in relation to the child, but to state that the focus of the SID Project was not on describing the children's development. Thus, the work in the SID Project was indeed informed by pedagogical insights through the discernments of the staff, but mainly as a backdrop rather than as explicit references to the children's development. Moreover, it has been crucial for me not to act as if I was a doctoral scholar of pedagogy or a Snoezelen peer – hence, the focus of my contributions on design potentials is on what a design scholar can address with competence.

The descriptions by the staff that I built on focus on interaction with the design as it is 'staged' by the staff – such as in putting *LivelyButton* near a child with certain settings of the design, or laying together with a child in *WaterBed*. One might argue that such a focus leaves less attention to preceding actions of the staff or the situation in the widest sense. However, given the SID Project's set-up, the staff members were not to be the objects of study. Rather what they provided was discernments for what they found relevant, which is ultimately what frames their use and acquisition of designs for Snoezelen. Another project could have included

the actions of the staff more broadly and more explicitly. Nonetheless, it is worth noting that a social action space is implicit in the staff's contributions and that the deliberations over time entailed many discussions of what Snoezelen pedagogy entails.

Engaging praxes by designs not only perturbs, but also inevitably risks being disturbing. This was occasionally the case in the SID Project, where the crudeness of the designs sometimes forced the staff to worry about too many practicalities. Besides the practical aggravation, this sometimes also pulled the staff away from being fully present in the Snoezelen interplay. Such disturbances illustrate inherent dilemmas in building 'actionable' designs [see 'Virtues in being actionable'].

With the choices and constraints of the SID Project, the resulting scope points to the immediate [Danish: *det umiddelbare*] , which is also at the core of Snoezelen experiences for this user group. As described in the 'Snoezelen' section, these matters are no less important, and as a research focus, the immediate points to a kind of aesthetics, that may all too easily recede or be black-boxed, when complex social interplays and cultural codes take centre stage in design research.

The above framing is important to keep in mind in chapter 6, where I present design qualities starting from a stance made by the pedagogical staff. Before that, I dedicate the next chapter to developing thoughts on designerly knowledge construction within research, which conceptualises both the engagements of the present chapter and the knowledge they address.

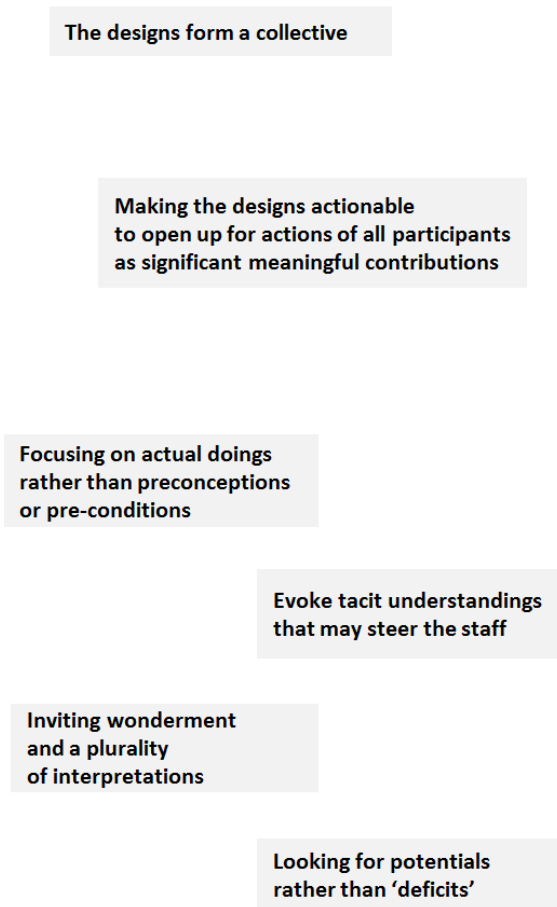


Figure 4.11.
Excerpts capturing key points

Generic, yet still evocative designs carries a curiosity

Actionable imaginations of how Snoezelen could also be

Debateables as designs carrying tactics for how to speak into the praxes

Pastiches evoke curiosity, reflection and debate by gestalting rather than by analytic critiques and questioning

Co-annotated port¬folios entail exploration, collaboration, and rich ways to communicate

5

HERITAGE

Co-developing knowledge domains
To explore a design space
Domains and engagements
Design agency
Tangible knowing
A continued quest

> . . . it is about opening up, exploring new territories,
> and reframing and imagining things that do not yet exist.
> Designing is not about wanting
> to organize and control the situation or the problem from the start.
> It is about surfing the waves of complexity, of uncertainty, of open-endedness,
> and of resistance, and about finding new worlds by engaging in the situation
> rather than being driven by fixed research questions/hypotheses or external theories.
>
> *Hummels & Lévy (2013: 45)*

Coming from the actual designs in chapter 3 and their role in engagements with pedagogical praxes in chapter 4, I will now take a step back to develop thoughts on designerly knowledge construction within research. These thoughts include conceptualisations of design processes like those just described in chapter 4 as well as of knowledge contributions on design qualities in the next chapter and in the form of design imaginations like in chapter 3.

Building on thoughts at the Royal College of Arts "Design with a capital D", Cross (2007) in his seminal book, *Designerly Ways of Knowing*, argues for design as a distinctive field of not only knowledge domains, but also ways to know and types of knowing. Taking these three areas as entry points to a design heritage, I will address:

a. Three co-developing *knowledge domains.*
b. Design engagements as intertwined *ways to explore* a design space.
c. Designerly knowing conceptualised as tangible *type of knowing*.

For each of these three areas, I will relate to significant previous conceptualisations of design– *a heritage* to continuously be appropriated and reinterpreted. Taking this heritage into designerly research may liberate it from limitations, compartmentalisations and habits known from commercial settings. Yet, the status of being research imposes other ties of *rigour* akin to the ones with which artistic research is currently struggling (Borgdorff, 2012). In chapter 7, 'Criteria', I will return to these ties by addressing criteria for recognition of the research.

I will first introduce thoughts on knowledge domains (a) and design engagements (b), which I then relate to the engagements presented in the previous chapter. After considerations on the topic of design agency, I move to address what kind of

knowing (c) the design processes entail. I conclude with a classification of my research.

My search for a thoroughly designerly research has – as most of the efforts of this dissertation – taken the form of a duality of trying out ways and relating to theories in the field, where the conceptualisations and the concrete engagements have grown together. My thoughts stem from a modest search for feasible ways for my own research, where design processes are integral to the research. Consequently, my conceptualisations form *a tentative model.* It is not intended to fit all kinds of design research or indeed to be seen as a new norm. On the contrary, I cherish design – and by extension design research – for its diversity and its inherent ability to transgress schemes and fixations.

Dalsgaard (2014) has recently assessed that "the major challenge in addressing this field [i.e. a designerly paradigm] as a researcher is that it is only marginally articulated, whereas other paradigms have well-developed vocabularies". In continuation, I see a need for conceptualising and performing an example of designerly research that can raise awareness of traits that might all too easily recede, when design research is merely seen as a creative aspect of well-established research disciplines of engineering or social science, or as bound by procedures known from commercial enterprise.

Thereby in no way implied that design research should shy away from getting involved with other fields and remain in the studio. On the contrary, as my design work with pedagogical praxes also illustrates, I hope to provide an inspiring example of designerly engagement with praxes. This includes showing how designerly research can be open to yet have agency in relation to pedagogical praxes and by inference related contexts.

Before I can move on, I need to frame my effort.

To me, design is about embracing complexity (Nelson & Stolterman, 2003/2012; Stolterman, 2008; Hummels & Lévy, 2013), which is matched by the complexity of serendipic design processes, the entangled types of designerly knowledge as well as a knowing that cuts across human faculties (Borgdorff, 2012: 25f, 149).

Such complexities resist simple categorisations and formulas. Thus, I hesitate even to try framing designerly knowledge construction in this dissertation not having it

as its main agenda. Yet, I need to provide at least a draft from which to look at my knowledge contributions. I do so by describing ideal-typical knowledge domains and engagements. That they are ideal-typical does not mean that they are mere simplifications, but that they capture essential traits by the distinctions they impose, even if each ideal type may not be identified in separate and pure form. The engagements should be appreciated as intertwined rather than as discernible entities, and similarly knowledge domains as co-developing. The latter I connect to an interpretation of the concept of *design space*.

Co-developing knowledge domains

> …design-based sensitivity is not used to solve spatial problems,
> but to explore potentialities of sites, to spatially articulate visions
> as well as to test personal and collective intentions and opinions.
>
> *Servillo & Schreurs (2013) with reference to Schreurs & Martens (2005)*

A key trait of designerly approaches is to *co-develop* "design problem" and "design solution", rather than working by a purely sequential model starting from problem definition and requirements (e.g. Löwgren & Stolterman, 2004; Cross, 2007). In this co-development, designs and their use is being developed through an understanding of the design situation; and reversely, the development of design engages the complexity of the context or situation, and may even – as in the SID Project – partake in developing not only the perception of but also the actual situation.

In this process, not only situation and designs develop, but also understandings of the designs. Here, my interest is in salient qualities *across* the designs – what I call *design potentials*. This reflects that my design work is part of a design research programme rather than a project to get products to the market.

Furthermore, as my research is exploratory and set up by desiderata, it goes beyond problems as it rather aims to develop a *design situation* and beyond solutions as it aims to develop designs as suggestive alternatives opening up a design space – what I call *design imaginations*.

In this way, my research concerns three domains – design situation, design imaginations and design potentials – I call the overall progression of these three *formative design orientations*.

From a designerly change perspective, all three domains are subject to perturbation, wonderments and mediations by designs engagements. The domains co-develop; yet, in the following, I will describe the domains separately.

Design situation

> The observable world is not necessarily "there,"
> it is "becoming" as a result of design efforts.
> Theories on new forms of digital and interactive artifacts
> must therefore not only deal with the existing but with the not-yet-existing
>
> *Stolterman & Wiberg (2010: 99)*

To see the design situation as subject to development is to raise a change perspective; not just on the designs but on the situation as a whole. Rather than seeing the design situation as given or fixed, it is seen as a flux and as much upheld by tensions as by solidity. Thus, the point is not to lay bare a motionless state of affairs, but to perturb values as they are played out, to wonder and look for seeds in the actions and to alter by suggestive designs.

In the SID Project, the design situation concerned the continued development of pedagogical praxes and especially their use of designs. This knowledge domain is not fully accounted for in this dissertation. Yet, in chapter 6,'Potentials', I have described a single element, the so-called 'Aspects', which – seen from the angle of design situation – could be said to include a pedagogical stance of the use of tangibles.

Design imaginations

> Imagination draws its energy from a confrontation with desire.
> It feeds off desire, transmuting and magnifying reality through desire's power
> . . . imagination goes toward reality, shapes and evokes it.
>
> *Poetry by Fisher (2005)*

Design imaginations can be design concepts and – as in this dissertation – material constructs thereof. Each imagination is a suggestive unit, but it need not be an optimised solution.

The design imaginations evolved from a interplay of inspirational elements, mediations of form and guiding motivations – all embedded in serendipic and collaborative processes [see chapter 4] where one cannot track the detailed development across human faculties and the many participants in the SID Project.

Many designs have evolved in the SID Project. Yet, only the designs that were actually built and used are included in this dissertation [They were presented in the chapter 3, 'Design imaginations', and the reader will also get to know them better in the next chapter]. These designs can be seen as *exemplars* (Löwgren, 2001: 33), and as such they embody knowledge (Löwgren, 2007a) – even by themselves to an informed and close community. Put differently, not unlike works of art, a concrete design stands as an evocative articulation, and to grasp the tacit knowledge therein requires contextualisation, disciplinary insights and a shared discourse within a community. Thus, given the still young and very diverse field of aesthetics of tangible interactions, it is anything but simple to discern, how "artifacts themselves can be said to be knowledge in the very simple sense that they answer the research question '*How would you design an <X>?*' " (Löwgren, 2013: with reference to Cross, 2007).

Design potentials

Design potentials concern salient qualities *across* the designs. Understanding qualities across the designs in the SID Project has entailed discerning evocative traits of the designs in action tied to a progression and even transgression of views. Here, the rich fond of inspiration from the praxes has served to see connections that could draw together the knowledge into *lenses* with which to address (sense /view /reflect /act on) a design space.

As this knowledge domain is the prime concern of this dissertation, chapter 6, 'Potentials' is almost exclusively dedicated to it. Discerning knowledge contributions on potentials has taken many routes and steps – in significant parts, closely together with the pedagogical staff.

To explore a design space

> The very core of design research … produces knowledge
> by engaging in the generative, in the act of designing
>
> *Sevaldson (2010: 13) on Research by Design*

The core activity of my research has been to engage the pedagogical praxes by design artefacts and activities around these. Thereby, pedagogical praxes as well as designs and design sensitivities evolve and give body to the programme. Put differently, as a world-in-spe becomes "inhabited" by designs (Gaver, 2012), the three knowledge domains co-develop in exploring a *design space*.

By the term *design space*, I mean an emergent mental construct of a world-in-spe that stipulates contours of a field of characteristics and qualities; from concrete artefacts to abstract conceptualisations as well as from hunches to analysis. As such, the concept embraces a multitude of human faculties and does so across all the three knowledge domains. Design research abounds with numerous uses of the concepts of *design space* (e.g. Westerlund, 2009; Botero et al., 2010), which I refrain from detailing, but please note that my definition goes beyond notions of design space as a mere solutions space or as solely a collection of designs sharing a simple set of common denominators.

In order to explore a design space, Hansen (2013: 56) advocates acknowledging the designerly presence and sensitivity to be open for 'the more' of a situation, that which is not there, but could be. However, Hansen in the just referenced book does not address participative elements in design processes. I broaden his view to bring design in contact with the caring professions – like the staff in the SID Project – that Hansen has addressed separately elsewhere (Hansen, 2008).

Chapter 4, 'Engagement', unfolded significant parts of the processes in the SID Project. However, the intentions behind the design artefacts as research vehicles and the processes around them can only fully be appreciated in light of the following conceptualisations of design engagements as ways to explore a design space.

By design engagements

For me a defining trait of the design discipline is that it embraces complexity for its richness (Stolterman, 2008: 58,62; Hummels & Lévy, 2013) rather than trying to reductively control the situation. Here, exploration through making and deploying artefacts are the designerly activity per excellence (Buxton, 2007; Löwgren, 2007a; Stolterman, 2008: 62). Such constructive traits are not about making something already thought out, but about making as exploration (Löwgren et al., 2013). One generic term for these kinds of design activities is "design experiments" (e.g. Koskinen et al., 2011) such as interventions by probes, objects for collaborative workshops, as well as constructing and sketching in the studio. Telier et al. (2011) use the even broader terms of "design things" and "design games" to encompass means and ways employed in a situated and participative manner; even when neither actual designs nor designerly mediations are prominent.

Like Telier et al., I address a broad scope of design processes. However, in tune with my sentiment and my quest for a research that is thoroughly designerly, I stay with a designer's engagement with materials and where the processes are concerning not only *ways to explore*, but also *design knowledge* and *designerly knowing* – i.e. thoroughly designerly. In addition, my engagements not only go "into the wild" (Buxton, 2007), but also engage praxes. In sum, my engagements go beyond pure studio-work and mere process facilitation.

To point out the engaged nature of my design research both when it comes to *materials* and *participants*, I have chosen to call these activities for *design engagement*s. What I wish to address thereby is how designer-researchers can use *actual designs* (in casu actionable and with characteristics of debateables) to explore a design space together with participants [Chapter 4 situated such design engagements in the wider engagement with pedagogical praxes].

I will present three types of design engagements: sketching, inspiration and debate. In total, these engagements aim to explore a design space (in my sense of the term). The three types are not to be seen as discrete activities, but rather as adhering to three purposes, which may potentially be at play in any given activity or around any given design artefact and therefore – in principle – should be

considered in any engagement. This distinction of intertwined purposes may also impose some order to the plethora of terms for such activities within Interaction Design.

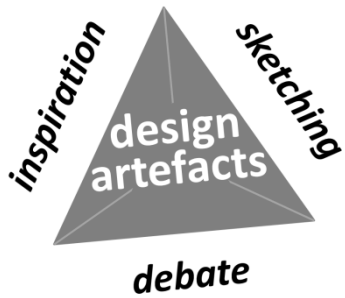


Figure 5.1.
Three types of design engagements. Design artefacts may serve three intertwined ideal types of design engagements: inspiration, sketching, and debate.

The three design engagements have been essential to my work. Yet, they do not encompass all perceivable design activities, as they for example do not address dissemination and presentation, nor specifically a priming of participants (Sanders et al., 2010) or indeed activities that do not make use of actual designs.

I concur with Nelson & Stolterman (2003/2012: 107) when they emphasise that desiderata-oriented design efforts should form an emergent whole, thus the address of domains and purposes should not be compartmentionalised. Nonetheless, thinking through the three separate ideal types of engagement may aid and guide the work of other designer-researchers; possibly both as an incentive to ponder how to compound the three generic purposes, and as a way to reflect on concrete activities.

I will now turn to conceptualising each of the engagements separately. Yet, in an actual engagement across the many participants and over time, one cannot meaningfully isolate one purpose from the other. Instead, the quality of the engagements rests on the totality of them. I portrait the engagements on a general level, as it is not my ambition to account for the actual experiences or psychological processes of designing – yet, it is important to stress that engagements cannot be reduced to solely a line of conscious moves.

Sketching

Sketching is about exploring a world-in-spe – not just by envisioning it but also through making traits manifest. As I will describe below, my take on sketching brings Bill Buxton's thoughts into a participative context.

Inspired by Gabriela Goldschmidt's thoughts on architectural drawings (alike to Donald Schön's work), Buxton (2007) has argued for cherishing sketching as a key design activity, and he has provided a wider set of tools suitable for mediating experiences, including how it feels to interact. This is especially called for in Interaction Design given its complex situated, temporal and dynamic forms (Löwgren & Stolterman, 2004; Buxton, 2007; Redström, 2013).

The essential point for Buxton is to contrast "sketching*"* with (final stage) "prototyping". Buxton uses "prototyping" as a counter image to sketching and as a very narrow term compared to, for instance, Houde & Hill's (1997) definition of prototypes as "any representation of an design idea, regardless of medium". Buxton sees sketching as a mediation of experiences and an embracing of potentials, which is explorative, evocative and opens up – all this as opposed to the narrowing down of "prototyping".

It is these explorative qualities of sketches, I also take to characterise my conceptualisation of the design engagement of sketching. Yet, in doing so I differ from Buxton in three ways:

Firstly, I address research and development beyond a sequential process model and a commercial setting.

Secondly, I take sketching not only into *the wild*, but also into engaging pedagogical praxes. This in itself is not in conflict with Buxton's view, as he in the abstract claims potentials of sketching in participative design efforts. However, I do not concur with Buxton's remark that the inclusion of user participation can simply be an add-on "taken for granted" (Buxton, 2007: 143) because I think this changes the perspective of engagement fundamentally, and thus also the means.

Thirdly, in aiming to embrace input from all participants, my design may not be as quick and inexpensive to make as Buxton (2007: 136) recommends sketches to be [see 'Virtues in being actionable' in chapter 4]. Moreover, in the shared trying-out,

my design artefacts grow into becoming more than solely "vehicles" and "by-products" (Buxton, 2007: 117/8) of explorations – albeit differently for the different participants. Nonetheless, my design artefacts – seen as sketches in the design processes – still pursue Buxton's intention with sketches of being explorative, evocative and opening up (Buxton, 2007: 140).

The sketching in the SID Project's design team has entailed a lot of backtalk on form (in the widest sense of the term). Sketching has also served my exploration of design potentials; even when it has just been an urge to go back to re-sketching or altering a certain feature. In addition to the sketching in the design crew, there has also been tweaking parameters with the pedagogical staff out in the Snoezelen places as well co-creation workshops for staff and design team. Sketching has also spoken into the pedagogical praxes by making parts of a world-in-spe manifest and thereby open to try-outs by both staff and the children. To complex matters, one may even say that the pedagogical staff within their field in some sense sketch pedagogical actions, when they try-out the designs in their praxes.

From the perspective of design engagement, the outcomes of sketching are not only to find a suitable form, but also to discern salient traits and to make alternatives manifest. Thus, key traits of sketching are that it mediates form in design imaginations, evokes sensitivities to design potentials and is suggestive to praxes in relation to the design situation.

Inspiration

> . . . activity that results
> not in the reproduction of previously experienced impressions or actions
> but in the creation of new images or actions
> [is] creative or combinatorial behavior
> . . . that combines and creatively reworks elements of this past experience
> and uses them to generate new propositions and new behavior.
>
> *Vygotsky (2004: 9)*

The design engagement of inspiration is all about how actual designs may not only be outcomes of inspiration, but by themselves serve to elicit inspiration. To encircle this engagement, I will address various types of design artefacts in the design (research) heritage.

Buxton (2007: 186) promotes the use of sketchbooks, which is a classic ideation tool from art & design schools. A sketchbook can take many forms across the various design fields. Here, a sketchbook means a continuous collection of – often at first sight disperse – impressions and impulses captured and reworked by quick drawings, notes and clippings. These elements are mainly suggestive, yet often also annotated, and by their sum, they embody inspiration.

Inspiration is the purpose of this second type of design engagement. Yet, not as a solitary activity as with a sketchbook, which is sometimes several steps away form an actual design, but as ways to use artefacts to elicit inspiration and wonderment related to collaborative processes. Inspiration is here seen as what feeds our combinatorial ability to divergently connect matters in the world (Vygotsky, 2004: 14f and the above quote), not detached from the world or by mere self-contemplation.

In design research, the *cultural probes* by Gaver et al. (1999) stand as an ultimate example of promoting the importance of inspiration rather than solely laying bare a situation. The significance of this is reflected in the hardship they have had in convincing the HCI community to stay with this ambition (Gaver et al., 2004a). Similarly, Nelson & Stolterman (2003/2012: 107) warn against "analysis paralysis" and advocate finding seeds for design.

Gaver et al's cultural probes were not sketches of a world-in-spe; yet, my interest concerns the use of designs related to a design space. One example is the *Placebo Project* by Dunne & Raby (2002), where evocative objects through their use are intended to "elicit stories". In a less radical form, *technology probes* uses elaborated designs to (also) elicit inspiration (Hutchinson et al., 2003) – the latter probes are also an example of combining several purposes.

In the SID Project, we staged design artefacts and developed an open mind-set in deliberations around videos of my designs in use. In doing so, we worked by wonderment (Hansen, 2013) as in being open to 'the more' of a situation and to find seeds. Furthermore, my ideation partly springs from associations of elements in the use situations – experienced in actu or shown in deliberations. Last, but not least, the fond of inspirations serves to connect matters in a nontrivial sense to come to grips with my take on the design space and the ways to capture potentials in this take.

Key traits of inspiration lay in notions of 'the more' in a design situation, in the growing sensitivities to design elements in design imaginations and in connecting salient potentials.

Such inspirational processes are pervasive in any design work, yet also very evasive by their predominantly tacit nature – hence any description may only capture mere glimpses.

Debate

The design engagement of debate concerns how actual designs may not only give form to a world in spe, but also question it and its guiding values. To present this engagement, I will address what is referred in general to as Critical Design (Malpass, 2012).

I concur with Nelson & Stolterman (2003/2012: 105f) when they argue that design should be careful not to be solely "reactive" to fixed value judgements and therefore recommend that designers explore, question and even transgress driving values in order to avoid "value paralysis". In a similar vein, Mogensen's (1992) concept of *provotypes* suggests designs as a means to elicit concrete experiences that proactively call "forth what is usually taken for granted" and "stimulate to action" (i.e. not provocation in the colloquial sense of hostile challenge).

The last decade of efforts related to Critical Design (Malpass, 2012) has paved the way for thinking design as an activity to raise issues (also) by the designs themselves. To serve this purpose, the designs tend to be highly evocative and provocative. Yet, to the best of my knowledge, most of these efforts do not stem from close engagements with people or communities, and the designs predominantly act as items for public debate rather than as being part of situated change. By contrast, Telier et al. (2011) points to how "design things" can be part of raising concerns in participative processes, but do less to progress thoughts on the level of concrete designs. This divide between strands of Critical Design and Participatory Design is addressed by Bowen (2009) in his work on *critical artefacts*, where he uses evocative designs in a participative context. These artefacts are intended to be "provocative and prompting reflection" in order to

address “future and latent needs” (Bowen, 2009), including the value base of the design situation.

In a similar vein, by the design engagement of debate I want to point to how designs can relate to pedagogical praxes and similar contexts by being concrete and evocative. Accordingly, I have used my designs to perturb praxes and thereby to not only address guiding values (i.e. the design situation), but also to seek salient qualities (i.e. design potentials) that may transgress the present. Furthermore, any of the designs imagination ultimately encapsulates even tacit motivations (Jönsson et al., 2006), which may thereby become subject of debate.

The key traits of the engagements of debate are the generative ways by which designs address the value base of praxes set in relation to the programme, aid the design work in transgressing the incremental, and form a nexus of concerns and motivations.

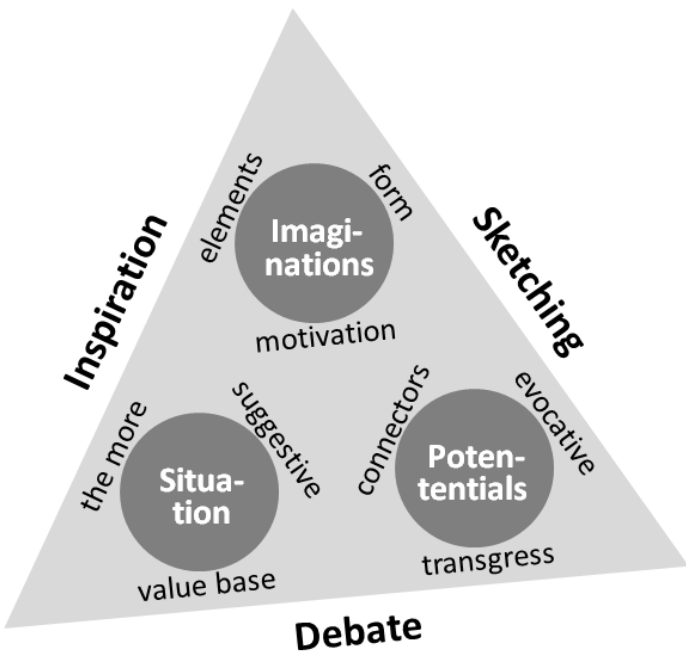


Figure 5.2.
Engagements related to domains. The exploration of a design space (in my definition of the term) conceptualised as three intertwined engagements (bold black letters) that explores three co-developing knowledge domains (circles). The engagements connected to domains (black letters inside the triangle) are merely to be taken as indicators of the manifold and often serendipic ways.

Domains and engagements

I have conceptualised design engagements and knowledge domains, and continuously linked the two. To further highlight these connections, I have provided an overview of connections in Figure 5.2. The connections are merely to be taken as indicators of the manifold and often serendipic ways.

I now return to examples of the design engagements mentioned in chapter 4 in order to illustrate how they can be intertwined in the design processes. In pinpointing the separate combinations of engagements and domains around individual designs, I have simplified matters considerably. This is because such elements defy separation due to their ideal-typical nature and because my designs have cross-pollinated rather than developed separately. I will indicate engagements related to the domains by a mark in the triangle of the figure *Domains & engagements* to show the variation rather than to do away with the intertwined nature.

On 'The story of HugBag'

HugBag came about as a quick sketch to open an action space for the staff related to a child's actions. The following stipulates the ensuing engagements:

The staff explored by adding bell balls to the existing bed with pillows. Together with bodystorming in a workshop with the staff, these try-outs moved the focus to sounds as the primary coupling to movement.

The design crew sketched various ways to make the physical and digital work together and took various sketches to the staff for further sketching.

Early actionable versions were taken to the children, and in return inspirations therefrom – especially of ways to engage bodily – later served a partial redesign of the actual feel of using *HugBag*.

By being actionable, the design even it its earliest stages gave a strong feeling of coupling body and sound, which was very evocative with respect to salient traits of sensuousness.

The design made manifest a suggestive alternative of what Snoezelen can be, and the design progressed deliberations and concerns on the role of the body.

A similar tale could be written about the design of *WaterBed* – starting with the design opening of embracing the smallest of movement, and collecting self-produced sounds from the children. The following stipulates the ensuing engagements:

The design work on *HugBag* inspired the *WaterBed* design.

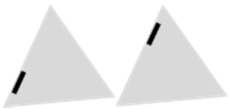
We did extensive collaborative sketching of ‘wave’ feedback.

The design and the children’s use thereof pointed to concerns around the focus point of ‘the body’.

The variations in use – such as rocking together, big movements almost playing the bed as an instrument, as well as call & response by hit – aided me in connecting and differentiating thoughts on design potentials.

The concreteness of the *WaterBed* design and the possibility to discuss by altering and feeling the design aided debate with the staff.

On 'The væsen workshop'



The designs served as boundary objects in the sense that the designs gave the staff an initial sense of interactivity, and the design crew a first sense of praxes based on the staff's anecdotes. These quickly made designs pointed to 'the more' in the design situation as well as to elements in a design space related to the known.

As the staff was asked to make up 'future anecdotes', they also started to bring up values and matters of concerns close to use.

On 'Pastiches'

As pastiches, the *ActiveCurtain* and *LivelyButton* designs – over long time – invited going beyond the present and even transgress values.

At the same time, these designs were also actionable and thereby provided inspirations from use with regards to both design development and connecting thoughts on potentials (The latter goes for all the designs except *VibeBoard)*.

The way the designs invited debate varied with many other factors. No design partaking in the close collaborations in the SID Project was – in principle – neutral as they may all have carried motivations, even if such may only be discerned through the articulation of the design. As germinal designs, the two designs carried motivations of the programme.

Design agency

The point with distinguishing between the three ideal-typical design engagements is not to dedicate a single artefact to a single purpose or to keep purposes apart, but to consider design engagements across purposes and domains – and by principle in any design engagement. What I offer is a *perspective* on the complexities of domains and engagements, not a model for schematic application.

Seeing all three types of design engagements as potentially intertwined in relating to the co-developing knowledge domains [see Figure 5.2] liberates the design engagements from a waterfall model or other sequential models of design development that may not be relevant for explorative design research.

In the previous section, I gave examples of how designs in the SID Project served various purposes in an intertwined manner. As such, the role of a design may transgress distinctions between concepts like probes, sketches and provotypes, but the characteristics of a design may still relate to these.

As Buxton notes in his distinction between sketches and prototypes, one cannot – at least by principle – distinguish them from one another solely by the design artefact itself. It (also) depends on for what and how, the design artefact is being used. Yet, in line with Buxton, this does not mean that the artefact itself does not play a role. On the contrary, the agency – or backtalk in a broader sense (Tholander et al., 2012) – of design artefacts builds on their ability to fulfil their purposes in design engagements.

For that, the design artefacts get *agency* (i.e. capacity by their own characteristics) in speaking into praxes by their tangible and concrete form. Thus, what should be considered in collaborative settings can hardly be reduced to the mere discursive, since the designs relate to a broader set of human faculties. A way forward could be to emphasise that a *design thing* (Telier et al., 2011) becomes so much more by (also) being conceived and carefully crafted as a *design gegenstand*, i.e. that which by its concreteness stands against and presses itself upon us (This said without any deeper claim in relation to etymology or Heideggerian philosophy).

The term *design agency* may be ascribed other meanings, and two are of relevance here:

The Participatory Design community have primarily addressed facilitation of participant's agency by design-oriented, but often predominantly discursive social interplays. As mentioned, Bowen (2009) has pointed to how designerly ways can enrich participative efforts, and I would be pleased if my conceptualisation and performance of an engaged research can add to this agenda.

In doing so, it is crucial not to lose track of a designerly heritage and the agency (i.e. own capacity to act) of the design discipline. This concern is echoed by Ho & Lee (2013) in their critique of Björgvinson et al.'s efforts in the emergent tradition of *design things* for not giving "many arguments to show the significance of design as a professional discipline and as a specific form of practice". Thus, Ho & Lee worry "that this conception of design would miss the key disciplinary and practical components of design". As I see it, this also entails *designerly knowing*, the third element in "Design with a capital D" mentioned in the beginning of this chapter. Designerly knowing is the topic of the next section.

In continuation, to promote an activity as a *design engagement* – as I outline it in this chapter – is to say that it requires specific competencies and considerations. Accordingly, a designer-researcher may undertake intertwined engagements by ways that are not interchangeable with segregated regimes of for instance ethnographers, construction and test engineers.

Tangible knowing

> . . . in a Research by Design view,
> more is at stake than simply immersion in design.
> Designer-researchers work reflectively,
> moving between creative action and critical reflection.
> Reflection and creation is layered and feeds into each other
> and is closely bound together in a symbiosis
> that goes beyond the remote position of the observer.
>
> *Sevaldson (2010: 8)*

For this dissertation, a key question is how to understand programme dynamics as designerly knowing. My intention has been to look for traits in the design heritage that could capture how I performed my research. From early on, I began to see my design research moving forward by part/whole dynamics, and hence having some hermeneutical traits (co-authored paper on the subject: Löwgren et al., 2013). Furthermore, given my sentiment of *tangible participation*, the concrete actions and evocative design artefacts play a key role in the very knowing.

There have been efforts to conceptualise design processes as "hermeneutic" (e.g. Snodgrass & Coyne, 1996; Hill, 1997; Lie, 2011; Kidder, 2012; Jahnke, 2013) and herein often specifically the significance of sketching as known from Donald Schön's studies of architect drawing. What is addressed is not design processes seen as specific methods, but as a way of knowing, where "the senses and the imagination are at work in every step" (Kidder, 2012: 91). Also more generic references to part/whole dynamics of can be found (Healey, 2009: 287)

However, explicit references to hermeneutics do not seem to have spread into Research through Design and the like besides general references akin to "moving between creative action and critical reflection" (Sevaldson, 2010: 8).

To capture my own research, I appropriate thoughts on design processes as having hermeneutic traits in the sense of part/whole dynamics. In doing so I go beyond purely discursive measures (otherwise often associated with hermeneutics), and I promote design artefacts and actions as significant articulations. On this basis, I will draft a tentative model for a design research, where programmes mature by part/whole dynamics of articulations and framings.

I do so to promote designerly research – yet, without any wider philosophical claims as my ambition is limited to capture significant traits of design knowing (rather than to unfold discussions of various concepts of "understanding" per se, or to address hermeneutic knowing at large).

Articulations & lenses

> . . . we advocate for an approach based on articulation.
> This is to say that we view a designer's knowledge of product quality
> as an ongoing debate . . . Statements are made in this debate
> through the main vehicles of design and reflection.
> A digital artefact or a design concept can be seen as a statement . . .
> likewise for a written or spoken analysis
>
> *Löwgren & Stolterman (2004: 102)*

> Aesthetic cognition . . . is a back-and-forth
> between material particulars of objects and interpretative/meaningful wholes.
>
> *Bardzell (2011: 609)*

To Borgdorff (2012: 149) a key trait of Artistic Research is "the articulation of the unreflective, non-conceptual content enclosed in aesthetic experiences, enacted in creative practices and embodied in artistic products". Borgdorff (2012: 157) sees Artistic Research as a peer of Research by Design, and I extent his emphasis on *articulations* into the framing of my type of design research.

Design processes abound in articulations, and so has been the case in my work. Articulations have taken the form of "externalisations" in sketching (Buxton, 2007: 114-9) and manifest traits in the designs, as well as actions and experiences with and around designs. I see such articulations as *parts* – or in design lingo: *particulars* (e.g. Stolterman, 2008; Gaver, 2012), or that which *talks back* (e.g. Schön & Bennett, 1996). Along with Borgdorff (2012) I emphasise that such processes go beyond the discursive, the solely conscious and indeed beyond the readily mapped – and no less so in collaborative processes as those in the SID Project.

The other side of the design processes is framings, which in my research have progressed from desiderata and foci of the programme, over groupings of design qualities and feelings of kinship between particulars, and then on to the co-annotated portfolios/collages and a holistic take on the design space. I see framings like these as wholes; and when they have matured into having sufficient coherence and appeal to grasp salient traces of a design space, they can serve as *lenses,* which in turn may aid in addressing other design spaces [see also chapter 6]. I use the term *lens* to refer to the academic metaphor for a coherent, yet contingent, way to address (sense / view / reflect / act on) something – with the

connotation that a physical lens aims and orders the light coming through it according to its own construction. The point being that maturing a program is not a "question of truth" [Redström's Swedish term: *sanningsfrågor*], but about being suggestive of alternatives (Redström 2007:169) and in doing so cherishing multiple ways to address the programme.

The relationship between articulations and framings is that of tensions between *parts and wholes*, and from this interplay of tensions, the programme matures: The parts become something more in light of a whole; yet, the parts are not just what they substantiate in this light, they potentially point to other connections and thus perturb, unsettle and potentially progress the whole.

Reversely, the whole frames, gives relevance and points to what is significant in the parts. As the whole presupposes and gains substance from the parts, the whole is not separated from parts [see Figure 5.3]. Thus, knowledge contributions cannot be mere abstractions, but need to be tight couplings of lenses and articulations. Or as Gaver (Gaver, 2012) puts it, the role of theory is to "annotate" designs rather than to replace them.

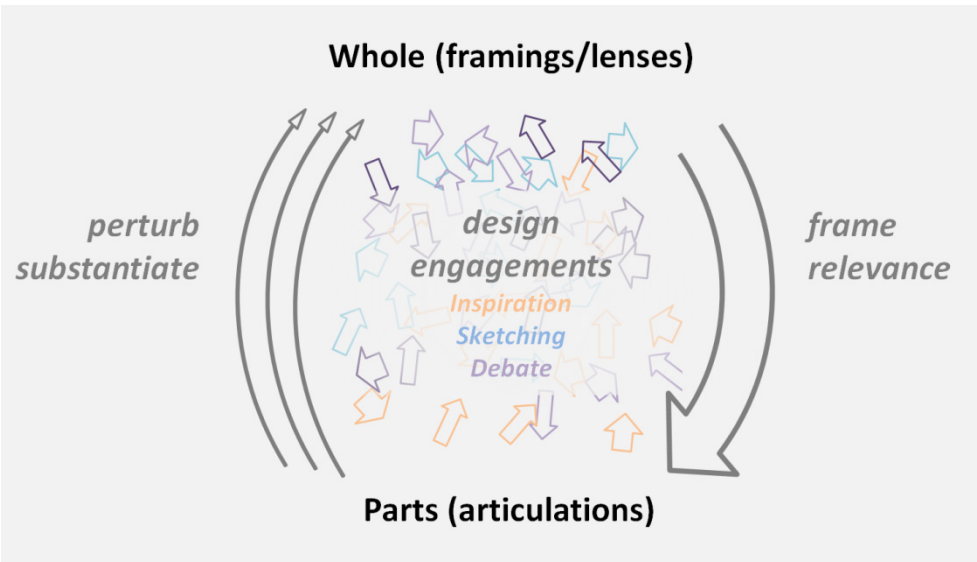


Figure 5.3.
Design engagements driving the part/whole-dynamics of the programme.

Therefore, this dissertation entails not only pictures but also videos as well as rich descriptions of and close pointing to elements of my designs. In doing so, I do not seek to break dissertation formulas, but I see a need for further work on giving the articulations prominence. Here, traditional exhibitions may be questioned with respect to which kind of research-relevant design knowledge they can convey. Nevertheless, the closing exhibition of the SID Project may carry seeds for how to 'stay' with the particulars, which may be worth exploring in future work: In the exhibition area, visitors could not only try out the designs, they could also view collages from the project's web page with videos of the children using the designs, and speak to the pedagogical staff and the design crew. In this way, the exhibition came closer to addressing the design space in the broad sense rather than just as design imaginations.

Seeing knowing as the maturation of a programme by part/whole dynamics leading to both lenses on and population of a design space matches the intricate and serendipic character of design processes.

I call this kind of knowing *tangible knowing* as it is in line with my sentiment of *tangible participation* in several ways: Firstly, in these knowing processes across human faculties, the actual design artefacts and design actions matter profoundly. Secondly, the programme dynamics stay with the tangible and sensuous as it matures and ultimately lead to knowledge contributions by tight couplings of articulations and lenses. Thirdly, I posit that the generative power of such contributions rests on staying with the particulars. Thus, also the dissemination of knowledge contributions should carry traits thereof.

These kinds of knowledge contributions go beyond the concept of *intermediate-level knowledge* proposed by Höök & Löwgren (2012) as the coupling of lenses and articulations transgresses the author's proposed scale from "instances" to "theories". Furthermore, particulars matter beyond proof and superficial illustration as they are integral to the designerly articulation and crucial in making the contributions evocative; for instance as a interplay between wholes as pointers (Bowers, 2012: 72) and parts as tracings.

Chapter 6, 'Potentials', includes various couplings of articulations and lenses. There could always be others, but the ones I present are the ones that the design engagements carried forward. These contributions connect to the desiderata and

foci; yet, such order might give the false impression that the process of eliciting knowledge contributions has followed a straight path. Rather, it has been a very pragmatic undertaking made together with the pedagogical staff, where the outcomes formed trajectories building on the diverse ways of articulating and framing – including the co-annotated portfolios/collages where the staff both metaphorically and literally drew lines between incidents in videos and terms to capture these. Referring to key traits in the collages, the staff also formulated a stance of three aspects. These two main outcomes, collages and aspects, are matched by my built design imaginations as well as my take on the design space.

Wider implications

Using the notions of interplay and part/whole dynamics, I have chosen not to follow the common ways of using metaphors of dialogues to explain hermeneutics – as in entering "into a dialogue with a text" (Snodgrass & Coyne, 1996: 19). There are several reasons for this: Firstly, the power of these metaphors fades with the distance from the original textual scope of hermeneutics. Secondly, in lieu of my sentiment, the metaphors of language may carry too many misguiding discursive connotations. Thirdly, I see the relation between parts and whole as a tension rather than sequential exchanges (even if it may be experienced as the latter; hence, the popular metaphor of question and answer).

Thereby not said that my take is at odds with all of the tradition. On the contrary, I see my contribution as in line with Jahnke's take on hermeneutics in design. Especially, as Jahnke points to how a hermeneutic take on design processes may move beyond what Jahnke sees as problematic sides of Donald Schön's view (Jahnke, 2011). Given the prolific use of Schön in design education, Jahnke' critique is in itself significant. For me, two points made by Jahnke – based on his own design practice – carry special value as they address traits, I also recognise from my own work:

Jahnke (2013: 90) points to how Schön presupposes a negative something, "a problematic situation", which is not in line with more open and explorative design approaches. Furthermore, Jahnke sees a tendency in Schön's thinking to regard the situation and the designer as "inert", which does not capture how a designer may engage her/himself in a situation, and that such engagement may also entail change processes beyond the actual design. Jahnke then moves on to show how

Gadamer's hermeneutics may capture such traits by seeing the designer as "immersed". This is in line with my engaged approach.

Moving beyond Gadamer, Jahnke supplements with a critical stance of including diverse interpretations, embracing tensions and frictions as well as seeing situations as fluid. Similar thoughts can also be found in Kidder (2012: 109-16). This stance is in line with how I address the *design situation* as being in flux and include the design engagement of *debate*. My errand here is not to elaborate on the heritage of hermeneutics per se, but to point to how Jahnke's contributions qualify how my research is set-up by desiderata, driven by critical design engagements, and partaking in change processes within pedagogical praxes.

A continued quest

> In the case of artistic research, it is important to stress
> that the object of research, the context of research, the method of research,
> and the way the research results are presented and documented
> are inextricably bound up with the practice of making and playing
>
> *Borgdorff (2012: 121)*

Having now drafted a tentative model of designerly knowledge domains, type of knowing and ways to explore, I hope to have provided the reader with a perspective on the design engagements presented in the previous chapter as well as on the design knowledge in the form of design imaginations as presented in chapter 3 and in the form of design potentials presented in the next chapter.

Before I move on, I would like to conclude this chapter by classifying my type of research, and thereby hopefully aid the on-going formation of a distinct and self-reliant field of research.

As stipulated, my research aims to stay with the knowing processes inherent in design and thereby finding fertile grounds for serving designer-researchers. In other words, a thoroughly *designerly research* as it is designerly through and through. The pun on prepositions intended, as I see my work as a continuation of the continuous efforts often referred to as Research through Design; understood here as an appreciation of the knowing in constructive efforts by a designer (e.g.

Sevaldson, 2010; Gaver, 2012; Hansen, 2013). More precisely, I address the characteristic forms of knowledge construction related to heritages from art and design schools (Pullin, 2009: 3), rather than taking an all-embracive approach to constructive research across research paradigms as Koskinen et al. (2011) do.

So far, I have not dwelt on the long lasting controversies in defining design research around the prepositions to put between *research* and *design*: *into / on / about / for / in / as / through / by / with / from-within* (Sevaldson, 2010; Borgdorff, 2012; Hansen, 2013; Bowen et al., 2014). However, to situate how I frame my type of research, I will now relate to views carried by the prepositions.

Research that is thoroughly designerly integrates several of the disputed prepositions, which is also the position of Sevaldson (2010) whose term *research by design* is in line with my intentions – yet, I do go further in my thoughts on programme and programmatics. I could stop here with this reference to Sevaldson; yet, the topic calls for a more detailed account.

The type of design knowledge my programme primarily address, I call *design potentials* which concerns salient design traits of a world-in-spe. Such projective traits are not a matter of proof and prediction, but of suggestive ways to sense/ view/ reflect/ act in designing. Thereby such a research is *for* design, and *into/about* design – yet, not from a distant perspective, but explicitly from a designerly perspective when involved in a context. As such, the research is unlikely to be accomplished by non-designers as is otherwise associated with the prepositions *for* and *into/about* (Sevaldson, 2010; Hansen, 2013).

I use my programme to connect to pedagogical knowledge and knowing. Such situatedness of the design processes may afford close co-development with a non-design field, but the primary goal is to serve design research rather than being a 'method' serving other disciplines (hence the proposition *through)*. Two examples of the latter related to the pedagogical field are Alghamdi & Li (2013) and Christensen et al. (2012). Furthermore, I concur with Hansen (2013: 147), as he puts this even stronger by emphasising designerly sensitivities and necessary presence in the making processes rather than an instrumentalised research *through* design.

The type of design knowledge I look for is closely tied to seeing design processes in themselves as knowing processes across human faculties, i.e. research *by / through* / *from within* design (Sevaldson, 2010; Borgdorff, 2012; Hansen, 2013). To say that designing entails particular knowing processes requires an understanding of design processes, i.e. *into/about* design; i.e. as processes. I have described such matters, but from an insider perspective.

Acknowledging the role of the design artefacts as evocative knowledge nexus goes far back in the discourse on design (e.g. Carroll & Kellogg, 1989), and ties back to research *through* design. In continuation, serving designers in future design work benefits from disseminations with evocative richness and from opening up by the play between lenses and the concrete, rather than only detached abstractions solely in discursive language. Thereby also implied, how dissemination must reflect that knowledge is tied to the design artefacts and experiences with them, and therefore especially the choice of (re)presentations. The latter concern may relate closely to the specific design discipline as when Interaction Design being a temporal discipline may prefer videos (Löwgren, 2011). However, while the design deliberations in my research have relied heavily on video and try-outs, I have not tried to break the dissertation format to accommodate such concerns fully. Thus, this text is still highly self-contained and based on discursive language.

The just given stipulation of a designerly approach to doing design research frames my own situated research. Hopefully it can also inspire others, but it is in no way meant as a fixed recipe. On the contrary, I cherish the inherently unruly character of design and by extension designerly research that defies schematisation and fixations.

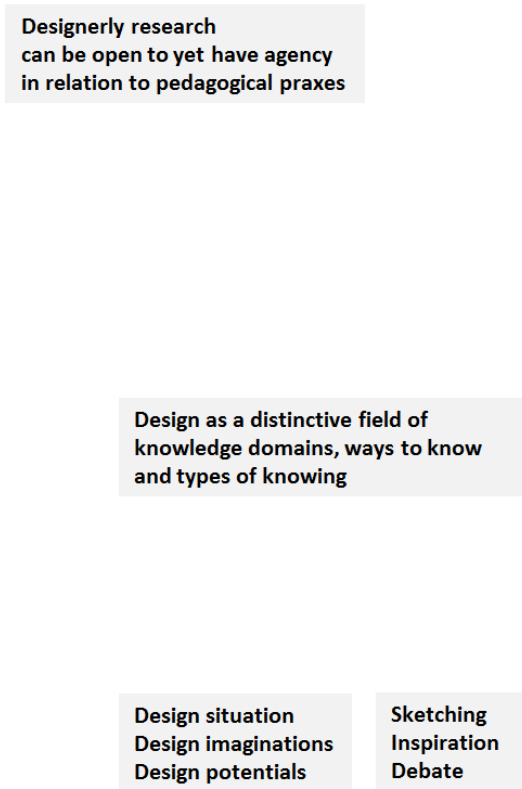


Figure 5.4.
Excerpts capturing key points

Programmes mature
by part/whole dynamics
of articulations and framings

Acticulations
enclosed in aesthetic experiences,
enacted in creative practices, and
embodied in artistic products

Framings as wholes matures
into lenses as they gain
coherence and appeal
to grasp salient traces
of a design space

Knowledge contributions
by tight couplings
of lenses and articulations

6

POTENTIALS

Progression of the programme
Aspects
The take

After-the-project reflections

A designer's palette
Unfolding potentials

By sensuousness
Through a compositional principle
For participation

> Rather than predict the future, we seek to inspire novel work and offer a mapping of the dimensions of emerging design spaces in which it might be situated.
>
> *Gaver &Bowers (2012:48)*

The last chapter ended with threads back to a design heritage and partially historic classifications. As a bridge from these conceptualisations of knowing to this chapter that deals with actual design qualities, I introduce Helle Hove's (2010) thoughts on learning within design and use some of her key concepts to structure this chapter.

First, I need to state some reservations. As also I do, Hove addresses designing of the immediate and sensuous (Hove, 2010: 37), but her examples are limited to giving form to static physical objects and in design processes separate from users. This limitation, however, does not affect the concerns I address since they are more generic. Furthermore, Hove's paper is in Danish, where many design-related terms defy simple translation, but I use an approximate word-to-word translation, when it does not interfere with the issues at hand.

Hove (2010: 15) suggests three generative and interrelated ways to address matters of form: appraisal [Danish: *værdsættelse*], holistic take [Danish: *greb*], and lens [Danish: *blik*]. After introducing these three ways, I point to how they relate closely to the way I frame my contributions.

Appraisal refers to a holistic set of values, stances and judgements integral to the designer's "register"/way of conduct – like the "key in music" (Hove, 2010: 16). For Hove, it is important to cast light on this value base in order to understand choices of form. In my work, I see both the desiderata and the sentiment as ways to address such "keys".

Hove's use of the term is the most academically inclined reference that I have found, despite the Danish term for holistic take, *greb* or *helhedsgreb*, being widely used close to practice (e.g. KADK, n.d.). Hove (2010: 15-9) refers to *a holistic take* as the coherent fashion by which a designer uses design materials, and such a take may only become conscious through having been used many times. According to Hove, unfolding a take may entail many and varied concerns, and may even serve as an "eye opener" to others with similar "appraisal". I use the term *holistic take* to stand for an *emergent* and *overarching* guiding principle permeating how one addresses (senses/ views/ reflects/ acts on) a design space. In

this chapter, I present the take, *designing for engagement,* that emerged from my work in the SID Project.

With the term *lens* [Danish term used: *blik*], Hove (2010: 15) refers to ways to perceive and comprehend form – this includes appreciating known qualities in a new light. I use the term in a similar fashion albeit in the broader sense of providing *contingent, yet coherent ways* of addressing a design space in the form of matured framings [see also 'Articulation & lenses' chapter 5]. This chapter is dedicated to the pursuit of such framings of salient aesthetic traits related to designs and designs experiences, on what I call *design potentials*. These traits are salient in the sense that they stand out through the design engagements and have given body to and enriched the programme.

Progression of the programme

The contributions on design potentials are grounded in the outcomes of a wide span of design engagements. These include the collages and a broader backdrop of the many deliberations in monthly meetings, workshops as well as countless sketching sessions within the design crew, and – not to forget – experiencing Snoezelen during numerous visits to the Snoezelen places. In other words, discerning design potentials builds on the extensive project work, where the pedagogical praxes have contributed with their actions, sensitivities and insights (i.a. by deliberations, try-outs, collages). That being said, my contributions relate more closely to a design perspective, as my intention is to catch a quintessence appropriateable for design efforts rather than pedagogy.

While the final formulations of design potentials to a large extent have been done after the end of the SID Project, the design engagements with all their richness, multiplicity and serendipity have grown inside and have matured the programme throughout the project [see Figure 6.1].

The initial framings (sentiment, desiderata and foci) and germinal designs (pastiches and the first workshop designs) have progressed into a set of designs as

well as to experiences with the designs assembled in the collages and at the end of the project leading to a pedagogical stance. I present the stance later in this chapter as what we in the SID Project called **aspects of interactive Snoezeling**. The aspects were developed with the Snoezelen staff and built on the co-annotated portfolios/collages and on the continuous deliberations.

Next, from looking back on the sum of articulations and especially the aspects, I sum up the design efforts at large into what has emerged as **a holistic take**. I call the take *designing for engagement.* The take is a guiding principle, which has permeated my design work as an emerging realisation not verbalised until the end of the project.

I then move on to after-the-project reflections. First, I provide two ways to highlight traits of the take and the design work at large: **A designer's palette** grouped around the three foci, and a set of selected rich descriptions of interactions in what I call an **unfolding of experiences**.

As a last step, I provide **contributions tied to each of the desiderata** to highlight different perspectives and relate these to relevant literature.

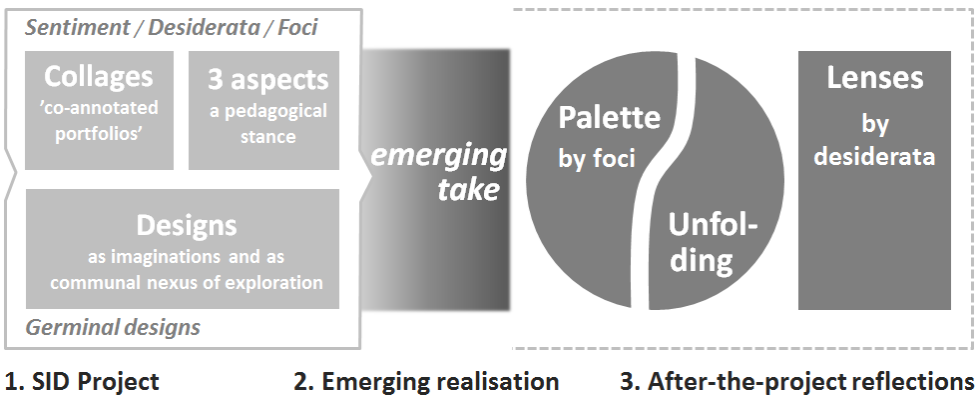


Figure 6.1.
The progression of the programme (left to right):
1. Through the SID Project, the programme set up by on the one hand sentiment, desiderata and foci, and on the other hand germinal designs leads to designs, collages and a pedagogical stance.
2. An emerging realisation of the holistic take as a guiding principle permeating my design work – yet, not verbalised until the end of the project.
3. Building on the outcomes of the project, first two types of after-the-project reflections to highlight traits of the take (parts of circle) and then lenses, connecting back to each of the desiderata and relating to separate fields of theory.

Before I begin with the contributions, I would like to point to a paradox, which I – in hindsight – think many of the contributions aim to grasp. Most of the designs go beyond known causalities (i.e. the *cause and effects* for the children to experience). Nonetheless, the designs have been part of joyful experiences of children for whom grasping basic causalities is a pervasive challenge in daily life. In continuation, one side of the contributions in this chapter is a pursuit of how the designs have made the world not only more accessible for these children but also more fantastic.

I must stress that the contributions should be seen as supplementing and as casting light on each other. The point here is to cherish a multiplicity of framings rather than privileging a singular view. As a consequence of this multiplicity, overlaps are inevitably and elements of redundancy have been hard to avoid, so I will have to ask the reader to bear with this.

I recommend that the reader revisit chapter 3 to recall the designs before reading the following contributions on design potentials.

Aspects

Across the many deliberations, the staff and I together searched for ways to convey insights around qualities in the interactions connected to where the staff saw meaningful Snoezeling.

One challenge became evident from early on in the video-deliberations. In the staff's comments on the designs, many statements pointed in opposite directions and beyond what could be ascribed to variance in situation or the like. To illustrate, Figure 6.2 shows a set of statements on the foci of *more-than-a-button*.

A way to deal with such confusion slowly emerged, as I could begin to distinguish between different concerns in the descriptions. Through debates with the staff, three *aspects* of interactive Snoezeling were formulated: support attention, inclusive basic interaction, immersion.

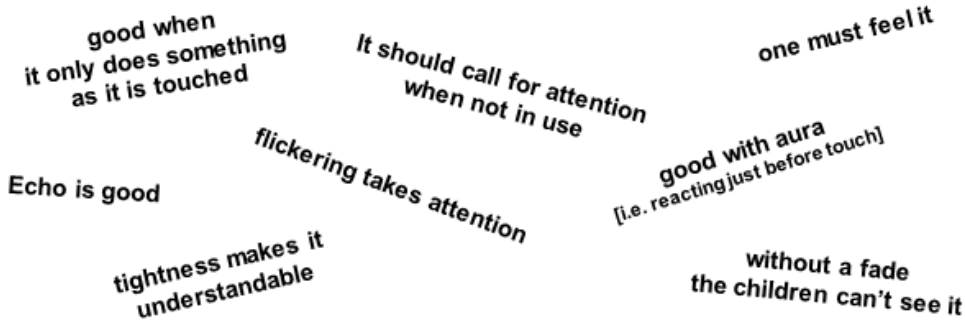


Figure 6.2.
Examples of potentially conflicting statements from the staff [my translations into English].

The earlier confusion diminished perceptibly as these aspects enabled me to see how the statements related to different concerns. Even if the aspects are tentative and in no way pretend to cover the whole span of qualities, let alone the totality of the Snoezeling, the basic distinction made sense to the staff when looking back at the process. As a pedagogical stance, the aspects can be seen as a contribution to the Snoezelen staff's community. Hence, the aspects are foregrounded on the SID Project's website in a simple version.

The aspects not only stand as a pedagogical stance, but also suggest potentials for design research and lay a ground for the following steps in discerning design potentials. The aspects were formulated so that each consisted of statements pointing to qualities and examples thereof. After presenting each of the aspects, I point to a dynamic perspective behind them.

In the following sections, I will present each of the three aspects as they were formulated at the end of the project. I have, however, added clarifications in brackets. In the descriptions of the aspects, the titles of their elements are translations from Danish, plus – set in parentheses – sometimes the English term, I used thereafter in the text. When the translations are merely approximate, they are supplemented with the original Danish title.

Support attention

[This aspect addresses a continuous process throughout interactions, where attention may vary considerably over time. As the artefacts calls, sustain reaction, start co-incidentally or frame focus, they can support the child in (re)entering and staying in the interaction and interplay.]

There are four elements in this aspect:

Framing

“Here!”

Framed by the black box, the inner light of *LivelyButton* provides a focus.

One version of *ActiveCurtain* had a vertical ribbon, which served as a starting point.

To call

”Come along”

When *LivelyButton* is not used, it starts to emit a faint pulsating light.

LivelyForm starts to move if it has not been touched for a while
[later comment: This feature was actually a bug].

Prolonged reaction to give the child time to process

“I’m still here”

WaterBed has an echo effect.

MalleablePillow has an afterglow.

Starting by coincidence

”Come again”

The version of *ActiveCurtain* that were all black when untouched brought one of the children out of repeated monotonous movements by reacting very clearly to a coincidental hit.

MalleablePillow also reacts to loud sounds.

Inclusive basic interaction (grasp)

Danish: *inkluderende grund-interaktion*

> [This aspect addresses suitable ways to couple cause and effect by tightness, sensuousness, and the designs being open for input. In short, enabling the child to affect the design and feel/recognise this. Such engagement is broader than having a conscious insight into cause and effect as an end goal, as it is rather what makes the child have feelings and hunches of how the design may react and how they relate such to their own actions.]

The elements of this aspect fall into three groups:

Tight couplings of input and output support grasping cause and effect

In *MalleablePillow*, fidgeting creates light, where one touches; and the more one fidgets the more the lights shine.

In *ActiveCurtain*, the colour changes instantaneously, where one presses and the resulting shapes get bigger with deeper pressing.

Use of many senses to amplify

Coupled to the body, so one feels oneself in the interaction

Moving in *WaterBed* makes it respond by a wavescape that goes all the way into the feel of one's body.

Several of the children have felt the inner movement in *LivelyButton*.

Open to input

Anywhere:

Even when one is just near the top of *LivelyButton*, it may react.

No matter where one lays in *WaterBed*, it responds.

Anyhow:

Several children have manipulated *ActiveCurtain* and *LivelyButton* with their heads.

Immersion

Danish: *Fordybelse*

> [Due to the character of this aspect, it was told differently than the other aspects. The 'we' means the staff and me]

This aspect has been the hardest to formulate; yet, maybe the most important. Across our many talks, it has been referred to as "when the violins sing" as well as "when we say '*Now* it's Snoezeling!'". What constitutes Snoezelen is a subject, we will never exhaust, but this aspect concerns crucial matters.

There are three sides to this aspect:

Arousal dance (balance of immersion)

We got the impression that designs invited different levels of arousal in the children. From this notion, an ambition grew to have the designs respond adequately to the change of arousal; i.e. questions of digital behaviour pointing back to the focus point of *væsen*. We explicitly related this thought to the temperaments of *LivelyButton* as well as to the characters of *WaterBed* and *HugBag*. For instance, both *LivelyButton* and *WaterBed* can through varied output nudge the child to move out of stereotypical-like behaviour by continuing the activity – yet, gradually changing its output slightly. In this way, *WaterBed* has become more versatile. We have also seen that the activity-level of *LivelyForm* seemed to 'rub off' on the child.

Small mysteries and adventuring (Exploration)
Danish: *Gå på opdagelse og små mysterier*

We got the general impression that the interactivity supported the children in exploring and – as part of that – getting a feel of themselves [Danish: mærke sig selv]. This was not only the case with the interactivity by a program coupling sensors and actuator, but also by the mechanic workings of *LivelyButton*. With *HugBag*, we have seen how the twist in its soundscape by the ratio between the two detection zones evoked shifts between deep bodily engagement and (both metaphorically and literately) laid-back pondering [Danish: grunden]. In addition to the significance of feeling oneself as part of the experience, we have also seen the joy of sharing the experiences.

Being engulfed and finding one's calm (Musing)
Danish: *Opslugthed og finde ro*

We saw how the tight version of *ActiveCurtain* with its co-located and gradual feedback was more calming than the loose version with flickering feedback all over the curtain. Yet, there is more to it. With *LivelyButton*, *HugBag* and *MalleablePillow,* we have seen how intense and absorbed use grew into almost meditative calmness.

A dynamic view

The staff used various terms for the aspect of immersion. Sometimes they would refer to the snuffelen/doezelen duality [see 'Snoezelen' in chapter 2], which has quite varied connotations within the Snoezelen movement. At other times, the phrase "balance of high and low arousal" was used. However, the term *arousal* could easily give the impression of a very reductive understanding that does not capture the depth of the staff's own descriptions of engagements. The staff and I were even hesitant to use the word *balance,* as the interplay may be more intricate than that. Nonetheless, the terms served as shorthand for pointing to how the immersion unfolded dynamically over time.

Another dynamic perspective lies in seeing sensory processing as an active process entailing a continual selection and relating – even when apparently passive. Similar thoughts can be found in the Snoezelen-related literature (e.g. Ayres, 1997; Bundy et al., 2002; Pagliano, 2012) and within design-related literature in Wright & McCarthy (2004: 80f) and in Bardzell referencing Russon: "…the notion of perception as a form of cognition, not as a passive data reception service for the mind" (Bardzell, 2011: 610).

These dynamic views and the aspects have fed my further efforts to elicit design potentials.

The take

> . . . call for new ways of interacting requiring the expansion
> of ideals as transparency and efficiency
> to include subtle poetic elements exciting imagination
>
> *Petersen et al. (2004: 269)*

The three aspects just described came out of the long-term work with the Snoezelen staff through the video-deliberations and the making of collages. After the SID Project ended, I continued this search for ways to elicit salient traits – yet, by then, exclusively from a research perspective.

From my continued delving into and diverse reordering of the annotations and videos of Snoezeling *a holistic take* took form. By *holistic take,* I mean an overarching guiding principle permeating how one deals with a design space. The take has permeated my design work in the SID Project. Yet, I did not start to verbalise it until the end of the project. In the process of maturing the take, the collages and aspects played a key role, but the process built on all kinds of framings and articulations from the project. This is not to say that the take has not played a role *during* the project. On the contrary, in hindsight I see the take as something that has guided the most significant parts of my design work. I would have liked to have taken the verbalised take back to the staff for longer and shared deliberations, but by then the project had ended.

Looking back on the aspects and with the dynamic view in mind, it struck me that an essential virtue of the designs is that they do not separate means for *attention* and *grasp* from means for *exploration* and *muse*. Rather, a key trait of the design work seemed to be ways to combine them. Thus, I suggest seeing the aspects along two dimensions, where *immersion* is a balance of *exploration* and *musing* and where *connecting* entails continuous and interweaved processes of *grasp* and *attention* that cannot be conflated with mere control.

Seeing the three aspect as dimensions invites seeing them as potentially coupled and simultaneous. Let me – at the risk of becoming reductive – illustrate what this entails in Snoezeling:

- Connecting during exploration may entail a very generic sense of turning to or even just staying with a design or a situation to see what it may bring. Thus, exploration does not presuppose a conscious intention or indeed tactics of probing possibilities, but may over time entail both deliberate as well as more coincidental try-outs.
- Connecting during musing can be an engagement of savouring and integrating – in opposition to an absence of engagement as in drawing away from the world. It can be about taking in what has happened – as in apparently 'merely' repeating some (non-'stereotypic') action – or about slowing down to process and dwell, or about a needed recollection of oneself in relation to the interactions.

- The balance between musing and exploration is dynamic and crucial to being engaged in the Snoezelen interplay. The balance facilitates prolonged engagements, which in turn may give better time for both attention and grasp. Yet, just as a balanced interplay can enhance participation, so can a lack of it make the child too hyper or the opposite and therefore potentially inclined towards withdrawing from the world rather than connecting.

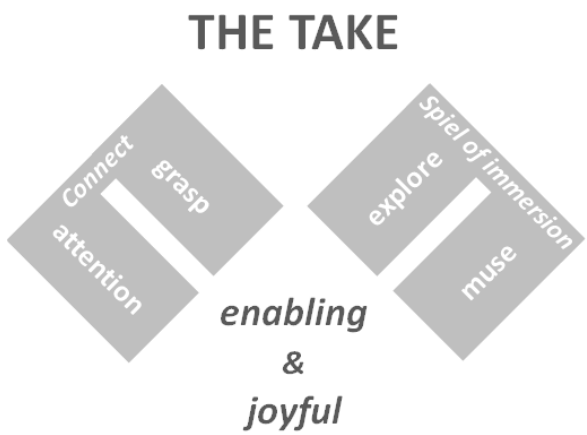


Figure 6.3.
The take with aspects seen as dimensions. Left: The dimension of connecting. Right: The dimension of immersion. The take promotes integrating the two dimensions to design for enabling and joyful experiences.

Designing for engagements

Seen through the take, the prime virtue of the design work lies in addressing both dimensions in an *integrated* way to make the experiences enabling and joyful, i.e. not to design for connecting *plus* immersion, but to integrate the two dimensions [see Figure 6.3.] and develop qualities that may serve both dimensions.

Thus, when experiences are *enabling*, it is an emergent quality – not a simple function of connecting. Similarly, a *joyful* experience is not a simple function of immersion. The point here is that by transgressing a separation of connecting and immersion, a designer-researcher can look for richer ways to interact. Thereby the take suggest an alternative to the many existing designs for people like the

children, which simplifies the interaction and detach it from the marvel of the output.

On this basis, I propose a holistic take, *designing for engagements,* which can be summed up as follows:

- Designs takes part in interactions and interplays to make the experiences both enabling and deeply joyful.
- The key notion is the integrated manner by which the designs aid in the user to connect and immerse.

As mentioned, a take is a guiding principle permeating how a designer-researcher addresses a design space. Akin to a manifesto (albeit emerging rather than pre-established), I see such a take as a designer's very generic way to embrace complexity – not as a recipe of two times two positions to ponder separately, but as something to feel, play out and reflect upon. As such, the take may serve other designer-researcher as inspiration and support for getting to their take in similar contexts.

The take is also a crucial stepping stone towards the coming contributions on design qualities, and traits of the take will be apparent in them.

After-the-project reflections

I will now present after-the-project reflections to highlight salient traits in the design work. To do so evokes questions of how and where aesthetic design qualities can be relevantly discerned by/for designerly research – in contingent experiences and/or in the actual designs (such concerns can be found across recent literature, e.g. Hallnäs & Redström, 2002; Löwgren & Stolterman, 2004; Lim et al., 2007; Lundgren, 2010; Gaver & Bowers, 2012; Höök & Löwgren, 2012; Lenz et al., 2014).

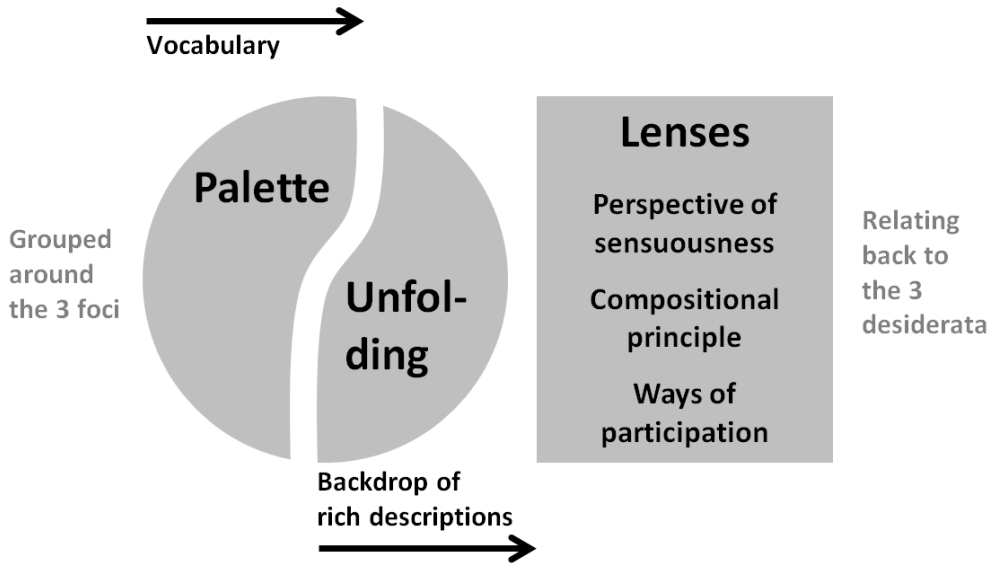


Figure 6.4.
After-the-project reflections. Three types of contributions and how they relate to each other as well as to the programme's foci and desiderata. By concretely pointing to elements of the designs, 'the palette' relates to the programme's foci. It also it provides a vocabulary for later use. The subsequent 'unfolding' gives a rich backdrop for the 'lenses' relating back to the three desiderata.

I address this by three kinds of contributions [see Figure 6.4]:

The first contribution takes the form of ***a designer's palette*** grouped around the three foci. It stands on the brink of a designer's experiences from making and seeing the design in use, where accumulated experiences have fed sensitivities to certain attributes. As such the palette stays close to the designs themselves, but seen in the light of Snoezelen and the genre (Löwgren, 2009) of aesthetic tangible interactions – or as Redström (2013) expresses it, as referring to "certain acts of perception and appreciation", beyond which the attributes of the palette may not apply. Besides being a contribution in its own right, the palette also establishes a vocabulary to describe the designs in use.

Next and on the brink of the user's experiences, I present an ***unfolding of potentials***, which consist of a set of selected rich descriptions close to the interactions seen as well as an accompanying video**.** The aim of the unfolding is primarily to provide the reader with a feel for experiences with the designs in action and to do so by being evocative and by offering multiple angles. As such, the unfolding stay close to the experiences in Snoezelen. Besides being

inspirational in itself, this contribution also serves as an evocative backdrop for the subsequent contributions.

I conclude by presenting **contributions relating specifically to the desiderata**. The desiderata implicitly permeate all the knowledge contributions. Yet, for each of the desiderata I provide an especially salient single contribution. As I want to reduce redundancy, these three contributions sometimes merely refer to earlier descriptions and can therefore only fully be appreciated in the light of the previous contributions and their more detailed descriptions.

Relating to the desiderata, I provide the following:

- I present designing with an awareness of *sensuousness* as related to multiple senses and an array of bodily engagements otherwise less explored. This lens connects to themes in Interaction Design research concerned with aesthetics, embodiment and corporeality.
- Related to the desiderata of *interactivity*, I propose a compositional principle as a lens for how to design tangibles by interplays of coherence and perturbation. This lens connects to the themes in Interaction Design research around transparency and ambiguity.
- I connect concepts of *participation* in relation to people like the children in the SID Project to qualities seen in the Snoezeling with my designs. This lens in a very concrete manner highlights how interactivity can address concerns within pedagogy.

A designer's palette

The palette aims to aid the sensitivity of designer-researchers to attributes of tangibles and thereby a feel of *design materials* in the sense of what she/he addresses and engages when sketching. After some thoughts on the status of such knowledge contribution on attributes, I present the palette grouped around the three foci: the body, more-than-a-button, væsen.

Attributes

> It is not only about merely inventing new materials of construction to serve designers,
> we can/must also let these new material's materiality
> play the classical role of materials in design sketching processes.
>
> *Manzini & Cau (1989)*

Form pertains not only to the realm of the static, but also to the temporal and dynamic. From both sketching and trying-out, it is evident that my designs defy a three-part division into traditional materials, the sensor/actuator set-up, and the coded behaviour. Rather, these three form an integrated whole in experiential terms and thus by extension in sketching [see 'An extended materiality' in chapter 2].

Given this holistic view, the palette reaches beyond a dominance of the static and the visual (Hallnäs et al., 2002; Locher et al., 2010; Redström, 2013). The palette also cuts across divisions of a design's 'appearance' (i.e. that which comes forth) and then its 'behaviour' (i.e. that which acts/reacts), and it thereby avoids simplistic separations as in implying that 'appearance' serves only passive observation of shallow beauty in visuals, or that 'behaviour' can never have any significant integral relation to non-digital matter.

The palette describes sets of what I call *attributes.* Here, the noun 'attribute' connotes something attributed as belonging to an entity, as in claiming that "Sensitivity is one of his attributes" (Dictionary.com, n.d.-a). The perspective is that of a tangible interaction designer's sense for the materials and thus, with at keen eye for form potentials and capabilities for facilitating experiences. Ingold (2012: 435) objects to the term *attribute,* when it connotes objectivity, but I use the term to point to a designer's appreciation parallel to that of a craftsman's, which Ingold praises. Thus my thoughts may differ from Lim et al.'s (2007) use of the term *attributes* as "intrinsic . . . artifact properties" (my tangibles also go beyond Lim et al.'s concern for the purely digital).

Attributes of interactive tangibles may be more flexible, diverse and dynamic by their mix of computational and material means than, say, glass was to a glass designer decades ago. Nonetheless, having a feel for the materials remains essential; and for this, the attributes in the palette are intended to carry evocative potentials for other designers of tangibles. This does not mean that an interaction

designer must master a whole set of craft skills including programming (that would also be unrealistic, just as it was for most of the glass designers), but more so have a sensitivity to embedded potentials. Such a sensitivity builds on a repertoire of the design works of others and especially one's own work through both studio work and interventions.

The palette stays close to the design per se, but seen in the light of Snoezelen and the genre of aesthetic tangible interactions – or as Redström (2013: 25) puts it, "form-acts" referring to "certain acts of perception and appreciation", beyond which the attributes of the palette may not apply. Thereby not implied that a user's experiences can simply be inferred from properties of the designs. However, just as the qualities in a spectator's experience of a painting neither can be *inferred* nor *detached* from the careful selection of pigments and binder on the painter's palette, so it is with the experiential design qualities in Snoezelen and my interaction designer's palette. Essential design skills lay in the intimate understanding and sensitive use of such a palette to create what Petersen et al. (2004: 271) call *capacities* and *potentials.* No less so, when such a palette entails an entanglement of materials that not only have static and physical properties, but also dynamic and behavioural ones.

To detail attributes and to establish a vocabulary, I will now present the *palette* with its sets of attributes, i.e. of what interactive tangibles can be by their totality of material construct, sensing, actuating and coded behaviour.

The Palette

I call my collection of attributes *a palette*. The palette is intended to capture main traits in the designs as they are seen through the foci, but the palette is by no means exhaustive. The sets of attributes could be suitable for other designer-researchers working with tangible interaction – even if such may indeed be more entangled than a painter's set of colour pastes.

It is crucial to remember that the purely material are integral parts of the attributes [see 'An extended materiality' in chapter 2] – as, for instance, with the tactile qualities of the fabric and paddings in *MalleablePillow* and *LivelyForm,* the flexibilities of *HugBag's* inner ball and *ActiveCurtain's* screen, the water level in

WaterBed, the resonating and rifled structure wood in *VibeBoard*, the strength of *LivelyButton's* motor, plus the various uses and dimming of light.

Attributes associated with 'the body'

As mentioned, a main concern for the Snoezelen staff is to relate to more than the audio-visual, and therefore to address touch as well a sense of bodily feel. Some of the existing Snoezelen products use vibration to give a sense of the affected area of one body, and there is some balance gear like waterbeds and swings. My designs take this further by exploring vibrations, wave-induced 'kicks' and moving objects.

Actuation

In relation to attributes of the designs, one side of this exploration has been to include the following line of actuation:

Vibration

As in *VibeBoard* sending vibration patterns through a wooden board, or more subtly in *LivelyButton* as the vibration of the motors makes the wooden cabinet resonate, as well as to some degree in *WaterBed* as the bass sounds cause vibration.

Infrasonic 'kick'

As in *WaterBed*, where non-audible sound waves – through the water in the bed – produce distinct 'kicks'.

Movement of the design

As in *LivelyForm* when it wriggles, and in a more subtle way in *LivelyButton* with the inner movements of its spirals including their pecking, when the turning of the stepper motor is hindered. Djajadiningrat et al. (2007) share this quest for aesthetic potentials of movement of interactive designs, a now growing field as new ways of actuation are developed, often labelled as "shape-shifting" (Holman & Vertegaal, 2008).

Sensing

Given the attention to also the sensing of oneself rather than solely the outer world, relevant attributes of the designs cannot be reduced to address actuation and 'outer' sensing. Therefore, relevant attributes of the designs also include sensors making the designs able to relate to bodily actions.

This can be seen in an array of relevant sensing capabilities; not known in existing Snoezelen products:

Sensing dynamic deformation of the inner matter

> Embedded microphones are used to pick up the sounds induced by water waves in *WaterBed* as well as the sounds caused by the manipulation of a carefully assembled set of physical materials inside *MalleablePillow*.

Sensing dynamic deformation of the surface

> The Kinect's 3D-camera detects the changes in the flexible surface of *ActiveCurtain* and in the softly inflated ball in *HugBag*.

Sensing restrain and proximity

> Two designs address being near. Inside *LivelyButton*, the stepper motor reacts (purely mechanically) to restrain of its turning spirals, and the design can be set to sense proximity of up to 5 cm (an 'aura'). *LivelyForm* has a sense for distributed touch, but does not react to being bent.

Here, the palette points to potentials for embodied aesthetics of the tangibility of the designs and the ability of the designs to relate to bodily engagements, which I will address later in 'By sensuousness'.

The bodily experiences of using the designs not only connects to the parts of the palette related to the *focus point of the body*, but also to other parts of the palette: For instance, *tight couplings* as in relating ones movement to the feedback, and the *openness* to input anywhere and anyhow on large surfaces, including whole body parts. In addition, it is crucial to remember that the purely material attributes take part in the responsiveness that I describe.

Attributes associated with ‘More than a button’

In relation to the focus point of *more-than-a-button,* I address two sets of attributes of interaction that can be seen as fundamental within Interaction Design.

Tight couplings

The prevailing buttons in Snoezelen mostly react *instantaneously*; that is, cause and effect happen (almost) at the same time, but the buttons separate cause and effect with regards to location and amount of feedback. So here the foci suggests – as an alternative – to address couplings with focus on being *co-located* (i.e. having input and output near each other), and on being *graduated* (i.e. correlating amounts of input and output). In total, I label these attributes *tight couplings* as input and output are brought together.

While the concept of coupling stems from a purely digital realm, it is crucial to note that in my designs, coupling is often closely related to the physical properties of the materials used.

Attributes of tightness play out differently across the designs. Both *MalleablePillow* and *ActiveCurtain* give feedback instantaneously where they are touched, and they react proportionally: A deeper press on *ActiveCurtain* creates bigger figures of coloured light around the pressed area, and the more one manipulates an area of *MalleablePillow,* the more it will light up where it is manipulated. However, the tightness of the two designs varies. In *MalleablePillow,* the lights are set to linger a bit, and due to how the inner materials are connected, the different areas can affect each other in triggering the microphones and thus the inner lights; in total making *MalleablePillow* less tight than *ActiveCurtain*.

WaterBed could serve as a contrast: It does not react instantaneously, but rather as an echo. The feedback of the infrasonic ‘kick’ is only clearly felt as co-located when using one’s diaphragm to induce the waves. While there is a clear relation between power of impact and sound volume, it is tempered with slightly by an algorithm over time and the staff’s change of settings.

Openness

Unlike a button's narrow demand on handling, the designs can have an *openness* to input: Several of the designs can be used at *anytime* (i.e. there is no sequence to adhere to), *anywhere* on their surface, and in almost *any manner*. For example, the designs of both *WaterBed* and *ActiveCurtain* can receive input from *anywhere* on their surface, and almost any press will make the designs react. Furthermore, these two designs both have large surfaces big enough to receive input *anyhow*, including from bigger body parts or several users.

There is no demand on waiting for a sequence to end in most of the designs, so they can be used at *any time*. But the feedback may build up or coincide, as it does with complex sounds in the *WaterBed* design and with combined light figures on the fabric of the *ActiveCurtain* design.

By contrast, *LivelyForm* has states in its curling-up so timing does matter, and the inner mechanical play of the *LivelyButton* design requires that it is used within the framed soft area, where a certain kind of press will create a certain kind of effect.

To sum up, the attributes presented here point to how the designs can be *open* to input anywhere / anyhow / anytime, and *tight* by co-located / graduated / instantaneous couplings of input and output. As a HCI concept tight coupling has been addressed for some time, but primarily in relation to purely digital designs (e.g. Ahlberg & Shneiderman, 1994; Rogers & Muller, 2006; Löwgren, 2007b). Paradigms notwithstanding, I here see my work as adding to a growing stock of very diverse examples of tangible designs coming forth in the last decade (e.g. Ishii et al., 2004; Wensveen et al., 2004; Holman & Vertegaal, 2008; Hobye, 2014). The openness of a design is also of interest in relation to widening the scope of user's explorations and appropriations (e.g. Hansen, 2005; Hobye, 2014).

While these two sets of attributes address the focus point of *more-than-a-button* in a very specific manor, the attributes I relate to the other foci also point beyond the existing Snoezelen technology.

Attributes associated with 'væsen'

While *tight couplings* and *openness* address the input and output of the designs as an immediate response to input, the foci point of *væsen* addresses *rudimentary agency* of the designs as they may to some extent respond by their own accord – potentially also over time and with more complex behaviour. I see a line of attributes related to this sense of agency:

Behaviour according to sensed patterns

LivelyForm with its set of capacitive sensors can detect and interpret various touching patterns and behave accordingly by going through a set sequence of states. While this design works by discrete states, late versions of the *WaterBed* design have the treble sounds programmed to change gradually according to a continuous monitoring of input. Similarly, *MalleablePillow* can change colour spectrum when it senses prolonged rough use and *LivelyButton* has very simplistic behaviours of following or countering input intensity.

Non-disruptive setting

The Snoezelen and I staff had not only doubts about if it was possible to do meaningful mapping of several people touching in emergent sequences. We also doubted if it was at all desirable, as professional competences were needed to make the necessary careful and continuous judgements of how the interplay was evolving in relation to the child's experiences. Consequently, with both *WaterBed* and *HugBag* we focused on enabling the staff to continuously change the behaviour of the design, and noticeably so in a manner that did not disrupt their involvement in the Snoezelen interplay.

At the threshold of use

While there has not been time to learn much from the adaptations just mentioned as they came late, other more rudimentary types of agency have played a role. The most simple concerns the initial interaction, i.e. how the design is/acts at the threshold of use. For example, *ActiveCurtain* has had two opposite versions in this respect: One with strongly coloured light (often in stripes) where the first indentation just become a single part of a span of colours. The other version was fully black when idle, so here a touch produced

a strong colourful contrast to the black. Letting the response of the design linger can also be seen as a way to deal with the threshold of use/non-use. Both *WaterBed* by its echo and *MalleablePillow* by its fade of light have this attribute.

Idle state behaviour

In some designs, we have also worked with behaviour in the idle state; i.e. what does the design do when it does not detect any input? Both *LivelyButton* and *LivelyForm* have a kind of pulsating/'breathing' light, when they are idle for some time.

Wide sensing /chance

While the above is achieved by discrete states that guides the output, a sensor set-up in itself can also give a kind of incidental agency related to the idle state: In *MalleablePillow*, the detection of input is based on microphones embedded in the inner materials. In this way, the design can also pick-up and react to loud noises in the room. In a similar fashion, the capacitive sensor of *LivelyButton* gives it an *aura* that can be set to react even when one is just nearby.

Furthermore, moving designs may contribute to connotations of 'væsen' as when the children seemed to enjoy the mystery of the inner movement in *LivelyButton* or the distinct movements of *LivelyForm*. On a more general note, adding interactive designs at all to the praxes is indeed about agency of the design – even when they are merely rudimentary or simple.

The two attributes 'Behaviour according to sensed patterns' and 'Non-disruptive settings' speak to what has been proposed as "an interaction choreography" addressing temporal development in the behaviour (Djajadiningrat et al., 2007: 31). In my work, these attributes relate to the mentioned *balance of immersion*.

The focus point of *væsen* touches upon very rudimentary types of agency with no interest in superficial mimicry. As such, it may be tangential to the main interests in agency within HCI and robotics; and technically banal for sure. Yet, from a design research perspective, the palette points to the relevance of low-level agency that may otherwise easily fall in the shade of AI ambitions.

BODY	ACTUATION	SENSING
INNER	Kick	Inner deformation
SURFACE	Vibration	Surface deformation
MOVEMENT	Moving parts	Restrain Proximity

Figure 6.5.
Attributes associated with the focus point of 'The Body'.

MORE-THAN-A-BUTTON	TIGHT	OPEN
PLACE	co-located	anywhere
MANNER	graduated	anyhow
TIME	instantaneously	anytime

Figure 6.6.
Attributes associated with the focus point of *more-than-a-button*.

VÆSEN	
Behaviour according to	…state …continuous built-up
Non-disruptive setting	
At the threshold of use	
Idle state behaviour	
Wide sensing /chance	

Figure 6.7.
Attributes associated with the focus point of 'væsen'.

(Co-located) Graduated Instantaneous	**AnyWhere** **AnyHow** AnyTime
Kick (Vibration) Movement	Inner Surface Restrain 'Near'
Water Bed	(Sensed pattern) **Setting** **At threshold** Idle state Wide sensing

Co-located Graduated Instantaneous	AnyWhere AnyHow AnyTime
Kick Vibration **Movement**	Inner Surface **Restrain** 'Near'
Lively Button	**Sensed pattern** Setting At threshold **Idle state** **Wide sensing**

Co-located Graduated Instantaneous	AnyWhere **AnyHow** AnyTime
Kick Vibration **Movement**	Inner Surface Restrain **'Near'**
Lively Form	**Sensed pattern** Setting At threshold **Idle state** Wide sensing

Co-located **Graduated** **Instantaneous**	**AnyWhere** **AnyHow** **AnyTime**
Kick Vibration Movement	Inner **Surface** Restrain 'Near'
Active Curtain	Sensed pattern Setting **At threshold** Idle state Wide sensing

Co-located **Graduated** Instantaneous	**AnyWhere** **AnyHow** AnyTime
Kick Vibration Movement	**Inner** Surface Restrain 'Near'
Malleable Pillow	**Sensed pattern** Setting **At threshold** Idle state (Wide sensing)

Co-located **Graduated** Instantaneous	AnyWhere AnyHow **AnyTime**
Kick Vibration Movement	Inner **Surface** Restrain 'Near'
Hug Bag	Sensed pattern Setting At threshold Idle state Wide sensing

Figure 6.8.
Designs and attributes. Overview of how the presented designs cover the palette in various combinations of attributes. The statements give a very rough indication of the attributes of each design
(black = attribute, bold = significant, parentheses = partial).

Scope

The figures 6.5-6.8 list the attributes for each of the foci, and Figure 6.8 gives an overview of how the designs cover many different combinations of the attributes. This illustrates how the designs together have given body to the programme seen in relation to the foci.

Staying close to the material choices and shaping of form, the palette aims to enlarge the form 'vocabulary' of designers of tangibles and aid their sensitivity, rather than serving a purely theoretical perspective. I would love to see more sharing of such palettes.

Unfolding potentials

> While it may be risky to address individual sense-making processes
> apart from the whole,
> in our experiences it is the only way to render this work practically useful
> for talking about technology as experience.
>
> *Wright & McCarthy (2004)*

Video on CD (link: https://vimeo.com/user1928557/unfolding)

Having addressed the design from the brink of a designer's appreciation of form, I will turn to the brink of user's experiences of interaction and interplay.

This section presents an unfolding of key traits through a selection and retelling of descriptions of the designs in use – mainly building on the collages. The unfolding is intended to provide a feel for the evolved design space and thereby promote sensitivities in future design situations. Given this character, I use a less formal language and include a video that cuts across the unfolding. The video is intended to give a feel for the interactions and especially the temporal qualities. The video mainly consists of excerpts from the collages (and therefor include examples of annotations made by the staff).

Presentation may call for clarity, but it is essential to note that the unfolding is not about doing away with complexity. Thus, the descriptions are not intended merely

to state connectors to common denominators or to map out a matrix of combinations of qualities and attributes, but to provide a meaningful and evocative selection of diverse interactions, where various concerns and features are still somewhat entangled. As a contribution, it is this unsettled richness by the totality of the descriptions, which – for a designer-researcher – can be evocative, inspirational and appropriateable for a similar context.

Many tales could be told from seeing interplays and videos thereof, as well as from deliberations and collages. Across the various professions involved in the SID Project, the tales would vary considerably in priorities and perspective. My task here is to tell the designer-researcher's tale. Even then, a multitude of possibilities opens up as it is the totality of the design work that forms the basis for the contributions I would like to present; i.e. not the individual design as if they were each a 'werk' rather than the deliberately rudimentary design artefacts that they are [see 'Virtues in being actionable' in chapter 4]. Nevertheless, for presentation reasons I have chosen to use two of the designs as starting points and then later draw lines to the other designs.

It may be possible to unfold the tales with other designs as starting points, but I have chosen *LivelyButton* and *WaterBed,* as they – for the following reasons – together form a broad basis for unfolding potentials (even if *WaterBed* was only at one Snoezelen place):

- Together they cover most of the palette.
- They both involve many senses, yet in different ways.
- They are quite opposite in size and layout: *LivelyButton* being a little box to handle and *WaterBed* a huge surface to be on.
- Where *LivelyButton* was the design closest to being a provocation, *WaterBed* was the design where the staff were most directly involved in early ideation and in sketching the feedback.
- While *WaterBed* quickly triggered new possibilities, the potentials of *LivelyButton* seemed to grow over the long-term submersion in Snoezelen, but no less significantly.
- They have the richest and most coherent collages.
- Of the designs included in this part of the dissertation, they are respectively the first (*LivelyButton*) and the last (*WaterBed*) to be made.

In what follows, I describe some significant interactions and interplays and how the designs took part in them. The interplays are essentially 'just' Snoezeling through and through. Yet, what is the interesting for the present purposes is how the designs play a role therein. So, while common pedagogical interplays – such as soothingly rocking together, or call & response – in themselves are not novel, addressing the related use of the designs may indeed be.

The interactions and interplays are far too manifold, varied and complex to fit a scenario-like presentation such as *Boy X discover design Y / His first try-out with Y / After event Z, he...* Nonetheless, for communicative purposes, I will portray the experiences through quasi-chronological trajectories that go beyond a single session and include several children. This is intended to guide the reader through a meaningful and evocative cross-section of the intricate mesh of Snoezeling.

From the experiences with WaterBed

The initial spur for the design of *WaterBed* was an aspiration to respond in rich ways to the children's movements. Thus, the motivation was not enhancement of an existing design, but it happened to be opportune to piggyback on the existing non-interactive waterbed with its inbuilt subwoofers.

The staff had explained that the existing waterbed was mainly used for relaxation. For this, it had several properties: An absorbing material that made it strenuous to maintain movements strong enough to feel the water move inside the bed. The heat transmitted from the warm water was strongly fatiguing for the user when lying flat down in the bed. The music produced vibrations that were best felt when laying still.

With the added responsive wavescape of sound, vibration and infrasonic kick to the children's movements, the design was used in more varied ways. The collages and deliberations pointed to some of the diverse ways the children explored and mused with the *WaterBed* design, and in the following, I present one of many possible trajectories.

A WaterBed design trajectory

A boy eagerly crawls on to *WaterBed* and sets it going by merely entering it. Another time, a boy is placed on the bed by the staff , and after settling in, the staff member aids his legs in performing 'running' movements, which made the bed react. The boy's heals hit the bed's surface, yet also other parts of his body could feel the feedback from the bed.

Just getting on to *WaterBed* makes it respond – and does so with variation according to the different partial movements. Such entering played out very differently for the children as the examples above indicate. What is common is a strong reaction no matter how or from where the child entered, which supported attention. A point to note here is the *combination* of rich feedback with complex soundscapes and then strong bodily feedback and an openness. Without this combination, confusion and triviality would be more likely.

As the staff noted, the bed becomes one big interface. Because *Waterbed* was open to input anywhere and given its size, the children and staff could enjoy it together: A boy used the design to play with a staff member, showing what he could do and let the staff join in. Sometimes, these interplays alternated between exploring the staff's reaction, musing with the known effects of the bed as well as enjoying togetherness around a shared focus.

When the boy explored the design, he mostly hit the bed with his hands or heals. As he was laying down, he could feel the bass-induced vibrations and the infrasonic 'kick' in his diaphragm. The staff emphasised how this enabled him and another wheelchair user to relate to an otherwise often neglected sense of their backs. When musing, he would use rocking movements, which not only have a different bodily feel of one's own movement than hitting, but also produce a different and richer wavescape induced by the colliding water waves. In that way, the design responded to a hit – like so many non-digital objects the children are familiar with – yet, it also invited using other movements to get richer feedback. The basic interaction is still the same, and therefore easy to grasp as it always couples one's own movements with the response of the wavescape.

A girl found joy in shared experiences with a staff member, albeit in a different way: The staff member initiated rocking movements as she and the girl lay close together on the bed. After the wavescape got the girl's attention, she indicated to the staff to do it again, and later she initiated rocking herself in order to feel the wavescape. The openness of the design plays a role, as the girl can do her rocking anywhere, anyhow and anytime and still get a clear feeling of affecting the design; i.e. there is no requirement for her to (learn to) find for instance the right position.

The staff emphasised the importance of addressing several senses to aid the children in connecting to the world. For the girl, the diversity of the feedback may support her bodily feel and thus aid her attention to the interaction and grasping of the coupling to her own actions. At the core of these experiences of using the design lays a bodily engagement, where the joy of feeling oneself moving is enhanced by being coupled to sensing the wavescape. One of the children even started to hum with *WaterBed*, while musing.

A boy, who already liked rocking in the bed, made the richness of such bodily engagement very explicit. With the enhanced bed, he received a richer feedback, and his explorations indicated that the design was experienced as tight. However, seen from the focus point of *more-than-a-button,* the attributes were not tight in all respects: The feedback is not instantaneous due to its nature of an echo; it is only partially co-located as the sounds spread out; and even the amount of feedback would be thwarted by chaotic water waves during prolonged heavy use. Nonetheless, in connecting, the strength of the bodily feel seemed to make up for it.

The boy used the bed for long periods to both explore various ways to move and for musing by repeated movement patterns – yet, without elements of 'stereotypical' behaviour. A key to this might be how the feedback to repetitious actions tend to vary slightly. However, with very heavy use the chaotic build-up with its overwhelming feedback intensity was close to making the boy too hyperactive.

This actualised deliberations between the staff and design crew around what we called *ai-ki-do*. The term refers to a martial art that emphasises not to counter the power of the opponent, but to use it to transform the force into a safe situation – essentially a dance embracing attacks, so that the beauty and bodily feel can take

centre stage rather than aggression. Ai-ki-do as a design metaphor carries the approach that too hyperactive actions are not prohibited by giving no feedback or by the staff distracting or saying 'no', but responded to in a benign way by sustained yet gradually changing feedback. For the staff this is important as in their general practice they can find it difficult to handle 'stereotypic' and hyperactive behaviour in as positive a manner as they would wish.

The thoughts around 'ai-ki-do' led to a development of a continuum of wavescapes, which the staff could set and do so seamlessly without sudden disrupting changes in the wavescape. The staff called these wavescapes the *characters* of the design. By gradually changing the character, the staff could aid the child in moving between exploration and musing, and thus enhance the immersion. By countering getting stuck in stereotype-like repetitions, this may also aid the child to stay with the interplay. Although this came about late in the project, the staff seemed to make good use of it as part of an appreciative mind-set – not only to counter hyperactivity, but also to explore together with the children and find their preferences.

All in all, in its enhanced interactive form the waterbed not only took part in a much wider spectrum of Snoezelen than before, but also in a way that aided the children in connecting to and immersing in the interplay.

This wider spectrum of use of the white room with *WaterBed* triggered protests from Snoezelen people outside the project. For them, each specifically coloured Snoezelen room is dedicated to one kind of mood; in a sense ascribing a 'væsen' to each room. However, this presupposes passive objects that cannot change with the needs of the children during each Snoezelen session. By using the *WaterBed* design for more than solely calming and relaxing, the SID Project broke this formula by taking the "design plasticity" (Pagliano, 2012) normally achieved by variation of rooms into the single artefact.

This ability to follow the user has been a strong concern for the Snoezelen staff in the SID Project. In their praxes, they work intentionally with altering, combining or staging the existing artefacts to follow the user, and the interactive designs with behaviour over time have given them new and different possibilities for this. *WaterBed* with its characters is one example of this; *LivelyButton* with its temperaments is another, as I will describe in the following sections.

From the experiences with LivelyButton

Little did I imagine *LivelyButton's* full potential. It has become a favourite in both Snoezelen places, and the children have shown a rich spectrum of ways in which the *LivelyButton* design could be used. I will now present one of many possible trajectories.

A LivelyButton design trajectory

When idle, *LivelyButton* has a pulsating light that slowly changes colour. This play of light seemed to aid some of the children in noticing it before the staff would present it, so they from the start could indicate if they wished to use it. Late in the project, two children would gather around the design like with a campfire. The complex and partly autonomous play of light was focussed and framed by the black box. This focus and the idle state generally seemed to aid attention and staying with the design; for example when a girl seemed to need time to take in the experiences.

As a contrast to the visual appeal from a distance, the capacitive sensor supported getting in contact with a boy, who apparently barely used his sight. After a whole year of scarcely engaging in Snoezelen at all, the boy whose main activity was wringing hands – his own or other people's – sat and did just that, wringing his hands. *LivelyButton* was placed in front of him, but he made no sign of noticing it. Because the capacitive censor was on high sensitivity, the design's aura reached far and reacted to the proximity of his hand when it happened to be near. As the noisy motor inside the design started to turn, and the inner lights lit up strongly, the design caught his attention, and he gradually started to engage with it. He lowered – for once – his gaze and reached for the box. He touched and turned it over. As the design was quite hyperactive, it seemed to aid him in returning to it when leaving it for a few seconds. This way, the aura of the design can be seen as having a kind of rudimentary agency calling for attention to an otherwise mysterious interface.

The capacitive sensor of *LivelyButton* aided another boy in engaging despite his imprecise arm movements. The staff had placed *LivelyButton* in a position suitable for this sight, but not all that easy to aim for. As he reached for *LivelyButton*, it

reacted even when he ‘touched’ only its ‘aura’. This together with the focused light seemed to lead him to continue, and gradually he got more and more precise, despite the strenuousness involved. Eventually he not only touched the box often, but also found a resting spot as he managed to stick a finger in a gap and feel the vibration. In this way, the capacitive sensor reacts to also approximate movements, yet there is still a very concrete object to touch and feel. As the interactions evolved, he made humming sounds that the staff took as indications of immersion.

The interactions with the moving spirals rest on the mechanical interplay with the stepper motor, but also on the pre-setting of temperament that guides the change of motor speed according to the touch-intensity and the capacitive sensor turning the motor on and off. The children found several ways of interacting with the moving spirals inside the box. This often involved using not only hands, but also arms, feet and even heads – the latter not only in the metaphorical sense of coming up with inventive uses, but also quite literally as in touching with various part of the head.

A boy explored the motor-related features very thoroughly: by poking the box, so the lights went on and off; by pressing hard so the motor started pecking and then letting go with the accompanying change in sounds; and by resting his chin or teeth on the box and thereby feeling the vibrations resonance in his skull. The boy repeatedly used the design for long periods, and not only for exploring, but also for musing. During this, he often made positive sounds and shared the experience with the staff. Inferring from his actions and his accompanying sounds, it seemed like the boy could connect as he got reliable reactions to his actions, but as the surface would come alive, there was also something more, something richer. In this sense, *LivelyButton* is indeed ‘more than a button’, but not by ‘tightness’ as suggested by the attributes grouped under the related focus point, but by its liveliness of inner mystery and the agency of aura sensing.

Another boy mused for a long time while alternating between briefly hitting the box and then laying with his chin on the moving surface; i.e. between connecting to the simple response of hit-gives-light, and then the perpetual vibration as well as calm and gentle caressing by the spirals against his cheek. At one stage, the staff even exclaimed “remember to breathe!” as the boy seemed utterly engulfed. This – together with other incidents – promoted the staff to address the setting of the design’s temperament.

A girl apparently got very little out of being in Snoezelen as she would constantly change focus and not stay with any activity. The staff had tried many ways to reach for her, but to little avail. However, when the temperament and sensitivity of *LivelyButton* was turned up and thereby made it very hyperactive, she stayed with the interplay longer. It would have been interesting to explore the potentials in slowly changing the temperament of the design as with the 'ai-ki-do' of *WaterBed*, but – alas – this came too late in the project. With less extreme setting, the other Snoezelen place used the temperaments of *LivelyButton* to suit child and situation.

On the other designs

In the following, I connect to the other designs that have been used for longer periods; primarily to provide a richer stock of examples, but also to give a sense of the totality of the design work otherwise lost by having singled out only two designs.

MalleablePillow, HugBag and *ActiveCurtain,* all have openness as they can be used almost anywhere, anyhow and at any time. Such openness may leave little room for an indication of how to interact and for one boy the vibrant lines on *ActiveCurtain* in combination with the openness failed to aid him; he needed a starting point to connect to. A simple broad ribbon across the soft screen of *ActiveCurtain* aided him well; not only initially, but also as a point to which he could return.

The black idle state version of *ActiveCurtain* helped a girl out of repetitious movements by reacting to a waving hand gone astray. In this version, the initial response from the design was strong through the contrast between the black screen and its coloured indentation, which seem to have aided the girl as she left her repetitious movements to engage with the design.

Casual movements also triggered light in the *MalleablePillow*, but it was more subtle in its response by diffused LEDs. *MalleablePillow* also reacted to loud sounds, as when the staff called and thereby made the design light up. This led a boy to resume his engagement with the design.

The above-mentioned variations across the designs point to various ways of using openness to aid initial and continuous attention. An equally crucial point here is

that attributes that aid the children in connecting can also be appealing to the children beyond the mere attention. An example of this is that the always reacting *WaterBed* seemed to serve well as a never-ending invitation to exploration and musing, while *MalleablePillow* in its mellow and solely visual subtlety seemed to suit continued musing well.

Tightness has mattered in various ways. For a girl it was a huge thing for her to create the first light figure around her hand's wee touch on *ActiveCurtain.* I think the instantaneous and gradual response was crucial for her in this first and insecure moment. Later, less well-calibrated versions of the designs sufficed as well. Another example of how the degree of tightness matters is a boy's use of *ActiveCurtain*. At first, his musing seemed to be aided by the tightness of the coupling of *ActiveCurtain's* pattern to his calm movements, but when the frame loosened and the design reacted stronger but also more arbitrarily, he got very hyperactive. This could also point to a potential in adding some kind of 'ai-ki-do' to the design in order to relate to the boy's mood and use variation in the suspension of the fabric to aid immersion rather than losing it in a frenzy. In other words, the SID Project may only have scratched the surface of the potentials in this bearable kind of change in tangibles.

While tightness can keep it together, lingering feedback – which is less instantaneous and graduated in relation to repeated movement – according to the staff aids the children in connecting because it reduces demands on memory. It also seemed to have invited musing with *MalleablePillow* for several of the children.

While *HugBag* always reacted tightly to hard pressure by sound volume, the ratio of the two sound layers would vary according to the distribution of the indentation. Most of the time, the children would gradually alter the ratio. This happened beyond the children's full control, but was nonetheless valuable as the children could still connect by relating the volume to their own action at the same time as staying attentive to the variations in the sound layers. Two boys stayed with *HugBag* for long periods, also after the initial exploration. They seemed to alternate between exploration and musing.

By sensuousness

I will now turn to sensuousness as the first of the lenses relating to the desiderata.

Building on inspiration from Snoezelen, the lens of sensuousness formulates a perspective on designing tangibles as well as it qualifies how to address sensuousness by listing seven elements that call for careful considerations and for imaginative combinations.

I have come to see sensuousness as a quality unfolding through interactions where experiences encompass a multitude of inner and outer sensing in engaging ways of feeling one self and one's action coupled to the doings of the designs. Designing with such a dynamic view in mind is a key to appreciate, how my holistic take of *designing for engagement* integrates connecting and immersion.

As the aesthetics of my designs lie in the sensuousness opening up for and sustaining a multitude of engagements, sensuousness permeates all contributions. In this section, I specifically look at matters of designing with an awareness of addressing multiple senses and bodily engagement. I do so by addressing concerns that have been salient in the deliberations with the staff, as well as how my designs may point to an array of engagements otherwise less explored.

Multi-sensory

I will point to four elements in designing for a multitude of senses: a) to cater for differences in sensory profile and especially for the bodily senses; b) to support the experience by involving several senses; c) the appeal and richness in using many senses in interaction; and d) moving beyond known causalities.

The Snoezelen staff aimed to cater for a child's preferred and/or strongest sense(s). This is based on the assumption that different people have different sensory profiles that profoundly affect the way they connect to the world. Here, a key point was also that the preferences and strengths may indeed not be audio-visual – and for these children often more so the proximate and bodily senses. Let me point to three ways that my designs have stayed with such: Firstly, the designs made use of enhanced tactilely appealing materials (e.g. the paddings and covers of *HugBag*,

LivelyForm and *MalleablePillow*). Secondly, four designs – *VibeBoard, WaterBed, LivelyButton,* and *LivelyForm* – together formed a set of varied and nuanced uses of vibration and movement, and thereby a richer interactivity going beyond the existing passive forms of vibration. Thirdly, the next section will address how my designs related to bodily engagements.

Another approach of the Snoezelen staff was to – as they said – "amplify" by having several senses working together to support or augment the experience. This resonates with how *MalleablePillow* not only coupled touch and light, but also amplified the feedback by the sounds coming from the paddings, and with how *WaterBed* at its core coupled almost any kind of movement first and foremost to sounds, but also to the amplifying vibration and infrasonic kick. Another example is how *HugBag* not only couples hugging and sounds, but also had lights to aid attention.

Furthermore, the use of many senses gives a richness, which might explain the popularity of the two designs with the widest array of senses involved: *Waterbed* and *LivelyButton*. To illustrate, *LivelyButton* coupled varied ways of touching to light, spiral movements, vibration and motor sounds. Seen in relation to the take, a design that addresses many senses may give a stronger response by the design and thereby aid the children's grasp of and attention to the interactions. Simultaneously, addressing many senses can provide a richness that may enhance immersion.

Finally, I also see a sensuous quality in moving beyond the physical causalities and coupling of senses otherwise known to the children. When something can be said to has moved beyond known causalities can be debated, but the following illustrates the point: When manipulating *MalleablePillow,* the children affect not only material and sound but also light. Moving around in *WaterBed* affects not only the water and pillows, but a whole wavescape. Indenting *ActiveCurtain* not only moves the fabric, but also changes its colour gradually.

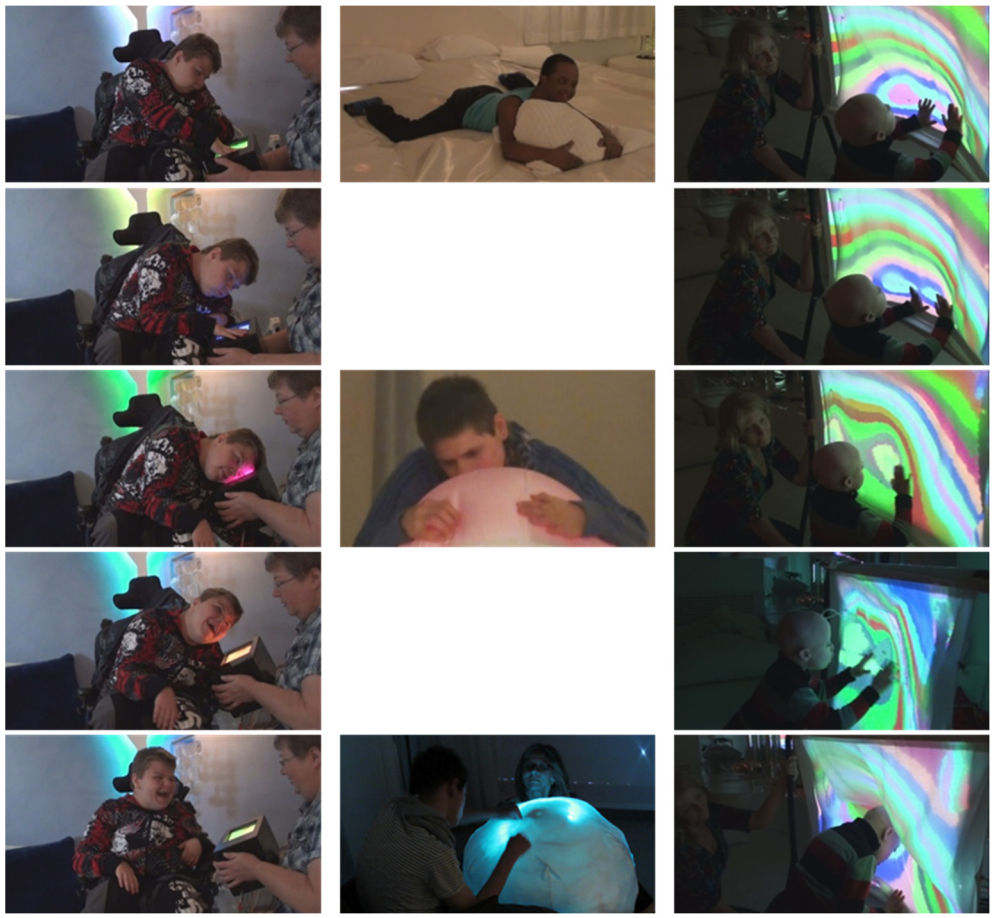


Figure 6.9.
Sensuousness. Left column: Exploring not only visuals and sounds but also vibration and movement. Centre column: Engaging the body and tactile feel. Right column: Using not only hands and arms but also head.

Bodily engagements

Acknowledging the bodily feel of oneself as part of any experience and appreciating preferences for basic senses gives significance to the bodily engagements of children – and the children have indeed used the designs in inspiring ways. I will point to three elements: a) using various body parts; b) engaging the body in various ways; and c) engagements beyond hitting. I conclude this section by briefly relating bodily engagements to similar fields within design research.

Firstly, the children have used more *parts* of their body than their hands and fingers, as for example, the torso in affecting and feeling *Waterbed*, the head in poking *ActiveCurtain*, and the chin in feeling the vibration of *LivelyButton*. Using various body parts has been facilitated by the openness of the design [see 'Openness'].

Secondly, the children have engaged their bodies in various *ways* as the following examples illustrate: to rest on or move-and-wait for vibration (*LivelyButton, WaterBed*), to manipulate the tactile/visual (*ActiveCurtain, MalleablePillow*), to grab/press/release moving objects (*LivelyButton, LivelyForm*), to do distinct movement to feel infrasonic 'kicks' (*WaterBed*), to do backward and forwards movements to perform dialogues with waves (*WaterBed*), and to lean into or hug the tactile/audio (*HugBag*). Seeing the various ways to engage and feel one's body as being closely coupled to the interaction relates to two traits, the tightness of the couplings, and the sensing of deformation and restraint [see 'Sensing' and 'Tight coupling'].

Thirdly, engaging the body can be richer than simple hitting. I have not been especially interested in exploring a plain hit, and not at all in just 'a hit gives a sound' as in using a drum – not only because there are ample possibilities for doing so by non-digital means, but more significantly, to move away from simplistic control and towards richer immersion. It may seem impossible to avoid 'drum-ness' and still have tightness, but across the designs, there have been some significant moves: Hitting *ActiveCurtain* gave little response compared to continued pressure. *LivelyButton* did light up when hit, but leaving a hand on the box provided richer and prolonged responses. *MalleablePillow* did react to a hit,

but it was the prolonged and varied touching that seemed to be most attractive for the children. *HugBag* did react to a hit by sound, but with its soundscape it was much more rewarding when pressed or hugged. *WaterBed* did react to a hit by sound, but the response was delayed (as an echo) as well as enhanced with vibration and infrasonic 'kick' to be felt elsewhere than the hitting hand. Moreover, any behaviour over time goes beyond drums, as does the possibility to engage with other parts of the body than the hitting hand. In sum, the designs seemed to have moved beyond 'drumness'. During initial use of the designs the children have often started with some kind of hit, and this may very well otherwise be their most common possibility to explore things. Yet, after the initial phase more nuanced use evolved.

The above-mentioned engagements point to a set of bodily ways to interact that go beyond the common range of tangible interactions, and do so without reifying presuppositions of the able body. I may not suggest taking, for instance, bum-lifting or pillow-hugging as starting points for other design efforts; but by having addressed such forms of interactions, I hope to contribute to a growing resource for imagining new forms of engagement of the body within Interaction Design and possibly even to hybrid games. Thus, in what follows, I will briefly relate to trends within these fields.

The introduction of Wii & Kinect based games marked a leap forward in engaging the body. However, these controllers leave the body in mid-air so to speak, as they do not engage the body directly (for similar critique, see Antle, 2013): Waving a virtual racket (let alone faking it by small movements) does not come near to the bodily feel of, for instance, hugging the soundscape of *HugBag*. To move forward, there is a need to acknowledge the importance of the feel of one's body and move beyond (able) hands and fingers.

I see two strands of research fields that are related to my interest in the bodily feel as an integral part of aesthetics within Interaction Design – both nascent yet quite different: the emergent scene of exertion games (e.g. Lyons et al., 2012; Mueller & Isbister, 2014) and Interaction Design inspired by somaesthetics as previously mentioned. While the development of exertion games explores the use of the full body and especially its forcefulness in computer-based games by a multitude of novel interfaces, the somaesthetics-inspired efforts within Interaction Design take

inspiration more explicitly from philosophies and communities of corporeal cultures.

I cherish both these efforts, but they predominately deal with mastery; either by the focus on winning a game and typically by strong and efficient input, or by learning from training one's body. By contrast, the various ways the children in the SID Project used their bodies are not results of training or competition, and are thus more so actions of the everyday – somewhat paradoxical given the specialised field. As such, my work may contribute with an aesthetic appreciation of corporeality at a level that may potentially be found in most of our lives.

Through a compositional principle

> The concept of influencing instead of controlling a machine
> may be a difficult one to get;
> perhaps one cannot expect many users to be able to understand it.
>
> *Sengers et al. (2002: 95)*

The desideratum of interactivity permeates all of the knowledge contributions on design potentials. However, one foundational aesthetic principle is worth highlighting as it speaks into the take's integration of connecting and immersion, and builds on the sensuousness just described.

In art class in the 90s, I was taught (alas, without theoretical references) a very generic compositional principle: A work of art – be it a painting or a piece of music – may work by intricate interplays between elements that keep the experience or interpretation of the work together (coherence), and then elements that perturb the very same order. To make the work come alive as well as to sustain engagement, the principle seeks a dynamic integration of coherence and perturbation. The principle seems to be in line with most of my designs, and in the following, I unfold the principle as a generic lens.

While my take of designing for engagement is holistic and operates almost like a feel, this compositional principle can be applied to concrete designs. The principle casts light on my designs and especially on the paradox that many of them reach

beyond known causalities, but have nonetheless been part of joyful experiences of children for whom grasping basic causalities is a pervasive challenge in daily life [see 'Multi-sensory']. Here I see a parallel to Djajadiningrat et al.'s (2007: 31) intention to "structurally violate the unity principles to investigate how such violations may trigger aesthetic experiences". The compositional principle points to how such "violations" can go hand in hand with elements of coherence to form aesthetic experiences. As I will return to, the principle here evokes concepts of *ambiguity* and *transparency*.

Let me illustrate the principle as a lens through which one may see qualities of the designs:

- The intense and accumulating soundscapes of rocking in the *WaterBed* may at times be hard to fully grasp. Yet, the potentially cacophonic wavescape can be not only a trilling but also a bearable perturbation, when set in a composition that holds it together by relating closely to the body (i.e. making it cohere). This can be seen as a contrast to the design's deliberately relatively dull response to a hit.
- *LivelyButton*'s rotating spirals can be felt as if they were almost autonomous by a somewhat secretive play of the spirals and light underneath the surface (i.e. perturbing). However, the totality of the co-locatedness, the presence of the pressed spirals, the framing by the black box as well as the 'call' by wide-sensing keeps it together and facilitates attention and staying with the inner mystery (i.e. cohere).
- The malleability of light in *MalleablePillow* is easy to grasp as it is tightly coupled to touch, but simultaneously it also seems to have a life of its own: The sensing is indirect; thus, one type of touch does not correspond exactly to one type of feedback, and its lights linger and are smitten by other sounds. Such small perturbing elements aid immersion with an otherwise coherent design.
- The illusive multi-coloured third dimension of *ActiveCurtain* may have been hard to grasp fully for some of the children; at least, when the design was less well-calibrated and thus more stripy. However, as the 'inner' light patterns are tightly coupled to bodily movement and with the surface being 'open' to input, the design also facilitates bodily engagement over time that may hold it all together. In this way, not fully knowing the next colour to come or not

being able to predict the shapes of the combined figures can be thrilling perturbations, when set in such a composition of elements that holds it together from the initial poke (i.e. cohere).

- The compositional principle may also serve to problematise a design: While leaning on *HugBag* to make a sound seemed easy to grasp, the ratio between the two sound layers may have been too decoupled from the bodily engagements to be ideal as a beneficial perturbation. This could be because the coupling was not tight enough (sound spreads and the often poor calibration spoiled the instantaneous and gradual feel); or perhaps because the physical construction was not suitable for the children's leaning. In other words, although two boys enjoyed, explored and mused with the design and its strong soundscapes, seen from the point of composition, the double sound layer as a perturbation could not rely on the bodily engagement to keep it together.

As the examples above indicate, bodily engagement is a key element in holding the compositions together, and address of many senses in the outputs often enrich, which ties back to the previous section, 'By sensuousness'.

Re-negotiating transparency and ambiguity

> Good design oscillates between hiding and revealing themselves.
> Interfaces should oscillate in a controlled way
> between states of transparency and reflectivity
>
> *Bolter & Gromala (2003: 68)*

I will now relate the compositional principle to a key topic within Interaction Design research. Moving beyond realms of efficiency and a tool perspective, Interaction Design research has been exploring new realms and perspectives (Petersen et al., 2004). Here, a key concern has been to problematise the prevalence of *transparency* (e.g. Bolter & Gromala, 2003; Hansen, 2005; Sengers & Gaver, 2006). Searching for alternatives to or even countering of transparency could be seen as a search for beneficial perturbations – with Gaver's work on *ambiguity* as seminal (e.g. Gaver et al., 2003).

While I cherish such explorations over the last decades, I have seen little efforts to explicitly connect perturbation to coherence, and the focus tends to be on

interpretation of thwarted information and intellectual pondering rather than the sensuousness in close exchanges between human actions and artefact behaviour. In contrast, my compositional principle brings to the fore an aesthetic concern of what makes the experiences cohere and thereby move beyond being "merely confusing, frustrating, or meaningless" (Gaver et al., 2003).

In their thoughts on *enchantment* as affective attachments to interactive systems, McCarthy et al. (2006: 373) cherish sensuous engagement because "Enchantment is not even imaginable without the acute sensory activity that notices the sensuousness of every thing". Yet, they do not move further towards elements supporting coherence, but only point to perturbation in the form of "paradox and ambiguity" in what they call "layered interpretation". Furthermore, they do not provide actionable contributions and their references to actual designs tend to stay with older technologies.

Gaver et al. (2003) detail how to work with insufficient information, imprecise representations, inconsistencies and the like. Yet, in relation to coherence, they merely offer a general concept of a balance of the familiar and the strange – a dualism shared by several (e.g. Wright et al., 2008).

This is not to say that most designs associated with terms of ambiguity are void of coherence. On the contrary, one may presume that there are indeed often such elements, and that they may be both evocative and sensuous (even if I cannot be certain, as I have not experienced the many designs first-hand). What I am pointing to is more so the possible lack of an equally developed way of addressing coherence. One reason for such a gap between design artefacts and their conceptualisation may be an exclusive focus on tapping into the human urge to see patterns when there are none, which leaves less attention to explicating the sensuousness that may come tacitly to a designer. Another reason may be that some designs are generally conceived as gallery pieces rather than as being intended for prolonged situated and physical engagement; e.g. *Robots* by Dunne & Raby (2007).

Nonetheless, a few designs may to some extent form exceptions, and I will address two of them, one old and one recent. The point here is not to do a deep analysis of these designs, but to *illustrate* that the compositional principle can be a lens by which to address existing designs and not solely a lens for designing.

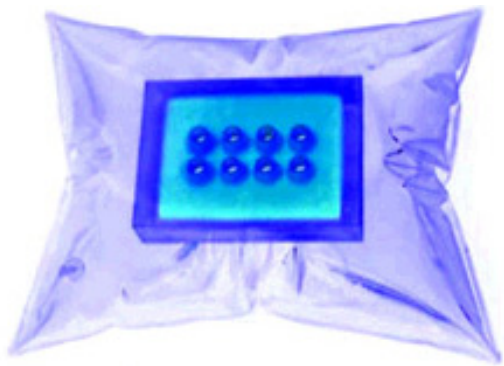


Figure 6.10.
The Pillow design by Anthony Dunne (Dunne & Gaver, 1997)

I start with Anthony Dunne's design *The Pillow* [see Figure 6.10] as it is emblematic of efforts over the years close to the British gallery scene. The design has an audio-visual response to electromagnetic waves. Dunne & Gaver (1997: 361-2) state that *The Pillow* is to be "beautiful and evocative in itself", and they point out that the design work is "emphasising aesthetics" and provoking "a search for meaning, using evocation rather than explicit communication".

My *tentative* interpretation – not having tried the design – is that it plays a) on a tension between the tangibility of the physical materials and the intangible waves, and b) on a contrast between the direct non-computational and physical feel of touch and the indirect computational response of inner diffused lights reacting to moving and possibly unobservable electronic devices.

Using such contrast and tension can be seen as a parallel to the compositional principle, but by a division of the physical and the digital typical of its time, which – I anticipate – leaves the user to ponder more than to engage. Abandoning this division could open up imagining possibilities for aiding coherence: for example, hugging the pillow could scramble nearby signals, and differences in waves could change the inflation of the pillow (i.e. its hugability). Thereby the tensions could be worked with not only more sensuously, but also according to the compositional principle.

Figure 6.11.
The Mediated Body design by Mads Hobye (2014)

Another and recent possible exception is Hobye's (2014) *Mediated Body* suit [see Figure 6.11]. This suit reacts by sound and built-in light to touching the person wearing the suit, and thereby it facilitates a shared and intimate exploration. The design has a tension between, on the one hand, the intimacy of touching and the tightness of its couplings to light and volume (i.e. coherence), and on the other hand, the perturbation of the mysterious evocative and evolving soundscapes that result from touching the wearer of the suit or his 'aura'. Again, such tensions can be seen as a parallel to the compositional principle.

Hobye (2014:101) conceptualises the workings of a suite of designs – including *Mediated Body* – as "a multi-layered approach: . . . to create clear and instantaneous feedback for the pristine participants, while keeping a larger interaction space to explore for the more experienced ones". Such a division of attributes may be used to work by the compositional principle, but as the approach is formulated, the aim is rather to target variation in user groups by additions of simplicity and complexity, which is different from integrating elements of coherence and perturbation into aesthetic wholes.

As my treatment of these two designs illustrates, the compositional principle can be used not only to develop, but also to analyse designs. At its core, the principle is very generic, and thus it may point beyond Snoezelen and even Interaction Design, but in the presented form, it is tied to interactive tangibles and immediate experiences.

For participation

> Decisive in this situation is the fact that I participated actively;
> *I pick* the dandelion . . .
> If we also wish to give the mentally handicapped the opportunity
> to gain these experiences, we will have to create such condition for them.
> An attractive atmosphere, in which we can address their senses
> very primarily and selectively and in which they can react in a primary way too
>
> *Hulsegge & Verheul (1987: 32) about Snoezelen*

Wishes to enhance the children's participation in Snoezelen were part of the pedagogical mind-set of all the staff in the SID Project from the very beginning, albeit without a clear and shared definition. Thus, in the deliberations, the term *participation* mainly served to set a direction or to point to an area of concern. At first, communicative acts with the staff rather than the children's feeling of affecting the world tended to dominate the deliberations, but later the views widened.

A book for practitioners and families on the topic of participation by Jenny Wilder, Anna Karin Axelsson and Maggan Carlsson was published in 2013, which was too late to affect the project. The book (Wilder et al., 2013) encircles and exemplifies the concept of participation very close to children like ours in the SID Project – albeit in the everyday and mostly without a focus on artefacts. To the best of my knowledge, the book is the closest one can get to the pedagogical praxes of the SID Project in relation to the concept of participation as it is based on in-depth interviews with families and personal assistants. The authors are also well versed in and contribute to the research discourses around the topic of participation.

We could have made good use of the book's framework in the SID project. Instead, I now use it to frame a contribution along the desideratum of participation. I will use the book's framework to introduce thoughts on participation and use key concepts to organise examples of how the designs have taken part in enhancing and aiding participation. My agenda is to look for design potentials close to praxes, not to unravel discussions and discourses around concepts of participation within disability research.

Concept of participation

Through in-depth dialogues with family and personal assistants, Wilder et al. (2013) have come to point to salient issues related to participation. Participation involves more than mere attendance as it entails the engagement in experiencing and taking action. Participation understood as an engagement is a holistic and subjective experience, which can include perceiving one's involvement in a situation as participative.

In working towards participation, the families and assistants pointed to several key "factors" (Wilder et al., 2013: 30f, 65f): a) the knowledge and approach of the adults, b) the physical and psychological accessibility of the situation; and c) four factors closer to the actual feel or experience of participation (a feeling of being reckoned with, to feel needed and to succeed, to gain opportunities to understand, to gain opportunities to affect). The knowledge and approach of the staff (a) are issues integral to Snoezelen praxes, so I will leave that aside. Instead, I will mainly focus on the four experiential factors of engagement (c) but also address accessibility (b).

Accessibility

I address accessibility as the *possibility* (Hedvall, 2009) to enter as well as stay with and act in a Snoezelen activity.

When it comes to being physically accessible, the Snoezelen places are all well-equipped in the sense of getting to the place of activity. Yet, the designs one engages with also call for concerns for physical accessibility. For instance, many of my designs are open to input by various body parts and even small inputs [see 'Openness' and 'Sensing'].

Wilder et al. (2013) do not say much about psychological accessibility besides making the daily activities attractive. All of Snoezelen is dedicated to being attractive by sensory appeal, and no less so with my designs and their appeal to immerse. Yet, I also see potentials for psychological accessibility in the sense of sustaining the situation: the various ways several of the designs support connecting and especially attention [see 'Support attention'], as well as in a beneficial balance

of immersion. Therefore, I suggest such dynamic behaviour of the artefacts to be added as one of inclusive traits of Snoezelen along with the existing virtues of timing stimuli and giving the child the time, he or she needs.

In practical terms, it is hard to separate concerns for psychological accessibility from participative concerns for possibilities to understand. It is a question of perspectives – respectively prerequisites for engaging and then the lived perspective, including the feel of engagement and one's emergent view of oneself in the world.

Experience

To illustrate how my designs in various ways play a role *in* participation, I will now relate to the experiential factors, which Wilder et al. (2013) have pointed to.

A feeling of being reckoned with

A line of experiences with my designs relates to "a feeling of being reckoned with" [Swedish phrase: *en känsla av att vara räknad med* (Wilder et al., 2013: 59)], which includes sharing both focus and joy as well as having the feeling of being part of what is going on.

A *shared focus* was seen many times – even among the children, as in the campfire-like sharing by a couple of children around *MalleablePillow* and with *LivelyButton* with its focused yet changing lights. Examples of *doing together* are the girl rocking together with the staff in *WaterBed*, the call & response sequences in *WaterBed*, and the co-drawing of light figures on the wall-to-wall version of *ActiveCurtain*.

A crucial point here is that the designs often enable the children to be the initiator, which is closely linked to the next factor.

Figure 6.12.
Participation. First row: Ribbon and aura as accessible starting points. Second row: Doing together. Third row: Being an initiator. Fourth row: 'Magic' hand, making waves, and manipulating the inner spirals.

To feel needed and to succeed

The factor "to feel needed" [Swedish phrase: *att få känna sig behövd* (Wilder et al., 2013: 69)] includes the feel of succeeding and playing a role. Examples of such agency can be seen in the following interactions with the designs.

I assume that both one boy's rich and exploratory use of movement in *WaterBed* and another boy's extensive exploration of touching and interfering with the spirals in *LivelyButton* entailed a feel of succeeding. Equally so, the possibly magic and empowering feel of an otherwise very passive girl's as she sees her feeble hand make big and strongly coloured figures on *ActiveCurtain*.

To feel oneself as the actor can be enhanced by feeling one's body as the locus of action, which one may presume to be the case for several of the children in affecting and sensing, for example, the wavescape of *WaterBed*. This is closely related to the next factor of affecting.

To understand & affect

The two last factors are "to gain opportunities [Swedish: *möjlighet*]" to "understand" and to "affect" what is going on (Wilder et al., 2013: 62,5). On this topic in general, my designs have provided ways to aid grasp and attention – and even to affect unknown causalities.

First and foremost, understanding what is going on is facilitated by the tightness of the designs. Yet, the involvement of multiple inner and outer senses also aids understanding. In addition, the designs have facilitated *affecting* by embracing many types of input.

Shared matters of concern

The desiderata of participation have matured into a lens able to point to potentials, both when it comes to prerequisites *for* participation and to factors *in* participation. From a Snoezelen perspective, this may add facets to the triangle model of Snoezelen [see 'The Snoezelen triangle' in chapter 4] by seeing the designs a) as invitations to a magic world, b) as enablers so the children can be initiators, and c) as meeting points for shared experiences.

While these considerations are closely tied to people like the children in the SID Project, such sensitivities may apply to a wider pedagogical realm aiming to promote *learned optimism* rather than *learned helplessness* (Pagliano, 2012: 27).

From an Interaction Design perspective, it is significant *how* the interactivity of the designs enhanced the children's participation rather than promoting roles as mere spectators of the marvels of the designs.

7

CRITERIA

Seek and express
Grounding, systematics and transparency
Relevance and reach

In this final chapter, I will address criteria for the development of my programme as well as the broader relevance and reach of my research.

Seek and express

As mentioned, Redström (2007: 168) advocates that the aim of design research programmes is to *seek* and *express* alternatives by critical *questioning* and *imaginations* of change. From this follows a set of criteria such as the *potency* of the programme and the ability to *negotiate* a design space as well as how *generative* the outcomes are. In the following, I will address such criteria.

The post-project reflections and the design engagements with their many and varied deliberations have in concert matured the programme. The matured programme makes "the possible present" (Redström, 2007: 170) by a set of designs, rich descriptions of the designs in use as well as a line of matured framings to address a design space. In total, these contributions show the *potency* of the programme.

How well these outcomes *opens up* and *expand* a design space (Redström, 2007; Fallman & Stolterman, 2010) may best be illustrated by *the palette* that explicitly maps how the set of designs spans a field related to the foci of the programme; yet, still maintains a coherence.

My designs together with descriptions and matured framings express intentions embedded in the programme by going *beyond* what could be imagined in the beginning – in a sense extending the scope of Nelson & Stolterman's (2003/2012) concept of *the expected unexpected* into programmatic design research.

The programme has become *expressed* in forms that are rich and evocative (designs, visuals and tales), which supports it in being *generative* (Löwgren et al., 2013) in the sense of eliciting emotions, actions and reflections. This criterion connects to Wright et al.'s (2008: 10) concept of *sensibilities* as "sensual and emotional aspects" embedded in "ways of knowing, seeing, and acting" in the design process. Here, it is also worth noting the assertion made by Nelson &

Stolterman (2003/2012: 165): “For the designer, vagueness is not a drawback. Instead, it opens up a whole range of possibilities”. To me, the point here is certainly not to strive for unclarity, but that the dissemination of design qualities does not necessarily become generative by reduction into univocal simplicity. Rather, generativity is fed by staying with the multiple articulations, senses and framings – and even by having an excess of associations tickling the imagination of future design work. Here, however, the dissertation format may fall short in catering for what Borgdorff (2012: 148) in relation to artistic research advocates for as the “performative power” of the material outcomes.

How to *seek* alternatives is in my research intimately linked to the collaboration in the SID Project. My designs have opened up as well as enriched the programme by taking part in collaborative explorations with the staff in a germinal (e.g. the first workshop and the pastiches) and critical manner (e.g. debateables).

Furthermore, the design engagements have also explored alternatives through having the children affect formative design orientations. Here, my belief is that the design knowledge may not exclusively be tied to people like these children, but also points to new sensitivities in other domains by seeing qualities in diversity and/or by breaking with established ways. This sense of exploring through diversity is echoed in the design research literature under labels of designing for the *diverse*, *alternative, marginal* and even *extreme* (Jönsson et al., 2006: 139; Ljungblad, 2007; Liikkanen, 2009; Bieling, 2010; Harrison et al., 2011: 390).

Another kind of criterion suggested for programmes is the sense of being done with and/or having transgressed the programme so that new programmes-in-spe takes over (Redström, 2007: 167-8). I might question the degree to which the idea of being “done” makes sense in programmes that are as intendedly open as mine are. At least, I cannot say that I am done with the Tangible Participation programme – but that may also be much to ask from a project like SID or from a first attempt at researching by a programme. Let me illustrate. At the end of the project, we started to explore more elaborate behaviours as well as bigger motor-driven actuations. We would, however, have had to do more within the project timeframe to sense if they efforts would enrich the project or point beyond it. Regarding more elaborate behaviours, I intend to return ‘balanced immersion’ behaviour in future work, but with a group of users who can partake in shaping the

behaviour, which may point towards a transgression of the programme. When it comes to exploring actuation, the SID Project has merely touched upon 'physical' actuation as in changing shape or consistency, which is a field that may indeed need another programme.

Grounding, systematics and transparency

As mentioned, programmatic and designerly research cannot be reduced to a "question of truth" or of what something "really is" (Redström, 2007: 169), as it is about providing framings and being suggestive of alternatives, where the latter is not about *the* optimal solution but about a multitude that expresses the programme (Redström, 2007: 170). This type of knowledge construction obviously does not attempt to comply with standard HCI schemes of justification often influencing Interaction Design research. Hence, it may make little sense to use terms that are applicable to natural science as starting points. This does not mean that similar matters are not to be considered. For example, in relation to Interaction Design research, Löwgren (2007a) has stipulated some generic common criteria: "new and relevant" as well as "grounded and criticisable". I will address similar key concerns by looking at grounding, systematics and transparency in the following, and in the subsequent section address relevance and reach.

The matured programme is *grounded* in the long-term, close and critical design engagements with pedagogical praxes. It is grounded in the sense that the appreciation of qualities not only relates to fieldwork, but does so in a collaborative way with the praxes it engages. The *collages* and *aspects* are key expressions of these efforts. Furthermore, my research is turned towards the children rather than "advances in technology [or] the commercialization of new platforms" (Antle, 2013).

The latter standpoint also marks a *transparency* of value base, where my research rests not only on the credo of Certec of all people's principled right to affect

technology development, but also on my sentiment and the desiderata. Such ways of taking a stand can also be seen as an inherent trait of an engaged research.

Working by a programme has its own kind of *systematics* in the sense of a coherent way of continuously guiding the research. Chapters 2 and 5 have stipulated such matters around thoughts on programmes and on a research that is thoroughly designerly. Yet, I hesitate to use the term *rigour*, because the word's connotations lead away from the dynamic and emergent traits of this kind of research. One of the dynamics is how my design programme and the way to explore it not only relate to each other, but also co-evolve. This co-evolvement has taken place from the first days of my PhD's studies of literally alternating between sketching designs and making models of programme dynamics. Yet, the implications often did not dawn upon me until after a longer period of design engagements. Here, an extreme example would be that some concept of *articulation* may have been with me – in actu – as far back in my work as I can remember, but it did not come together until looking back on the work on the collages and reading Borgdorff's (2012) thoughts on the matter.

The appreciation of processes across human faculties and including non-discursive articulations (Borgdorff, 2012) raises questions of how a design research community may discern the knowledge and the knowledge construction, i.e. the *transparency* of the research. I will present some thoughts on this issue, but without any claims to having exhausted the topic and I acknowledge – as also Borgdorff does – that these issues need further attention.

Borgdorff (2012: 168) outlines three ways "discursive components" may accompany "material research outcomes":

One is to express something or imitate qualities by language ("verbalisation"/"conceptual mimesis"). An example of this is the section 'Unfolding potentials' in chapter 6, even if my command of the English language does not allow me to unfold more poetic elements in such descriptions.

A second way is to use language to provide "interpretative access", which I understand as an indexical or pointing function as in the collages.

The third way is a "rational reconstruction of the research process, clarifying how the results were achieved". I may pragmatically acknowledge such a way in

training to design products, but as it seems to privilege or assume a succession settled and comprehensively encapsulated by the order of conscious awareness, I find it troublesome as a dominant way for a research that cherishes non-discursive articulations and cuts across human faculties.

Thus, if this "rational reconstruction" of design processes is taken as the sole norm for disseminating and grounding designerly research, this is a move away from the type of knowing I have described. If one were to do so nonetheless for pragmatic reasons, it would be better suited for solitary studio sketching than serendipic, multiple and collaborative processes. Anyway, the SID Project left me little room for accessing and accounting for the rationales of the various participants in our communal efforts beyond the examples I have included in chapter 4, 'Engagement'. I do describe a trajectory of design engagements to give a feel for the processes, but I have not grounded my research on design qualities in a sequential account, but on the *outcomes* of the collaborations. Here, I concur with Fallman & Stolterman (2010), when they with regards to the research field "design exploration" assert that "rigor can only be measured in relation to how well the approach does open up a design space and less how that is done".

This can be seen as being in opposition to an idealised conception of programmatic design research, where the research is transparent as it progresses by a design coming as an answer/challenge to a previous insight clearly formulated in a research group in a response to previous design work. The reality that I have been juggling with has been characterised by multiple dependencies, and it has been serendipic and emerging as well as polyphonic and polymorphic. Strongly simplified, I have continuously sketched and (re)built a set of designs (and their engagements), for them to relate to a continuously emerging and evolving set of discernments and actions by all participants. Here, insights emerged from a multitude of designs and deliberations interwoven over time and dispersed over many participants. To expect these processes to become transparent by sequential accounts risks being illusionary and reductionist. What I have done instead in this dissertation is to provide a trajectory of design engagements (chapter 4), conceptualisations of their type and purposes (chapter 5) and built on the outcomes of the SID Project like the collages and aspects (chapter 6).

Thereby, I have also indicated that with the serendipic and collaborative nature of the project an arguable downside is the researcher's limited control. On the other hand, with the engagement follows possibilities of grounding close to real use.

Relevance and reach

My contributions in this dissertation fall into three fields of design research: *design qualities* within aesthetics of the immediate; what *designerly research* could (also) be; and *design processes* to co-develop design and pedagogy within the field of profound disabilities. I will address the relevance and reach of each of these separately and after that turn to my research's relevance beyond academia.

Design qualities

My work can be seen as an answer to the call by Petersen et al. (2004: 275) for more experiments and guidelines for designing within the field of aesthetic interaction.

In relation to design qualities, my work speaks into two trends in design research and development: On the one hand, the last decade's increasing attention within Interaction Design to the realm of *aesthetic experiences* rather than a tool perspective (Petersen et al., 2004); and on the other hand, the current massive attention to developing digital solutions for people using *welfare technologies*. By populating with designs and by providing matured framings, I contribute to an intersection of the two trends – and not just any intersection: I foreground aesthetic concerns in technology development related to disabilities, where such concerns otherwise tend to be ignored or left to mere add-on beauty. In continuation, my work insists on appreciating the immediate and sensuous, which within design research tends to be superseded by interests in cultural codes and intricate social interplays.

My contributions may not be confined to this intersection. The *compositional principle* is so generic, that it may speak into other fields and wider application

areas by asking or exploring what makes an experience with any interactive design an interplay of elements that respectively perturb and cohere. *The take* – designing for engagement – with its *balance of immersion* stands as a way to address the immediate-over-time and to overcome dichotomies between joy and accessibility. In the latter respect, *the take* has already found its way to a project application on web accessibility, which may indicate a wider reach. The *lenses of sensuousness and participation* may be very specific for people like the children in the SID project – yet, essential in pointing to a core of engagement as well as to the significance of the immediate in becoming or flourishing. In this sense, it may even speak into a wider yet nascent design research field addressing subjective well-being (e.g. Desmet et al., 2013). In addition, the *lens of participation* – together with *the unfolding* and its video – may speak to pedagogy within a wider field as it touches upon core concerns of agency between things, practitioners and participants.

Furthermore, in appreciating the immediate, I promote *sensuousness as a lens* and my designs stand as examples of cherishing *bodily engagement*. Thereby, my work adds to a subset of concerns on corporeality and embodiment that have been maturing in Interaction Design for the last decade.

My work highlights *the tangible* as an aesthetic field, where I have presented views of *an extended materiality* and designs embodying this view. My explorations of tangibles have taken the form of an engaged research rather than the otherwise prevalent lab dominated explorations, and with a focus on experiences rather than objective technical features. Nonetheless, my *palette* may still be of interest to those fields.

Designerly research

My conceptualisations of designerly research have – first and foremost – been intended to account for the knowledge construction of this dissertation. Nonetheless, I add to voices currently seeking foundations for designerly and artistic research. I have not with this dissertation – driven as it is by the sentiment of *tangible participation* – taken upon me to dig deeper into the philosophic grounding of these voices, but I acknowledge a need for further work here. I

especially see this need with respect to the role of *wonderment*, where I may have used terms and concepts that are not altogether compatible.

In performing an *engaged design research*, I draw together participative, constructive and critical perspectives, and – by the force of example – hope to add to emerging interests in bridging otherwise historically separate design research communities. In addition, I provide an example of design research that by its engaged nature speaks into current trends towards value-orientation – yet, it does so by exploring potentials in *thoroughly designerly research* rather than in cross-disciplinarity (e.g. Blevis et al., 2014).

My *conceptualisation of design processes* appropriated for research may be of wider relevance for explorative design research as it makes the plethora of design experiments like probes, sketches and provotypes not only cohere, but also liberates them from being servants of a waterfall model or other sequential models of design development.

In continuation, the design processes in the SID Project also illustrate how strong technical competences *within* a design team can (also) serve participative ambitions by agile construction of evocative, actionable and critical designs, such as the *væsen* workshop and the pastiches. However, the purely technical angles fall outside of this dissertation.

I hope to have added to the *disciplinary diversity* of my research institution, Certec, by having conceptualised and performed an example of a designerly research and by addressing aesthetics. This includes showing how such a research can embrace situations and people even in the most complex and unique paths of life – and to do so by building on a value base.

Design processes

Developing design processes for the children with profound disabilities to affect formative design orientations relates to Certec's credo that everyone has the principled right to affect the development of technology. Furthermore, my concept of *debateables* speaks into ideas of "technology as language": that "technology has the ability to make things visible, makes technology a helpful tool when the user and those around her want to understand needs, wishes and dreams, provided the

individual is always shown deep respect" (Jönsson, 1997). I have shown how the actual designs can play a critical (in the double meaning of both decisive and questioning) role, by both embracing and perturbing the knowledge of the pedagogical staff – and, noticeably so, without being technology-centric or subserviently incremental.

In continuation, my work suggests and exemplifies that developing technology for the caring professions can gain from being seen as a co-development between design and the praxes of the caring professions in question. This speaks into current efforts – such as the *TecU* initiative (http://technucation.dk) – on how new practices with and views on technology "can develop in an interplay with the professional competences [Danish: *professionsfagligheder*]" (my translation from Danish of Hasse, 2012). Here, my designerly approach may also point to critical potentials of designerly ways within educational research as recently addressed by Richter & Allert (2014).

The latter – with its mandate to take critical design into situated engagements – may be of more general interest within the design research community. This may also be the case with the wider uses of *annotated portfolios*.

Beyond academia

Engaged research as mine also points beyond academia.

I have mentioned how thoughts of participation may be of interest to the pedagogical field, and that the developing processes may be relevant for a wider set of the caring professions. On the latter issue, one of the municipalities involved in the SID Project expressed interest in our way of working with pedagogical reflection. I have not had time to follow up on that; yet, drawing together concepts of wonderment, praxes and design engagements within the caring professions seems to be worth pursuing – by doing of course.

My designs and the design processes have been well received within Snoezelen: from the project exhibition to local conferences and my keynote at the international Snoezelen conference, ISNA-MSE XII 2014. Allegedly, the project led buyers within Snoezelen in Sweden to ask for non-button, non-screen interactive products. Not being able to meet this demand, a main provider brought

these requests to an internationally leading company that produces Snoezelen equipment. This contact has led to many hours with the company of deliberations on demos and promising talks. What is interesting here is not so much that the SID Project has pointed to a gap in the market or that the simplicity of actionable designs makes them easy to turn into products, as much as it is the company's emphases on the critical way of grounding the design work and on radical designs as pointers to new opportunities.

One crucial ethical concern is that the research should be worthwhile for the people involved and especially for those who cannot speak for themselves (Jönsson et al., 2005). While my design work might not become products the children can use while they are still children, influences on future products may benefit them and other users of Snoezelen. The project financed and ensured a possibility for the children to go to Snoezelen, which most of them did not already have. Their use of Snoezelen was given an extra reflective attention; and for most of the children, the designs not only gave new but also significant possibilities. In one of the parents' meetings in the SID Project, a parent said something like "If you can just find one thing that my child can truly engage with, it would be fantastic". I am happy that in project we have achieved this (and so much more), and I hope that this dissertation in concert with other disseminations will aid other people in pursuing similar ambitions.

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Besides the following, the photos in this dissertation are all taken by participant in the SID project (web pages last accessed February 28, 2015).

Fig. 2.3.:

www.oregonlive.com/health/index.ssf/2009/07/snoezelen_room_helps_balance_t.html.

Fig. 2.4:

Top left:
www.rompa.eu/glitter-gel-lap-pad.html.

Top right:
www.rompa.eu/sensory-integration-movement/si-tactile/abstract-tactile-panel.html.

Bottom left:
http://www.rompa.eu/rompa-interactive-lighting-system-4-beam-system.html.

Bottom right:
http://www.assistireland.ie/eng/Products_Directory/Healthcare_Products/Sensory_Integration/Sensory_Room_Equipment/Kikre_Tuba.html.

Fig. 2.5:

Top left:
http://www.spacekraft.co.uk/shops/sk/Products/PD1682489/Interactive-Battery-Bubble-Tube.

Top centre:
www.mikeayresdesign.co.uk/explore-app/switch-4-control.

Top right:
http://southpawenterprises.com/bubbletubes/icebubbletube.asp.

Bottom left:
www.rompa.eu/cube.html.

Bottom right:
http://www.mansionathletics.com/sound-to-light-panel-w20942r-snoezelen-multi-sensory-interactive-panels.html.

Terms & concepts

The following specifies my use of terms and concepts (the asterisks refer to other specified terms).

Actionable: When an early design is truly interactive to elicit input but also simple enough to be open for change.

Aesthetics: The study of *sensuous design qualities.

Articulation: Giving form to what Borgdorff calls "the unreflective non-conceptual content" as enclosed in aesthetic experiences, enacted in creative practices and embodied in artistic products.

Debateables: Designs seen as speaking into design collaboration through critical tactics.

Deliberations: Continuous, thoughtful and shared considerations.

Desideratum, pl. desiderata: Desiderata serve to name and aim intentions roused out of a desire, a hope or the like. Desiderata are the initiator of design action and designed change.

Design crew: Besides me as interaction designer, combinations of a sound designer, a textile maker, an electronics engineer as well as students with similar backgrounds.

Design engagements: Explorations through the making and deploying of designs in an *engaged design research with the purposes of inspiration, debate and sketching.

Design imaginations: A knowledge domain of design concepts and material constructs thereof. Each imagination is a suggestive unit – yet, it need not be an optimised solution.

Design potentials: A knowledge domain of salient qualities across designs.

Design situation: A knowledge domain, which in the SID Project concerned the continued development of pedagogical praxes and especially their use of designs.

Design space: An emergent mental construct of a world-in-spe stipulating contours of a field of characteristics and qualities; from concrete artefacts to abstract conceptualisations as well as from hunches to analysis.

Designer-researcher: Designers in *designerly research as well as in explorative development.

Designerly: Relating to an art & design school perspective (by education or outlook) concerning knowledge domains, ways to know and type of knowing.

Engaged design research: A research that gets involved in a real world setting, and do so with a will to change by a deep exploration of and by actions, artefacts and materials.

Engagement: A volition and holistic involvement.

Focus point, pl. foci: Aesthetic perspectives by which to address the *desiderata.

Formative design orientations: The progression of the three knowledge domains: *design situation, *design imaginations and *design potentials.

Infrasonic: With frequencies that can be felt, but not heard by humans.

Interactivity & interplay: Interaction addresses what happens between the design and the child (and staff), while interplay addresses the totality of the Snoezelen experiences in which the design may play a part.

Lenses: Evolved framings able to generatively address (sense / view / reflect / act on) a *design space. The term refers to the academic metaphor

for a coherent, yet contingent, way to address something – with a wordplay on the fact that a physical lens orders the light coming through according to its own construction.

Maturation of the programme: Part/whole-dynamics of co-developing *lenses and *articulations.

Participation: Continuous, situated and relational *engagement with special attention to the experience of being and taking part.

Perturbation: An external change creating both an impetus and an input to internal change. This concept relates to a view on becoming or learning (in the widest sense) that is without illusions of transfer of meaning.

Praxis, pl. praxes: The term praxis emphasises professional judgement tied to the embodied knowledge accumulated through years of practicing a profession. Developed in an interplay of concrete experiences and professional framings, such competencies go beyond what is solely tacit and implicit, but are first and foremost expressed through actions.

Programme, design research: A provisional knowledge regime set up through a tight coupling of design programme and *programmatics.

Programmatics: The knowledge construction side of the *programme at large regarding both its ways and conceptualisations.

Sensuousness: The richness and significance of experiences coupled to multiple both outer and inner senses.

Sentiment of tangible participation: An underlying basic orientation or perspective pointing to a fundamental appreciation of engagements coupled to tangible things and especially the *sensuousness therein.

Snoezelen: A diverse movement around pedagogical and therapeutic uses of multi-sensory environments, primarily for people with profound disabilities.

Snoezeling: What is deemed a *Snoezelen experience.

Staff / pedagogical staff: A collective term for the people doing pedagogical work in the Snoezelen places of the SID Project – not specifying educational background.

Take, holistic: An emerging and overarching guiding principle permeating how one addresses (sense / view / reflect / act on) a *design space, which may only become conscious through having been used many times.

Tangible: Three different meanings: a) significance and importance, b) palpable and comprehensible, c) actual and concrete.

Tangible participation programme: The name of my design research *programme.

Tangibles: Interactive designs that can be interacted with physically and have form by an integrated whole of the digital and the physical.

Wizard of Oz, method of: To (partially) replace the computation of an early design with simple external controls ("behind the curtain") – yet, still giving the user the intended experience.

Væsen: A barely translatable Danish concept meaning used for one of the foci: a) vaguely defined character/entity with mystical or rudimentary agency, b) inherent characteristics of an entity (i.e. loosely like the term *spirit*).

Populärvetenskaplig sammanfattning

Översatt av Per-Olof Hedvall.

Denna avhandling söker nya vägar:

- Nya vägar för sinnlig design som är både digital och materiell.
- Nya vägar för hur designforskning och pedagogisk praxis kan utvecklas tillsammans.
- Nya vägar för en forskning som värdesätter designfältets sätt att närma sig och verka i världen.

Ting och rum som är tilltalande för våra sinnen, känner vi alla till. En unik typ är så kallade Snoezelen-rum. Det är sinnesrum som kan anpassas till den enskilda individen och som typiskt används av människor med omfattande funktionsnedsättningar. Dessa rum är fyllda med designföremål som tilltalar olika sinnen. Sinnesrummen och användningen av dem har utvecklats från 70-talet och framåt. Ett kännetecken är ett sökande efter möjligheter i situationen – i mötet mellan användare, personal och designföremål, snarare än förutbestämda mål eller givna diagnoser.

Snoezelen-rörelsen hade också ett sökande förhållningssätt till utveckling av den teknik som fyller rummen. Emellertid förefaller inte ny interaktiv teknologi – där designföremål kan känna och reagera – att ha funnit sin plats i Snoezelen.

Skulle det kunna vara annorlunda? Vilka möjligheter uppstår när designföremål – genom sin interaktivitet – kan ge rikare sinnliga upplevelser? För att undersöka sådana möjligheter skisserar designforskningen en värld som vi ännu bara anar eller har sett en glimt av. Ett sådant sökande behöver värdesätta och vara baserat på värderingar, kunskap, omdöme, sensitivitet och handlingar ifrån alla involverade.

Detta sökande har utspelat sig i ett projekt kallat SID – Sinnlighet, Interaktion och Delaktighet (http://sid.desiign.org). De tre begreppen har också varit ledstjärnor för denna avhandlings designforskningsprogram, *tangible participation*.

Under tre år har barn med omfattande utvecklingsstörning besökt Snoezelen-sinnesrum. Designforskare och pedagogisk personal har tillsammans utvecklat processer och tankesätt som sätter användaren i centrum – utan de krav på samtals- och föreställningsförmåga som annars ofta kännetecknar användarmedverkan. Här har designföremål fungerat som förslag som skapat ett gemensamt fokus i sökandet efter inspiration, värden och estetik. Avhandlingen presenterar och reflekterar över en rad exempel på sådana designprocesser. Utifrån dessa lyfts designprocessers särskilda potential för pedagogisk reflektion fram.

Med tiden visade sig en paradox i projektet. Orsakssammanhang är en omfattande utmaning i dessa barns vardag. Icke desto mindre njöt barnen av att använda de nya designföremålen, trots att dessa byggde på okända orsakssammanhang som att beröra ljus, klämma på ljud och trycka sig in i ett färguniversum.

Genom att fånga sådana kvalitéer har avhandlingen bidragit till forskning inom interaktionsdesign med följande:

Snoezelens sinnlighet har med de nya designföremålen blivit berikad med interaktivitet – en interaktivitet som knyter an till både yttre och inre (kroppsliga) sinnesupplevelser. Avhandlingen lyfter fram sådana exempel och framhäver hur designers genom detta sinnliga perspektiv kan få syn på nya möjligheter för både att berika och stödja engagemang.

Avhandlingen bidrar till att begreppsliggöra ett relativt nytt fält, där form inte enbart handlar om användning av material utan också om hur designföremålen (re)agerar – deras interaktivitet. Designarbetet har dessutom fört fram en palett av dynamiska och flersinnliga formelement. Paletten kompletteras med stämningsgivande beskrivningar och videoklipp av designföremål i användning. Denna del av avhandlingen bidrar till att skapa ett gemensamt formspråk inom det nya designfältet för s.k. *tangibles*.

Varje design kan ses som en kombination av element som skapar helhet i upplevelser och element som kittlar eller till och med retar. Genom sådana kombinationer är designen både tillgänglig och berikande, på en och samma gång. Denna basala kompositionsprincip exemplifieras och förs i dialog med teman inom interaktionsdesign så att andra designers kan ha nytta av den.

Det som karakteriserar designföremålen är det sätt på vilket de både understödjer förståelse och uppmärksamhet samt berikar och fördjupar engagemang. Här skiljer sig designens estetik radikalt från synsätt som förenklar interaktionen och bara ser estetik som en tillfogad ”vacker” yta. Avhandlingen visar hur detta helhetsgrepp har vuxit fram ur samarbetet mellan designforskare och pedagogisk personal.

Allt som allt har designföremålens egenskaper främjat barnens delaktighet i Snoezelen-samspelet. Designen har både kunnat gripas och begripas. De designade föremålen har också tjänat som närmast magiska samlingspunkter som barnen har kunnat sätta igång samspel kring. En särskilt viktig egenskap har varit hur designens interaktivitet har understött barnens möjligheter att kunna påverka världen och känna sig själva som en del av den. Sådana exempel och tankesätt har relevans för såväl design som för pedagogik.

Designforskning som fångar drag hos en möjlig värld genom och för skapande processer är ett gryende fält. Denna avhandling ger ett exempel på hur sådan forskning kan ta form genom ett engagemang i en pedagogisk praxis. Dessutom skisseras en modell för en sådan designforskning. Modellen bygger på ett arv från designfältet avseende sätt att verka i världen, vad man strävar efter kunskap om och typen på denna kunskap.

Populærvidenskabelig sammenfatning

Denne afhandling søger nye veje:

- Nye veje for sanselige designs, der både er digitale og materielle.
- Nye veje for hvordan designforskning og pædagogisk praksis kan udvikles sammen.
- Nye veje for en forskning, der værdsætter designfeltets måder at tilgå verdenen.

Ting og rum, der appellerer til vores sanser, kender vi alle. En unik type er såkaldte Snoezelen-rum. Det er sanserum, der kan tilpasses den enkelte og som typisk bruges af mennesker med gennemgribende funktionshindring. Disse rum er fyldt med designs, der appellerer til mange forskellige sanser. Sanserummene og brugen af dem er blevet udviklet siden 70'erne. Et kendetegn er en søgen efter muligheder i situationen – i mødet mellem bruger, personale og designene, snarere end i forudbestemte mål eller givne diagnoser.

Snoezelen-bevægelsen havde også en søgende tilgang til udvikling af den teknologi, der fylder rummene. Imidlertid syntes ny interaktiv teknologi – hvor ting kan sanse og reagere – ikke at have fundet sin plads i Snoezelen. Kunne det ikke være anderledes? Hvilke muligheder opstår når designs – gennem deres interaktivitet – kan give rigere sanselige oplevelser. For at undersøge sådanne muligheder skitserer designforskningen en verden vi indtil nu måske kun har set en flig af eller blot fornemmer. En sådan søgen må værdsætte og trække på både værdier, kundskab, dømmekraft, sensitivitet og handlinger fra alle involverede:

Denne søgen har udspillet sig i et projekt kaldt SID – Sanselighed, Interaktion & Delagtighed (http://sid.desiign.org). Disse tre begreber har tillige været ledestjerner for afhandlingens designforskningsprogram, *Tangible Participation*.

Gennem tre år har børn med gennemgribende udviklingshæmning kommet til Snoezelen-sanserum. Sammen har designforskere og pædagogisk personale udviklet processer og tankesæt, der sætter brugeren af rummene i centrum – uden krav om samtale og forestillingsevne, der ellers kendetegner brugerinddragelse. Her har designene fungeret som bud på en verden snarere end produkter – udtryksfulde bud der har skabt et fælles fokus i en søgen af inspiration, værdier og

æstetik. Afhandlingen præsenterer og reflekterer over en række eksempler på disse designprocesser. Herudfra fremhæves designprocessers særlige potentialer for at fremme pædagogisk refleksion.

Undervejs i projektet fremkom et paradoks. Årsagssammenhænge er en gennemgribende udfordring i disse børns dagligdag. Ikke desto mindre nød børnene at bruge de nye designs på trods af at disse designs bygge på ukendte årsagssammenhænge såsom at berøre lys, skubbe lyd og trykke sig ind i et farveunivers.

Det er sådanne kvaliteter som afhandlingen har indfanget og derudfra bidraget med følgende indenfor interaktionsdesignforskning.

Snoezelens sanselighed er med designene blevet beriget med interaktivitet – en interaktivitet, der knytter an til både ydre og indre (kropslige) sanseoplevelser. Afhandlingen giver eksempler herpå, og fremhæver hvordan designere gennem dette sanselige perspektiv kan få syn for nye muligheder for både at berige og støtte engagement.

Afhandlingen bidrager til at begrebsliggøre et relativt nyt felt, hvor form ikke handler kun om brugen af materialer, men også hvordan designene (re)agerer – deres interaktivitet. Designarbejdet har tillige ført frem til en palet af dynamiske og flersanselige formelementer. Paletten suppleres af stemningsgivende beskrivelser og videoklip af designs i brug. Denne del af afhandlingen bidrager til at skabe et formsprog i et stadigt nyt designfelt af såkaldte *tangibles*.

Hvert design kan ses som en kombination af elementer der skaber helhed i oplevelserne og elementer der pirrer. Gennem sådanne kombinationer er designene på en og samme tid tilgængelige og berigende. Dette basale kompositionsprincip eksemplificeres og bringes i dialog med temaer indenfor interaktionsdesign så andre designere kan gøre brug heraf.

Det karakteristiske ved designene er den måde de på en og samme vis understøtter forståelse og opmærksomhed samt beriger fordybelse. Herved adskiller designenes æstetik sig radikalt fra tilgange, der forsimpler interaktionen eller som blot ser æstetik som en tilføjet 'pæn' overflade. Afhandlingen viser hvordan dette helhedsgreb er vokset ud af samarbejdet mellem designforskere og pædagogisk personale.

Alt i alt har disse træk ved designene fremmet børnenes delagtighed i Snoezelen samspillet. Designene har været til både at gribe og begribe. De har også tjent som nærmest magiske samlingspunkter, hvoromkring børnene har kunnet igangsætte samspil. Et særligt vigtigt træk har været hvordan designenes interaktivitet har fremmet børnenes muligheder for at kunne påvirke verdenen og mærke sig selv som en del av den. Sådanne eksempler og tankesæt har relevans for design såvel som pædagogik.

Designforskning som det at indfange træk af en mulig verden gennem og for skabende processer er et gryende forskningsfelt. Denne afhandling giver et eksempel på hvordan en sådan forskning kan tage form gennem et engagement i en pædagogisk praksis. Derudover skitseres en model for en sådan designforskning. Modellen trækker på en arv fra designfeltet med hensyn til måder at tilgå verdenen, hvad man vil have kundskab om og typen af denne kundskab.